FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Environmental Assessment and Restoration, Bureau of Watershed Restoration

NORTHEAST DISTRICT • LOWER ST. JOHNS BASIN

FINAL TMDL Report

DO and Nutrient TMDLs for Swimming Pen Creek (WBID 2410) and Nutrient TMDL for Doctors Lake (WBID 2389)

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TMDL Program

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http://www.dep.state.fl.us/legal/Rules/shared/62-303/62-303.pdf

STORET Program

http://www.dep.state.fl.us/water/storet/index.htm

2008 305(b) Report

http://www.dep.state.fl.us/water/docs/2008_Integrated_Report.pdf

Criteria for Surface Water Quality Classifications

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Basin Status Report for the Lower St. Johns Basin

http://www.dep.state.fl.us/water/basin411/sj_lower/status.htm

Water Quality Assessment Report for the Lower St. Johns Basin

http://www.dep.state.fl.us/water/basin411/sj_lower/assessment.htm

U.S. Environmental Protection Agency, National STORET Program

Region 4: Total Maximum Daily Loads in Florida

http://www.epa.gov/region4/water/tmdl/florida/

National STORET Program

http://www.epa.gov/storet/

Chapter 1: INTRODUCTION

1.1 Purpose of Report

This report presents the Total Maximum Daily Loads (TMDLs) for dissolved oxygen (DO) and nutrients for Swimming Pen Creek and the TMDL for nutrients for Doctors Lake in the Lower St. Johns Basin. Swimming Pen Creek was verified as impaired for both DO and nutrients, and was included on the Verified List of impaired waters for the Lower St. Johns Basin that was adopted by Secretarial Order in May 2009. Doctors Lake was also verified as impaired for nutrients, and was included on the Verified List adopted in May 2009. These TMDLs establish the allowable loadings to Swimming Pen Creek and Doctors Lake that would restore the waterbodies so that they meet applicable water quality criteria for both DO and nutrients.

1.2 Identification of Waterbody

Swimming Pen Creek, located in Clay County, in northeast Florida, drains an area of about 3.0 square miles (mi^2) and is located next to the Doctors Lake watershed. The creek flows approximately 0.6 miles into Doctors Lake. Doctors Lake has a surface area of approximately 5.4 mi^2 and is connected to the St. Johns River (**Figures 1.1** and **1.2**). The Doctors Lake watershed is located just south of Orange Park, in the northern portion of Clay County, and on the west side of the St. Johns River. The northern shoreline of the lake is highly urbanized. Additional information about the creek's hydrology and geology are available in the Basin Status Report for the Lower St. Johns (Florida Department of Environmental Protection [Department], 2002).

For assessment purposes, the Department has divided the Lower St. Johns Basin into water assessment polygons with a unique **w**ater**b**ody **id**entification (WBID) number for each watershed or stream reach. This TMDL report addresses Swimming Pen Creek, WBID 2410, for DO and nutrients and Doctors Lake, WBID 2389, for nutrients.

Swimming Pen Creek and Doctors Lake are part of the Black Creek Planning Unit. Planning units are groups of smaller watersheds (WBIDs) that are part of a larger basin unit, in this case the Lower St. Johns Basin. The Black Creek Planning Unit consists of 104 WBIDs. **Figure 1.3** shows the locations of these WBIDs and the locations of the Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389) watersheds in the planning unit.

1.3 Background

This report was developed as part of the Department's watershed management approach for restoring and protecting state waters and addressing TMDL Program requirements. The watershed approach, which is implemented using a cyclical management process that rotates through the state's 52 river basins over a 5-year cycle, provides a framework for implementing the TMDL Program–related requirements of the 1972 federal Clean Water Act and the 1999 Florida Watershed Restoration Act (FWRA) (Chapter 99-223, Laws of Florida).

Figure 1.1. Location of the Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389) Watersheds in the Lower St. Johns Basin and Major Hydrologic Features in the Area

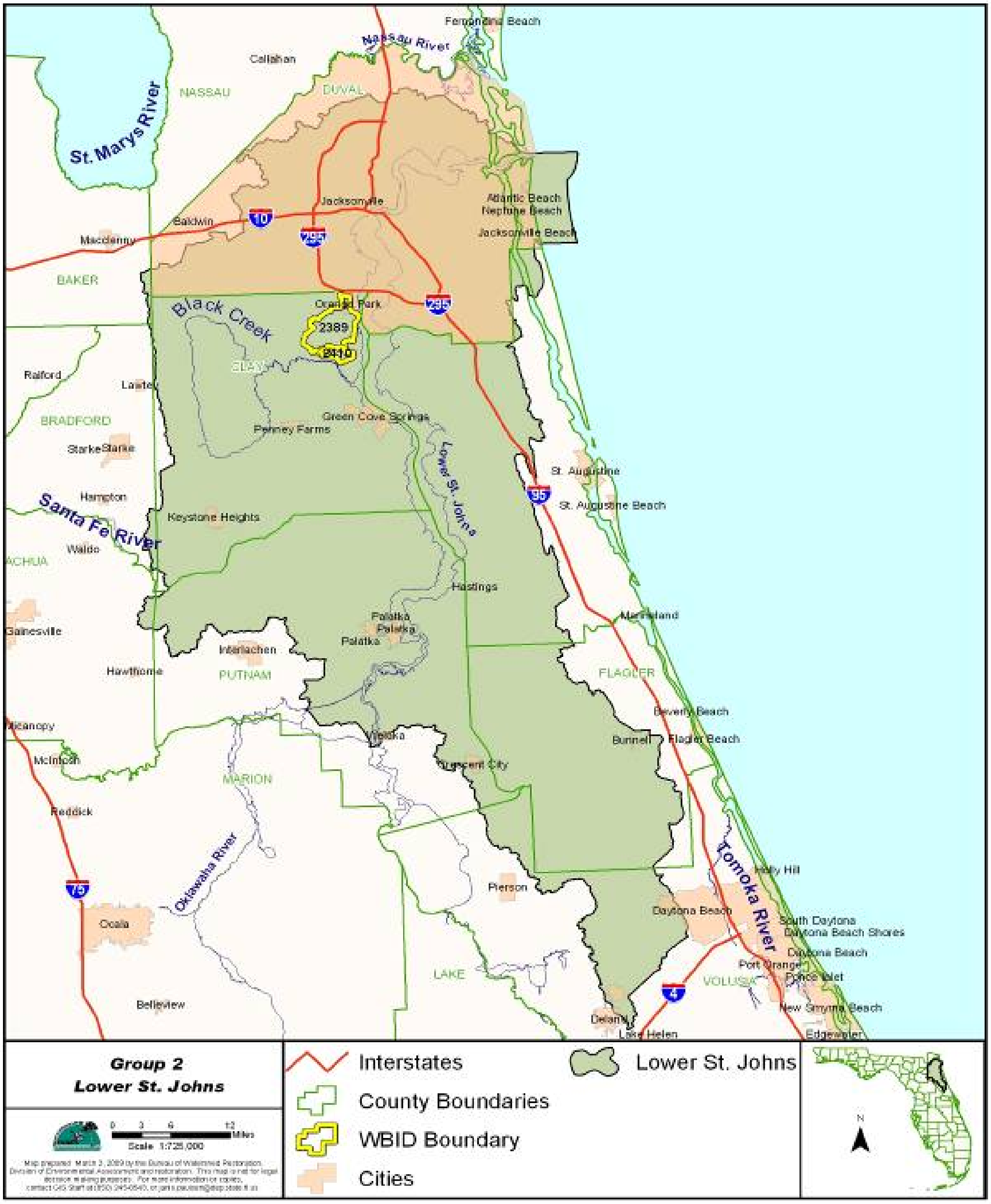
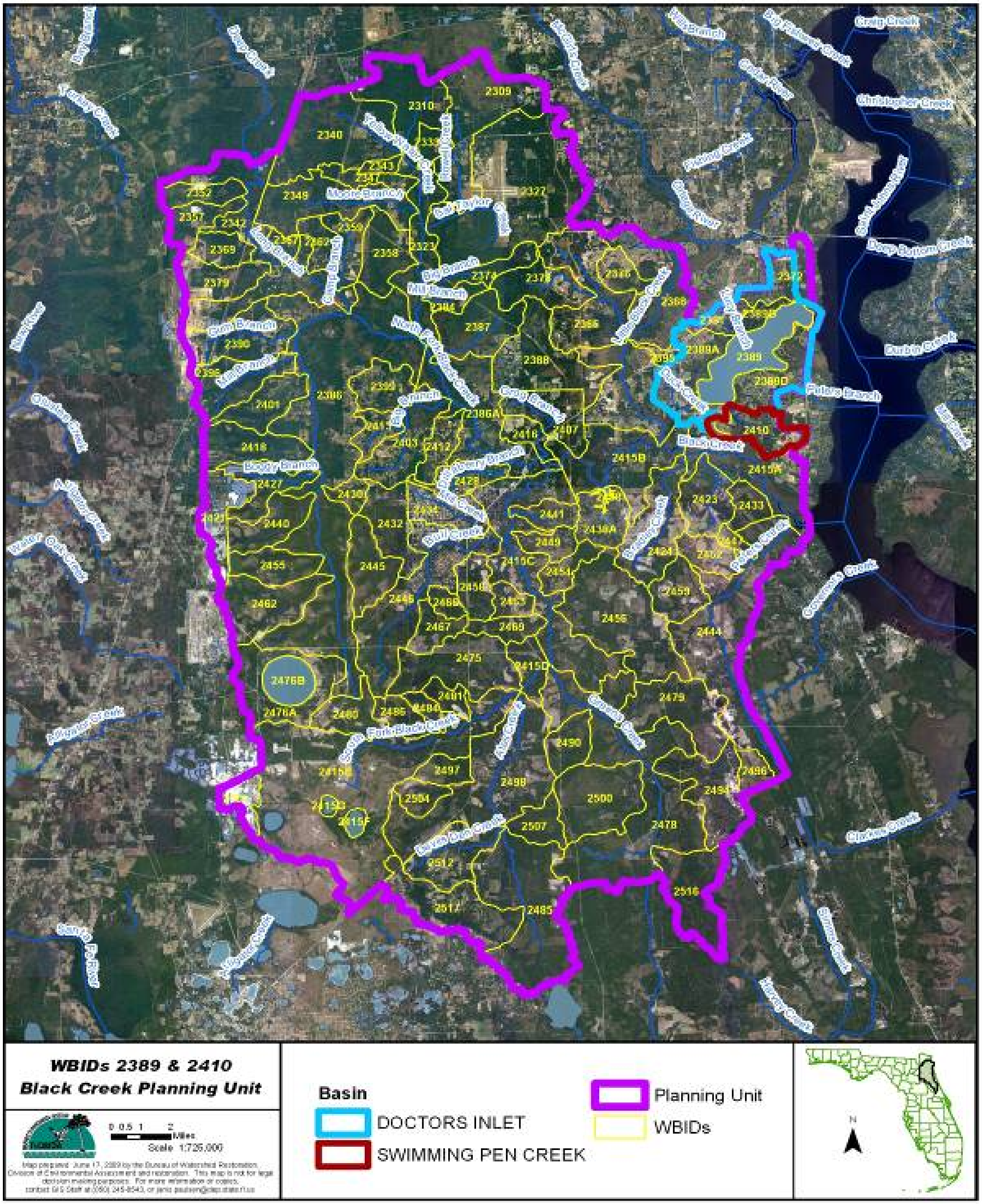


Figure 1.2. Location of the Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389) Watersheds in Clay County and Major Hydrologic Features in the Area

Figure 1.3. WBIDs in the Black Creek Planning Unit



A TMDL represents the maximum amount of a given pollutant that a waterbody can assimilate and still meet water quality standards, including its applicable water quality criteria and its designated uses. TMDLs are developed for waterbodies that are verified as not meeting their water quality standards. They provide important water quality restoration goals that will guide restoration activities.

A nutrient TMDL that was adopted in April 2008 for the mainstem of the Lower St. Johns River required a 30 to 50 percent reduction in anthropogenic loadings of nitrogen to the marine portion of the Lower St. Johns. A Basin Management Action Plan, or BMAP, was adopted in October 2008 that outlined a number of activities designed to reduce the amount of total nitrogen (TN) to the marine portion of the Lower St. Johns. These activities will depend heavily on the active participation of the St. Johns River Water Management District (SJRWMD), local governments, businesses, and other stakeholders. The Department will work with these organizations and individuals to undertake or continue reductions in the discharge of pollutants and achieve the established TMDLs for impaired waterbodies, including tributaries to the Lower St. Johns such as the Swimming Pen Creek and Doctors Lake watersheds.

Chapter 2: DESCRIPTION OF WATER QUALITY PROBLEM

2.1 Statutory Requirements and Rulemaking History

Section 303(d) of the federal Clean Water Act requires states to submit to the U.S. Environmental Protection Agency (EPA) lists of surface waters that do not meet applicable water quality standards (impaired waters) and establish a TMDL for each pollutant causing the impairment of listed waters on a schedule. The Department has developed such lists, commonly referred to as 303(d) lists, since 1992. The list of impaired waters in each basin, referred to as the Verified List, is also required by the FWRA (Subsection 403.067[4], Florida Statutes [F.S.]); the state's 303(d) list is amended annually to include basin updates.

Florida's 1998 303(d) list included 55 waterbodies in the Lower St. Johns Basin. However, the FWRA (Section 403.067, F.S.) stated that all previous Florida 303(d) lists were for planning purposes only and directed the Department to develop, and adopt by rule, a new science-based methodology to identify impaired waters. After a long rulemaking process, the Environmental Regulation Commission adopted the new methodology as Rule 62-303, Florida Administrative Code (F.A.C.) (Identification of Impaired Surface Waters Rule, or IWR), in April 2001; the rule was modified in 2006 and 2007.

2.2 Information on Verified Impairment

The Department used the IWR to assess water quality impairments in the Swimming Pen and Doctors Lake watersheds and has verified that Swimming Pen Creek is impaired for DO and nutrients, and Doctors Lake is impaired for nutrients based on data in the Department's IWR database. **Table 2.1** summarizes the DO data for Swimming Pen Creek over the verified period, which for Group 2 waters was January 1, 2001, through June 30, 2008. **Tables 2.2** through **2.4** provide data summaries for Swimming Pen Creek over the verified period by month, season, and year, respectively.

There is a 17.2 percent overall exceedance rate for DO in Swimming Pen Creek during the verified period (**Table 2.1**). Exceedances occur in all seasons except winter and in the months of January through May (**Tables 2.2** and **2.3**). During the verified period, samples ranged from 1.2 to 14.73 milligrams per liter (mg/L). As DO solubility is influenced by both salinity and water temperature, ranges in DO saturation were also evaluated. DO saturation (DOSAT) ranged from 15.1 percent (summer) to 185.5 percent (summer), with about 30 percent of the saturation values greater than 100 percent. Fewer than 10 percent of the DOSAT values were less than 47 percent.

When aggregating data by season, no exceedances occurred in the winter, while the highest percentage occurred between August and October. Possible relationships between DO and other water quality parameters are further assessed in Chapter 5, using the complete historical dataset.

Table 2.1. Summary of DO Monitoring Data for Swimming Pen Creek (WBID 2410) During the Verified Period (January 1, 2001–June 30, 2008)

- = Empty cell
[1] BOD = Biochemical oxygen demand
[2] TP = Total phosphorus

Waterbody (WBID)	Parameter	DO
Swimming Pen Creek (2410)	Total number of samples	93
Swimming Pen Creek (2410)	IWR-required number of exceedances for the Verified List	14
Swimming Pen Creek (2410)	Number of observed exceedances	16 (17.2%)
Swimming Pen Creek (2410)	Number of observed nonexceedances	77
Swimming Pen Creek (2410)	Number of seasons during which samples were collected	4
Swimming Pen Creek (2410)	Highest observation (mg/L)	14.73
Swimming Pen Creek (2410)	Lowest observation (mg/L)	1.20
Swimming Pen Creek (2410)	Median observation (mg/L)	7.93
Swimming Pen Creek (2410)	Mean observation (mg/L)	7.52
Swimming Pen Creek (2410)	Median value for 69 BOD observations (mg/L)[1]	2.4
Swimming Pen Creek (2410)	Median value for 79 TN observations (mg/L)	1.36
Swimming Pen Creek (2410)	Median value for 80 TP observations (mg/L)[2]	0.094
Swimming Pen Creek (2410)	Possible causative pollutant by IWR	BOD and Nutrients
-	**FINAL ASSESSMENT:**	**Impaired**

Table 2.2. Summary of DO Data by Month for Swimming Pen Creek (WBID 2410) During the Verified Period (January 1, 2001–June 30, 2008)

DO is in mg/L.

Month	N	Minimum	Maximum	Median	Mean	Number of Exceedances	% Exceedances	Mean Precipitation (inches)
January	7	6.99	11.51	9.88	9.33	0	0.00	2.03
February	7	5.30	11.05	8.32	8.56	0	0.00	3.32
March	5	5.43	9.43	8.95	8.05	0	0.00	4.05
April	11	7.88	11.38	8.24	8.63	0	0.00	1.99
May	13	6.03	12.08	7.02	7.91	0	0.00	1.85
June	13	4.92	10.08	7.22	7.49	1	7.69	9.08
July	6	4.00	12.51	7.47	7.91	1	16.67	7.71
August	7	1.74	11.95	6.45	5.80	3	42.86	5.50
September	7	1.20	14.73	4.06	5.78	5	71.43	8.63
October	6	3.43	9.17	4.29	5.34	4	66.67	3.55
November	6	3.14	8.76	6.66	6.62	1	16.67	1.33
December	5	4.65	9.81	7.95	7.77	1	20.00	3.63

Table 2.3. Summary of DO Data by Season for Swimming Pen Creek (WBID 2410) During the Verified Period (January 1, 2001–June 30, 2008)

DO is in mg/L.

Season	N	Minimum	Maximum	Median	Mean	Number of Exceedances	% Exceedances	Mean Total Precipitation (inches)
Winter	19	5.30	11.51	8.95	8.71	0	0.00	9.40
Spring	37	4.92	12.08	7.97	7.98	1	2.70	12.92
Summer	20	1.20	14.73	5.81	6.43	9	45.00	21.84
Fall	17	3.14	9.81	6.89	6.50	6	35.29	8.51

Table 2.4. Summary of DO Data by Year for Swimming Pen Creek (WBID 2410) During the Verified Period (January 1, 2001–June 30, 2008)

DO is in mg/L.

Year	N	Minimum	Maximum	Median	Mean	Number of Exceedances	% Exceedances	Total Precipitation (inches)
2001	12	1.74	11.51	6.10	6.58	5	41.67	49.14
2002	12	1.95	12.51	7.96	7.36	3	25.00	54.72
2003	12	3.14	14.73	7.81	7.88	1	8.33	44.47
2004	12	1.20	11.05	6.52	6.76	2	16.67	69.47
2005	9	4.00	8.79	8.03	7.40	2	22.22	65.49
2006	10	3.22	10.38	8.87	7.73	2	20.00	38.07
2007	8	4.54	11.95	8.23	8.23	1	12.50	45.98
2008	18	5.63	12.08	7.91	8.17	0	0.00	31.39

Table 2.5 summarizes annual average corrected chlorophyll *a* (CHLAC) concentrations for Swimming Pen Creek based on the IWR. During the verified period, the threshold of 20 micrograms per liter (µg/L) was exceeded in 2001, 2002, 2003, 2004, 2005, and 2006.

Table 2.5. Summary of Annual Average CHLAC for Swimming Pen Creek (WBID 2410) During the Verified Period (January 1, 2001–June 30, 2008)

- = Empty cell/no data

Year	Mean (µg/L)	Exceedance
2001	34.96	yes
2002	21.92	yes
2003	28.53	yes
2004	23.93	yes
2005	35.88	yes
2006	27.47	yes
2007	-	-
2008	-	-

In lakes, a Trophic State Index (TSI), based on the average of a chlorophyll *a* (chl*a*) index and a nutrient index, is used to assess nutrient impairment. **Table 2.6** summarizes the annual average TSI for Doctors Lake over the verified period. Based on a lake color greater than 40 platinum cobalt units (PCUs), the threshold for impairment is a TSI of 60. The TSI threshold was exceeded in 2001, 2002, 2003, 2004, 2005, and 2006.

Table 2.6. Summary of Annual Average TSI Values for Doctors Lake (WBID 2389) During the Verified Period (January 1, 2001–June 30, 2008)

- = Empty cell/no data

Year	Mean Color (PCUs)	Mean TSI	Exceedance
2001	89.1	63.4	yes
2002	124	60.5	yes
2003	113	65.2	yes
2004	132	60.3	yes
2005	132	63.1	yes
2006	57.3	64.1	yes
2007	43.7	-	-
2008	-	-	-

Chapter 3. DESCRIPTION OF APPLICABLE WATER QUALITY STANDARDS AND TARGETS

3.1 Classification of the Waterbody and Criterion Applicable to the TMDL

Florida's surface waters are protected for five designated use classifications, as follows:

Class IPotable water supplies
Class II Shellfish propagation or harvesting
Class III Recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife
Class IV Agricultural water supplies
Class V Navigation, utility, and industrial use (there are no state waters currently in this class)

Both Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389) are Class III freshwater waterbodies, with a designated use of recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife. The Class III water quality criteria applicable to the impairment addressed by these TMDLs are for DO and nutrients.

3.2 Applicable Water Quality Standards and Numeric Water Quality Target

3.2.1 Dissolved Oxygen Criterion

Numeric criteria for DO are expressed in terms of minimum and daily average concentrations. The water quality criterion for the protection of Class III freshwater waterbodies, as established by Rule 62-302, F.A.C., states the following:

Dissolved Oxygen Criteria:

Shall not be less than 5.0. Normal daily and seasonal fluctuations above these levels shall be maintained.

DO concentrations in ambient waters are influenced by many factors, including DO solubility, which is controlled by temperature and salinity; DO enrichment processes influenced by reaeration, which is controlled by flow velocity; the photosynthesis of phytoplankton, periphyton, and other aquatic plants; DO consumption from the decomposition of organic materials in the water column and sediment, and the oxidation of some reductants such as ammonia and metals; and respiration by aquatic organisms.

The nutrient criterion in Rule 62-302, F.A.C., is expressed as a narrative:

Nutrients:
In no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna [Note: For Class III waters in the

Everglades Protection Area, this criterion has been numerically interpreted for phosphorus in Section 62-302.540, F.A.C.].

To assess whether this narrative criterion was being exceeded, the IWR provides thresholds for nutrient impairment in streams based on annual average chl*a* levels and for lakes an annual TSI. The following language is found in Rule 62-303, F.A.C.:

2-303.353 Nutrients in Streams.
A stream or stream segment shall be included on the planning list for nutrients if the following biological imbalances are observed:

(1) Algal mats are present in sufficient quantities to pose a nuisance or hinder reproduction of a threatened or endangered species, or

(2) Annual mean chlorophyll a concentrations are greater than 20 μg/l or if data indicate annual mean chlorophyll a values have increased by more than 50% over historical values for at least two consecutive years.

62-303.352 Nutrients in Lakes.
For the purposes of evaluating nutrient enrichment in lakes, TSIs shall be calculated based on the procedures outlined on pages 86 and 87 of the State's 1996 305(b) report, which are incorporated by reference. Lakes or lake segments shall be included on the planning list for nutrients if:

(1) For lakes with a mean color greater than 40 platinum cobalt units, the annual mean TSI for the lake exceeds 60, unless paleolimnological information indicates the lake was naturally greater than 60, or

(2) For lakes with a mean color less than or equal to 40 platinum cobalt units, the annual mean TSI for the lake exceeds 40, unless paleolimnological information indicates the lake was naturally greater than 40, or

(3) For any lake, data indicate that annual mean TSIs have increased over the assessment period, as indicated by a positive slope in the means plotted versus time, or the annual mean TSI has increased by more than 10 units over historical values. When evaluating the slope of mean TSIs over time, the Department shall require at least a 5 unit increase in TSI over the assessment period and use a Mann's one-sided, upper-tail test for trend, as described in Nonparametric Statistical Methods by M. Hollander and D. Wolfe (1999 ed.), pages 376 and 724 (which are incorporated by reference), with a 95% confidence level.

62-303.450 Interpretation of Narrative Nutrient Criteria.
(1) A water shall be placed on the verified list for impairment due to nutrients if there are sufficient data from the last five years preceding the planning list assessment, combined with historical data (if needed to establish historical chlorophyll a levels or historical TSIs), to meet the data sufficiency requirements of subsection 62-303.350(2), FA.C. If there are insufficient data, additional data shall be collected as needed to meet the requirements. Once these additional data are collected, the Department shall determine if there is sufficient information to

develop a site-specific threshold that better reflects conditions beyond which an imbalance in flora or fauna occurs in the water segment. If there is sufficient information, the Department shall re-evaluate the data using the site-specific thresholds. If there is insufficient information, the Department shall re-evaluate the data using the thresholds provided in Rules 62-303.351-.353, F.A.C., for streams, lakes, and estuaries, respectively. In any case, the Department shall limit its analysis to the use of data collected during the five years preceding the planning list assessment and the additional data collected in the second phase. If alternative thresholds are used for the analysis, the Department shall provide the thresholds for the record and document how the alternative threshold better represents conditions beyond which an imbalance in flora or fauna is expected to occur.

Chapter 4: ASSESSMENT OF SOURCES

4.1 Types of Sources

An important part of the TMDL analysis is the identification of pollutant source categories, source subcategories, or individual sources of pollutants in the watershed and the amount of pollutant loading contributed by each of these sources. Sources are broadly classified as either "point sources" or "nonpoint sources." Historically, the term "point sources" has meant discharges to surface waters that typically have a continuous flow via a discernable, confined, and discrete conveyance, such as a pipe. Domestic and industrial wastewater treatment facilities (WWTFs) are examples of traditional point sources. In contrast, the term "nonpoint sources" was used to describe intermittent, rainfall-driven, diffuse sources of pollution associated with everyday human activities, including runoff from urban land uses, agriculture, silviculture, and mining; discharges from failing septic systems; and atmospheric deposition.

However, the 1987 amendments to the Clean Water Act redefined certain nonpoint sources of pollution as point sources subject to regulation under the EPA's National Pollutant Discharge Elimination System (NPDES) Program. These nonpoint sources included certain urban stormwater discharges, such as those from local government master drainage systems, construction sites over five acres, and a wide variety of industries (see **Appendix A** for background information on the federal and state stormwater programs).

To be consistent with Clean Water Act definitions, the term "point source" will be used to describe traditional point sources (such as domestic and industrial wastewater discharges) **AND** stormwater systems requiring an NPDES stormwater permit when allocating pollutant load reductions required by a TMDL (see **Section 6.1**). However, the methodologies used to estimate nonpoint source loads do not distinguish between NPDES stormwater discharges and non-NPDES stormwater discharges, and as such, this source assessment section does not make any distinction between the two types of stormwater.

4.2 Potential Sources of Nutrients in the Swimming Pen Creek and Doctors Lake Watersheds

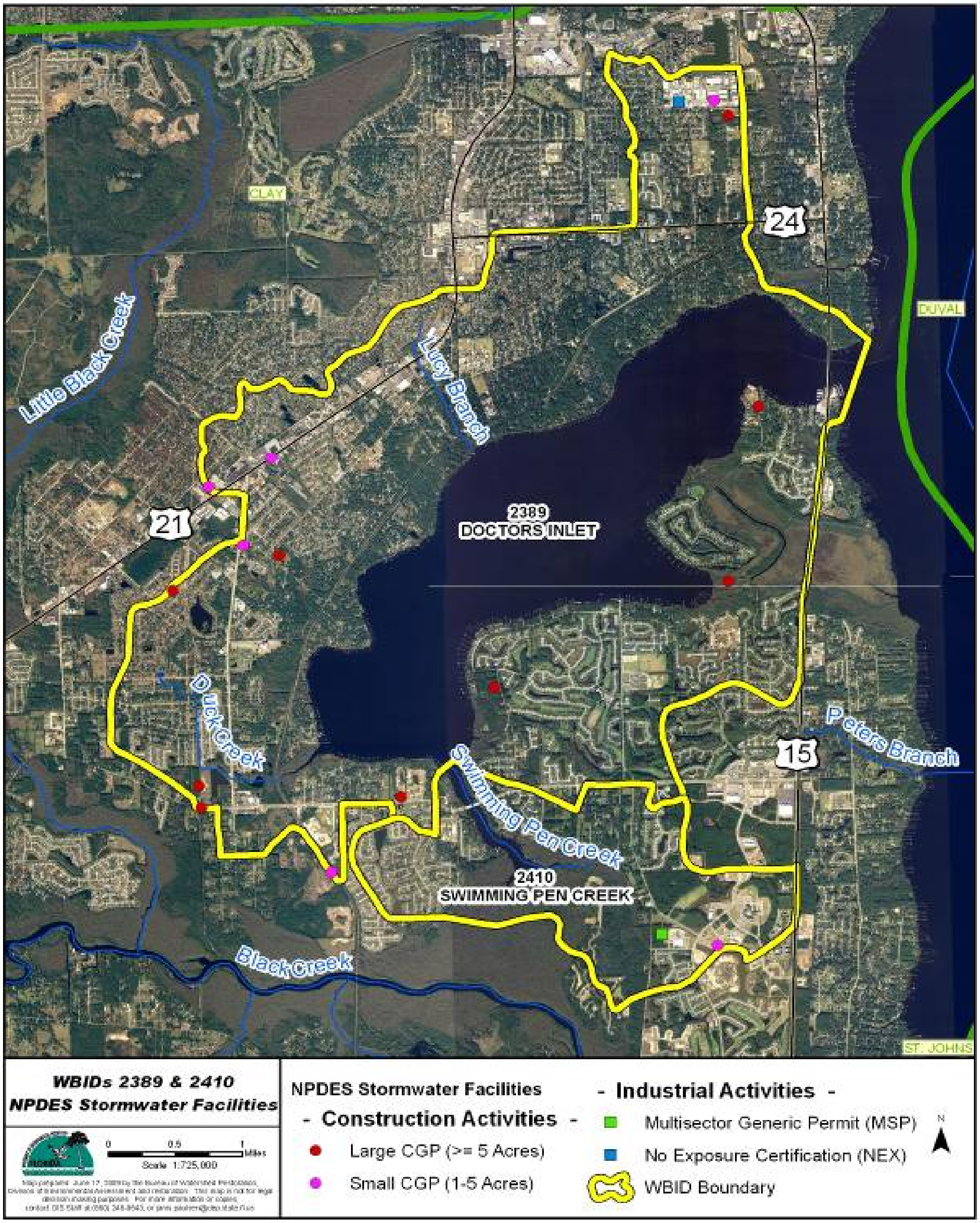
4.2.1 Point Sources

There are two NPDES wastewater facilities located in the watersheds (**Figure 4.1**): the Clay County Utility Authority Miller Street WWTF (Permit FL0043834) and the Fleming Island Regional WWTF (Permit FL0043834). However, these facilities discharge directly to the Lower St. Johns River.

There are 19 NPDES stormwater permits in the Doctors Lake watershed (**Figure 4.2**), 14 of which are still active. Of the active permits, 7 are small construction general permits, 4 are large construction general permits, 1 is a multi-sector permit, and 1 is classified as a no-exposure certification permit.

Figure 4.1. Location of Permitted Facilities in the Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389) Watersheds

Figure 4.2. NPDES Stormwater Facility Permits in the Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389) Watersheds



Municipal Separate Storm Sewer System Permittees

Clay County (Permit FLR04E045), Florida Department of Transportation (FDOT) District 2 (Permit FLR04E020), and the town of Orange Park (Permit FLR04E075) have Phase II NPDES municipal separate storm sewer system (MS4) permits that includes portions of the Swimming Pen Creek and Doctors Lake watersheds.

4.2.2 Land Uses and Nonpoint Sources

Nutrient loadings to Swimming Pen Creek and Doctors Lake are generated from nonpoint sources in the watersheds. These potential sources include loadings from surface runoff, ground water inflow, leakage from collection systems, and septic tanks.

Land Uses

The spatial distribution and acreage of different land use categories were identified using the 2004 land use coverage contained in the Department's geographic information system (GIS) library, initially provided by the SJRWMD. Land use categories and acreages in the watersheds were aggregated using the Level 2 codes tabulated in **Table 4.1. Figure 4.3** shows the principal land uses in the watersheds aggregated to the Level 1 land use codes.

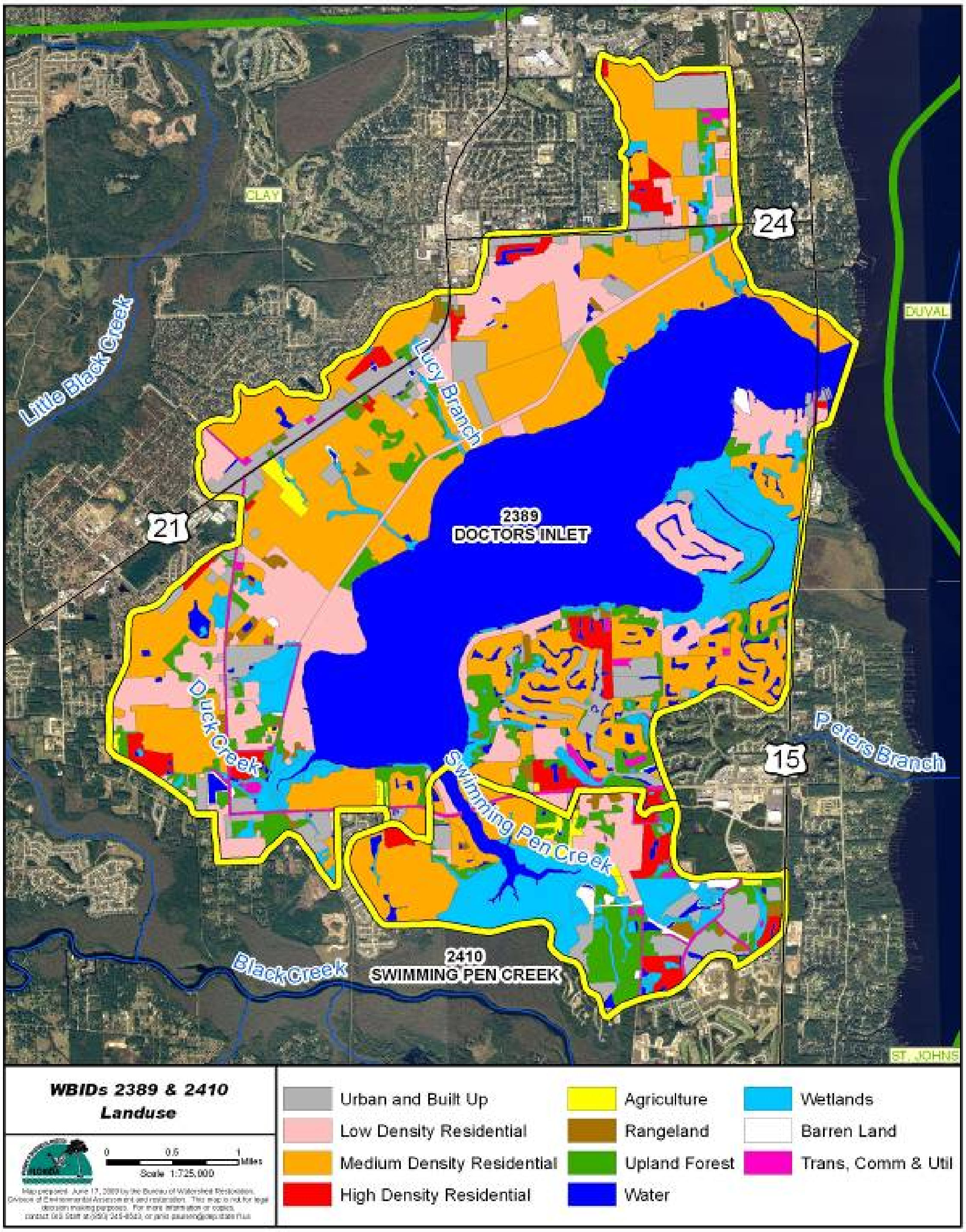
As shown in **Table 4.1**, the total area of the Swimming Pen Creek and Doctors Lake watersheds is about 14,695 acres. The Swimming Pen Creek drainage area is 1,918 acres. The dominant land use category is urban land (urban and built-up; low-, medium-, and high-density residential; and transportation, communication, and utilities), which accounts for about 52.8 percent of the total watershed area. Of the 7,766 acres of urban lands, residential land use occupies about 6,538 acres, or about 44.5 percent of the total watershed area. Natural land uses, including water/wetlands, upland forest, and barren land, occupy about 6,295 acres, accounting for about 42.8 percent of the total watershed area (water is 26.6 percent of the total area).

Table 4.1. Classification of Land Use Categories in the Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389) Watersheds in 2004

- = Empty cell

Level 2 Land Use Code	Attribute	Acres	% of Total
1100	Residential, low density – less than 2 dwelling units/acre	1,886.75	12.84
1200	Residential, medium density – 2-5 dwelling units/acre	4,192.96	28.53
1300	Residential, high density – 6 or more dwelling units/acre	458.55	3.12
1400	Commercial and services	471.92	3.21
1500	Industrial	108.15	0.74
1600	Extractive	16.64	0.11
1700	Institutional	325.86	2.22
1800	Recreational	245.11	1.67
1900	Open land	60.28	0.41
2100	Cropland and pastureland	72.81	0.50
2400	Cropland and pastureland	36.52	0.25
2500	Specialty farms	4.66	0.03
3100	Herbaceous upland nonforested	93.12	0.63
3200	Shrub and brushland (wax myrtle or saw palmetto, occasionally scrub)	34.89	0.24
3300	Mixed upland nonforested	10.87	0.07
4100	Upland coniferous forests	239.97	1.63
4200	Upland hardwood forests	10.79	0.07
4300	Upland hardwood forests cont.	608.72	4.14
4400	Tree plantations	64.64	0.44
5100	Streams and waterways	3,586.51	24.41
5200	Lakes	0.43	0.00
5300	Reservoirs – pits, retention ponds, dams	328.46	2.24
6100	Wetland hardwood forests	774.64	5.27
6200	Wetland coniferous forests	127.95	0.87
6300	Wetland forested mixed	199.56	1.36
6400	Vegetated nonforested wetlands	352.97	2.40
7400	Disturbed lands	87.15	0.59
8100	Transportation	198.04	1.35
8200	Communications	0.44	0.00
8300	Utilities	95.88	0.65
-	**TOTAL:**	**14,695.24**	**100.00**

Figure 4.3. Principal Land Uses in the Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389) Watersheds in 2004



Soil Characteristics

The Soil Survey Geographic Database (SSURGO) in the Department's GIS database from the SJRWMD was accessed to provide coverage of hydrologic soil groups in the Swimming Pen Creek and Doctors Lake watersheds (**Figure 4.4**). **Table 4.2** briefly describes the major hydrology soil classes. Soil groups A and B/D are the most common in the watershed, with type D found in the lower portion of the watershed and along the stream corridor.

Table 4.2. Description of Hydrologic Soil Classes from the SSURGO Database

Hydrology Class	Description
A	High infiltration rates. Soils are deep, well-drained to excessively drained sands and gravels.
A/D	Drained/undrained hydrology class of soils that can be drained and are classified.
B	Moderate infiltration rates. Deep and moderately deep, moderately well- and well-drained soils that have moderately coarse textures.
B/D	Drained/undrained hydrology class of soils that have moderately coarse textures.
C	Slow infiltration rates. Soils with layers impeding downward movement of water, or soils that have moderately fine or fine textures.
C/D	Drained/undrained hydrology class of soils that can be drained and classified.
D	Very slow infiltration rates. Soils are clayey, have a high water table, or are shallow to an impervious layer.

Population

Population and housing unit information from the 2000 census at the block level was obtained from the U.S. Census Bureau. GIS was used to estimate the fraction of each block in the Swimming Pen Creek and Doctors Lake watersheds and then applied to the block information to estimate the population and number of housing units. Based on **Table 4.3**, the population in the watersheds is estimated at 35,005, along with 12,092 housing units.

Septic Tanks

Based on the 2008 Florida Department of Health (FDOH) coverage of septic systems in Clay County (FDOH Website, 2008), approximately 847 residences in the Swimming Pen Creek and Doctors Lake watersheds are using septic tanks. Using an estimate of 70 gallons/day/person (EPA, 1999), and drainfield TN and TP concentrations of 36 and 15 mg/L, respectively, potential annual ground water loads of TN and TP were calculated. This is a screening level calculation, and soil types, the age of the system, vegetation, proximity to a receiving water, and other factors will influence the degree of attenuation of this load (**Table 4.4**).

Figure 4.4. Distribution of Hydrologic Soil Groups in the Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389) Watersheds

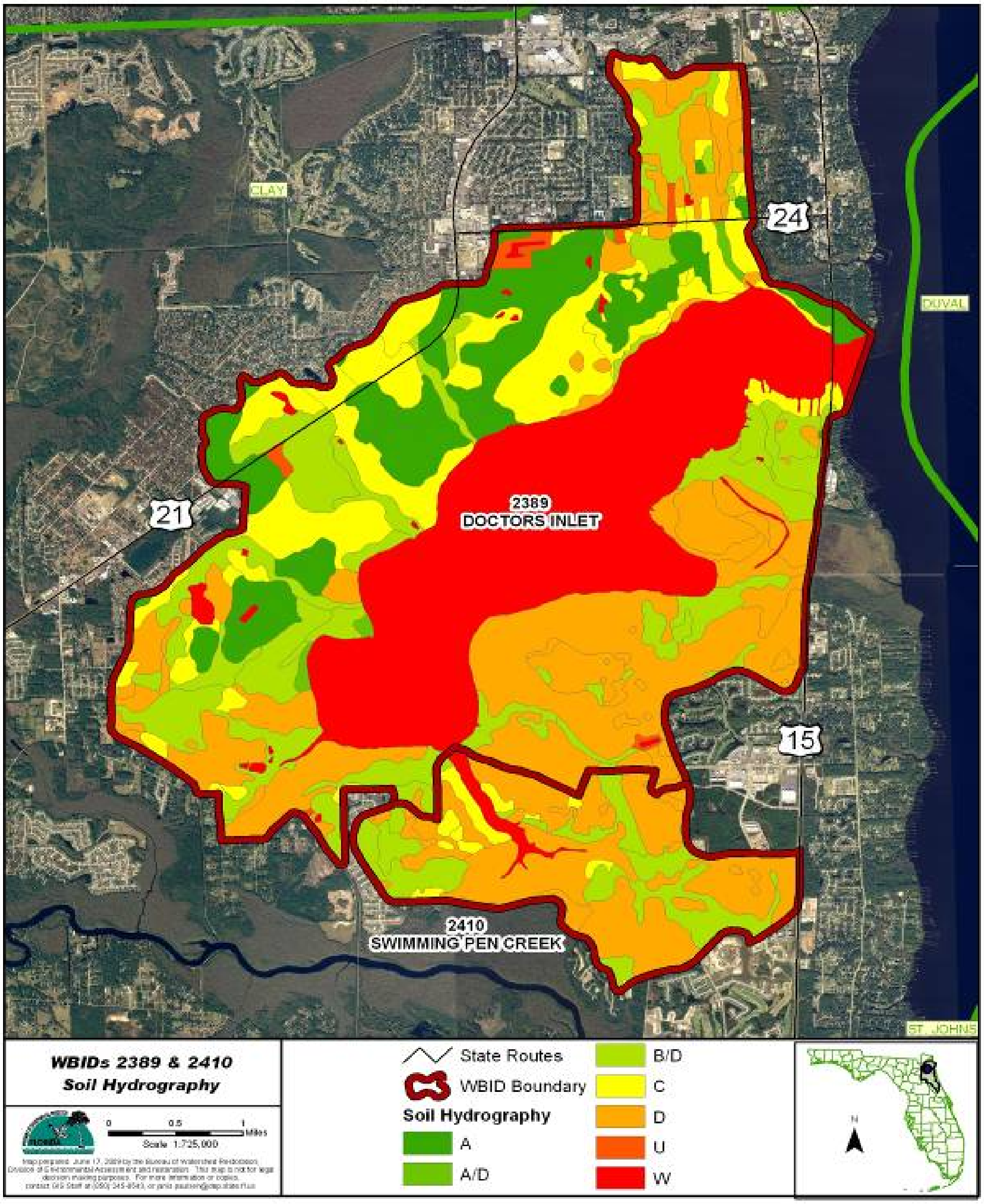


Table 4.3. Estimated Average Household Size in the Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389) Watersheds

- = Empty cell
Data from U.S. Census Bureau Website, 2005, based on Clay County blocks present in the Doctors Lake watershed.

Watershed	Tract	Population	Housing Units
Swimming Pen Creek	307	2,264	777
Swimming Pen Creek and Doctors Lake	303.02	2,564	974
Swimming Pen Creek and Doctors Lake	304	243	100
Swimming Pen Creek and Doctors Lake	305	2,630	848
Swimming Pen Creek and Doctors Lake	306	584	225
Swimming Pen Creek and Doctors Lake	307	11,422	3,785
Swimming Pen Creek and Doctors Lake	308.01	5,412	1,942
Swimming Pen Creek and Doctors Lake	308.02	5,798	2,094
Swimming Pen Creek and Doctors Lake	309.01	2,438	829
Swimming Pen Creek and Doctors Lake	309.02	3,914	1,295
-	**TOTAL:**	**35,005**	**12,092**
-	**-**	**AVERAGE HOUSEHOLD SIZE:**	**2.89**

Table 4.4. Estimated Nitrogen and Phosphorus Annual Loading from Septic Tanks in the Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389) Watersheds

[1] U.S Census Bureau; see **Table 4.3** for more information on this estimate.
[2] EPA, 1999.

Estimated Number of Households on Septic	Estimated Number of People per Household[1]	Gallons/ Person/ Day[2]	TN in Drainfield (mg/L)	TP in Drainfield (mg/L)	Estimated Annual TN Load (lbs/yr)	Estimated Annual TP Load (lbs/yr)
847	2.89	70	36	15	18,791	7,829

4.3.1 Summary of Nutrient Loadings to Swimming Pen Creek and Doctors Lake from Various Sources

Screening level estimates of annual nitrogen and phosphorus loadings to the watersheds were developed based on 2004 land use and hydrologic soil groups. GIS shapefiles of land use and hydrologic soil groups were used to determine the acreage associated with various Level 2 land uses and soils. Estimates for annual runoff coefficients and event mean concentrations (EMCs) were based on Harper and Baker (2007) and Gao (2006). A screening level estimate of annual runoff was calculated by multiplying the long-term annual average rainfall of 52.44 inches (Jacksonville International Airport [JIA], 1955–2007) by the respective runoff coefficient and area. Estimates of annual nitrogen and phosphorus loading were obtained by multiplying the annual runoff by the corresponding EMC. A more detailed loading analysis could be performed based on development of site-specific runoff coefficients, EMCs, and knowledge of best management practices (BMPs) that have been implemented in the watershed.

Agriculture

Five types of Level 3 agricultural land uses were identified in the Swimming Pen Creek and Doctors Lake watersheds. Improved pasture and ornamentals represented approximately 6.1 percent of the watershed area, or 603 acres. Field crops represented about 0.7 percent of the watershed area, or 100 acres. Aggregating land use to Level 1 for the Swimming Pen Creek and Doctors Lake watersheds yielded 114 acres in agriculture and 139 acres in rangeland. **Table 4.5** summarizes the screening level estimates for nitrogen and phosphorus loads from agricultural sources.

Urban Areas

There are 7,766 acres in the Level 1 category of urban and built-up in the watersheds and 381 acres in transportation, communication, and utilities. Low-, medium-, and high-density residential represent 6,538 acres of the 7,766 acres in the urban and built-up category and approximately 44 percent of the total acreage in the watersheds. **Table 4.6** summarizes the screening level estimates for nitrogen and phosphorus loads from the urban and built-up category in the watersheds.

Forest/Wetland/Water/Open Lands

Table 4.7 summarizes estimates for nitrogen and phosphorus loadings from land uses in the forest, wetland, and water Level 2 classifications. Wetlands and upland forests represent 30 and 36 percent, respectively, of the acreage in the watersheds.

Source Summary

Table 4.8 summarizes the estimated annual nitrogen and phosphorus loads to Swimming Pen Creek, and **Table 4.9** summarizes the loading estimates for nitrogen and phosphorus from various land uses in both the Swimming Pen Creek and Doctors Lake watersheds. It is important to note that this is not a complete list and represents estimates of potential loadings. In addition, proximity to the waterbody, site-specific soil characteristics, and rainfall frequency and magnitude are just a few of the factors that could influence and determine the actual loadings from these sources that reach Swimming Pen Creek and Doctors Lake.

Another factor is the types of BMPs, both structural and nonstructural, that have been implemented for specific land uses in the watershed that reduce the actual nutrient loads delivered to Swimming Pen Creek and Doctors Lake. Finally, the age and condition of the septic systems and drainage characteristics in the watershed could affect assumptions about the assimilation and/or retention of nutrients.

The screening model estimated an annual surface runoff of 17,936.7 acre-feet or 14.6 inches per year, based on the contributing watershed area. Dividing the estimated TN load by the surface runoff volume yielded an average TN concentration of 1.54 mg/L. The average and median TN concentrations from the available data were 1.39 and 1.33 mg/L, respectively. Dividing the estimated TP load by the surface runoff volume yielded an average TP concentration of 0.171 mg/L. The average and median TP concentrations from the available data were 0.108 and 0.092 mg/L, respectively. Flow and nutrient contributions from ground water inputs to Doctors Lake were not included in this screening level calculation and would likely influence in-stream concentrations. Tidal exchange with the St. Johns River was also not considered in the calculation.

Table 4.5. Estimated Annual Average TN and TP Loads from Agriculture in the Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389) Watersheds

- = Empty cell/no data

Land Use Classification	Soil Group	Acres	Annual Runoff Coefficient	Gross Runoff (acre-feet)	Estimated TN Load (lbs)	Estimated TP Load (lbs)
Cropland and pastureland	B/D	25.65	0.089	9.98	75.73	11.70
-	D	44.61	0.226	44.06	334.47	51.67
-	C	2.56	0.166	1.86	14.10	2.18
Nurseries and vineyards	B/D	20.96	0.089	8.15	61.89	9.56
-	C	1.71	0.166	1.24	9.42	1.45
-	U	13.35	0.435	25.38	192.66	29.76
-	A	0.49	0.021	0.04	0.34	0.05
Specialty farms	C	0.06	0.166	0.04	0.33	0.05
-	D	3.02	0.226	2.98	22.64	3.50
-	B/D	1.59	0.089	0.62	4.69	0.73
Herbaceous upland nonforested	C	19.9	0.166	14.44	45.17	2.16
-	B/D	17.65	0.089	6.86	21.48	1.03
-	W	3.55	0.435	6.75	21.12	1.01
-	A	28.75	0.021	2.64	8.26	0.39
-	D	23.25	0.226	22.96	71.85	3.44
Shrub and brushland (wax myrtle or saw palmetto, occasionally scrub)	D	25.79	0.226	25.47	79.70	3.81
-	B/D	4.66	0.089	1.81	5.67	0.27
-	C	4.44	0.166	3.22	10.08	0.48
Mixed upland nonforested	B/D	3.53	0.089	1.37	4.30	0.21
-	D	7.34	0.226	7.25	22.68	1.08
-	**SUM**	**252.86**	**-**	**187.13**	**1,006.58**	**124.53**

Table 4.6. Estimated Urban and Built-up Annual Nitrogen and Phosphorus Loading in the Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389) Watersheds

- = Empty cell/no data

Land Use Classification	Soil Group	Acres	Annual Runoff Coefficient	Gross Runoff (acre-feet)	Estimated TN Load (lbs)	Estimated TP Load (lbs)
Residential, low density – less than 2 dwelling units/acre	D	599.24	0.226	591.82	2,592.66	307.58
-	B/D	460.77	0.083	167.13	732.15	86.86
-	A/D	32.62	0.05	7.13	31.22	3.70
-	C	274.72	0.166	199.29	873.04	103.57
-	A	474.33	0.025	51.82	227.02	26.93
-	W	26.15	0.435	49.71	217.77	25.83
-	U	18.87	0.435	35.87	157.14	18.64
Residential, medium density – 2-5 dwelling units/acre	D	1,312.86	0.252	1,445.77	8,143.28	1,286.40
-	A	725.65	0.041	130.01	732.30	115.68
-	B/D	947.83	0.108	447.34	2,519.62	398.03
-	C	1,171.52	0.186	952.23	5,363.43	847.27
-	U	1.33	0.435	2.53	14.24	2.25
-	W	27.41	0.435	52.11	293.48	46.36
-	A/D	6.34	0.07	1.94	10.92	1.73
Residential, high density – 6 or more dwelling units/acre	C	53.82	0.309	72.67	458.78	102.83
-	A	11.28	0.148	7.30	46.05	10.32
-	D	288.61	0.35	441.43	2,786.62	624.59
-	B/D	80.15	0.24	84.06	530.66	118.94
-	U	22.11	0.435	42.03	265.32	59.47
-	W	2.55	0.435	4.85	30.60	6.86
Commercial and services	B/D	152.04	0.35	232.55	1,132.63	165.78
-	C	128.93	0.403	227.06	1,105.92	161.87
-	A	100.26	0.293	128.37	625.26	91.52
-	D	67.75	0.435	128.79	627.28	91.81
-	U	19.05	0.435	36.21	176.38	25.82
-	W	0.51	0.435	0.97	4.72	0.69
-	A/D	3.36	0.32	4.70	22.89	3.35
Industrial	B/D	17.58	0.241	18.51	75.57	14.11
-	D	72.28	0.35	110.55	451.22	84.23
-	C	15.96	0.309	21.55	87.96	16.42
-	A	2.32	0.186	1.89	7.70	1.44

Land Use Classification	Soil Group	Acres	Annual Runoff Coefficient	Gross Runoff (acre-feet)	Estimated TN Load (lbs)	Estimated TP Load (lbs)
Extractive	W	1.73	0.435	3.29	10.29	1.34
-	B/D	4.78	0.278	5.81	18.17	2.37
-	D	8.13	0.375	13.32	41.69	5.44
-	U	1.99	0.435	3.78	11.84	1.54
Institutional	B/D	28.96	0.241	30.50	99.59	21.58
-	A	117.34	0.148	75.89	247.80	53.69
-	D	114.57	0.35	175.23	572.18	123.97
-	C	56.79	0.309	76.69	250.39	54.25
-	U	8.17	0.435	15.53	50.71	10.99
Recreational	C	29.29	0.166	21.25	66.49	3.18
-	D	148.71	0.226	146.87	459.58	21.98
-	A	5.75	0.021	0.53	1.65	0.08
-	W	4.96	0.435	9.43	29.50	1.41
-	B/D	54.26	0.089	21.10	66.04	3.16
-	U	2.15	0.435	4.09	12.79	0.61
Open land	C	2.25	0.166	1.63	5.11	0.24
-	A	4.54	0.021	0.42	1.30	0.06
-	B/D	18.97	0.089	7.38	23.09	1.10
-	D	34.53	0.226	34.10	106.71	5.10
Disturbed land	B/D	26.45	0.089	10.29	44.79	5.60
-	D	39.4	0.226	38.91	169.41	21.18
-	C	17.37	0.166	12.60	54.86	6.86
-	A	3.19	0.021	0.29	1.27	0.16
-	W	0.74	0.435	1.41	6.12	0.77
Transportation	B/D	42.66	0.293	54.62	243.75	32.70
-	C	32.11	0.328	46.03	205.38	27.55
-	A	34.21	0.211	31.54	140.76	18.88
-	U	6.73	0.435	12.79	57.09	7.66
-	D	81.45	0.375	133.48	595.63	79.90
-	W	0.43	0.435	0.82	3.65	0.49
-	A/D	0.41	0.33	0.59	2.64	0.35
Communications	D	0.44	0.375	0.72	3.22	0.43
Utilities	W	11.22	0.435	21.33	95.18	12.77
-	D	43.14	0.375	70.70	315.48	42.32
-	U	2.09	0.435	3.97	17.73	2.38
-	B/D	28.65	0.278	34.81	155.32	20.84
-	A	3.68	0.186	2.99	13.35	1.79
-	C	7.06	0.328	10.12	45.16	6.06
-	A/D	0.06	0.22	0.06	0.26	0.03
-	**SUM**	**8,147.56**	**-**	**6,833.09**	**34,589.76**	**5,451.69**

Table 4.7. Estimated Forest/Wetland/Water/Open Lands Annual Nitrogen and Phosphorus Loading in the Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389) Watersheds

- = Empty cell/no data

Land Use Classification	Soil Group	Acres	Annual Runoff Coefficient	Gross Runoff (acre-feet)	Estimated TN Load (lbs)	Estimated TP Load (lbs)
Upland coniferous forests	C	11.93	0.166	8.65	27.08	1.30
-	B/D	52.73	0.089	20.51	64.17	3.07
-	U	1.05	0.435	2.00	6.25	0.30
-	D	167.6	0.226	165.53	517.95	24.77
-	A	4.58	0.021	0.42	1.32	0.06
-	W	1.5	0.435	2.85	8.92	0.43
-	A/D	0.57	0.13	0.32	1.01	0.05
Upland hardwood forests	C	0	0.166	0.00	0.00	0.00
-	A	10.78	0.021	0.99	3.10	0.15
Upland hardwood forests cont.	D	338.97	0.226	334.77	1,047.56	50.10
-	C	56.77	0.166	41.18	128.86	6.16
-	A	74.65	0.021	6.85	21.44	1.03
-	B/D	133.99	0.089	52.11	163.07	7.80
-	U	0.46	0.435	0.87	2.74	0.13
-	W	1.96	0.435	3.73	11.66	0.56
-	A/D	1.83	0.13	1.04	3.25	0.16
Tree plantations	D	51.86	0.226	51.22	160.27	7.67
-	U	5.51	0.435	10.47	32.78	1.57
-	B/D	6.67	0.089	2.59	8.12	0.39
-	W	0.59	0.435	1.12	3.51	0.17
Streams and waterways	B/D	8.38	0.435	15.93	54.18	4.77
-	A/D	0.94	0.435	1.79	6.08	0.53
-	C	15.43	0.435	29.33	99.76	8.78
-	D	14.84	0.435	28.21	95.95	8.44
-	A	1.87	0.435	3.55	12.09	1.06
-	W	3,545.04	0.435	6,738.94	22,920.83	2,017.03
Lakes	C	0.43	0.435	0.82	2.78	0.24
Reservoirs – pits, retention ponds, dams	B/D	61.89	0.435	117.65	400.16	35.21
-	W	40.7	0.435	77.37	263.15	23.16
-	D	212.48	0.435	403.91	1,373.81	120.90
-	C	9.74	0.435	18.52	62.98	5.54
-	U	1.15	0.435	2.19	7.44	0.65
-	A	2.54	0.435	4.83	16.42	1.45

Land Use Classification	Soil Group	Acres	Annual Runoff Coefficient	Gross Runoff (acre-feet)	Estimated TN Load (lbs)	Estimated TP Load (lbs)
Wetland hardwood forests	B/D	249.7	0.435	474.67	2,066.51	77.49
-	C	20.28	0.435	38.55	167.84	6.29
-	A	1.25	0.435	2.38	10.34	0.39
-	D	483.88	0.435	919.83	4,004.58	150.17
-	W	8.89	0.435	16.90	73.57	2.76
-	A/D	10.59	0.435	20.13	87.64	3.29
Wetland coniferous forests	D	39.87	0.435	75.79	329.96	12.37
-	B/D	85.31	0.435	162.17	706.02	26.48
-	U	0.21	0.435	0.40	1.74	0.07
-	A	0.18	0.435	0.34	1.49	0.06
-	W	2.39	0.435	4.54	19.78	0.74
Wetland forested mixed	W	1	0.435	1.90	8.28	0.31
-	B/D	104.03	0.435	197.76	860.95	32.29
-	D	92.64	0.435	176.10	766.69	28.75
-	C	1.91	0.435	3.63	15.81	0.59
-	A	0.01	0.435	0.02	0.08	0.00
Vegetated nonforested wetlands	B/D	107.41	0.435	204.18	888.92	33.33
-	C	3.21	0.435	6.10	26.57	1.00
-	A	2.5	0.435	4.75	20.69	0.78
-	D	217.42	0.435	413.30	1,799.36	67.48
-	U	0.06	0.435	0.11	0.50	0.02
-	W	22.45	0.435	42.68	185.80	6.97
-	**SUM**	**6,294.62**	**-**	**10,916.52**	**39,571.79**	**2,785.23**

Table 4.8. Estimated Annual Nitrogen and Phosphorus Loading to Swimming Pen Creek (WBID 2410)

Land Use Category	Acres	Gross Runoff (acre-feet)	Estimated TN Load (lbs)	Estimated TP Load (lbs)
Urban	893.27	952.72	4,751.51	794.03
Agriculture	91.55	73.44	421.90	55.03
Forest/Wetland/Water	933.42	1,490.66	5,950.24	275.67
TOTAL:	**1,918.24**	**2,516.82**	**11,123.65**	**1,124.73**

Table 4.9. Summary of Estimated Potential Annual Nitrogen and Phosphorus Loading from Various Sources in the Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389) Watersheds

Source	TN (lbs/yr)	TP (lbs/yr)
Septic Tanks	18,791	7,829
Urban and Built-up	34,589.76	5,451.69
Agriculture	1,006.58	124.53
Forest/Wetland/Water/Open Lands	39,571.79	2,785.23

Chapter 5: DETERMINATION OF ASSIMILATIVE CAPACITY

5.1 Determination of Loading Capacity

5.1.1 Data Used in the Determination of the TMDLs

Twenty-six sampling stations in Doctors Lake have historical water quality observations (**Figure 5.1**). There are four sampling stations in Swimming Pen Creek. **Tables 5.1a** and **5.1b** contain summary information on each of the stations in Swimming Pen Creek and Doctors Lake, respectively. **Appendix B** contains historical DO, BOD5, CHLAC, TN, and TP available observations from sampling sites in WBIDs 2410 and 2389.

Swimming Pen Creek

Tables 5.2a through **5.2e** provide a statistical summary of DO, BOD5, CHLAC, TN, and TP observations at each station in Swimming Pen Creek. **Figure 5.2** displays the historical observations of DO over time. There were only 3 stations with DO observations, and all the exceedances occurred at one station (SJWMSPCR). The simple linear regression of DO versus sampling date in **Figure 5.2** was not significant at an alpha (α) level of 0.05. **Appendix E** contains plots of DO by season, station, and year.

Figures 5.3 through **5.6** illustrate historical CHLAC, TN, TP, and BOD observations, respectively. The simple linear regressions of TN and TP were significant at an α level of 0.05. **Appendix E** contains additional plots by season, station, and year. **Table 5.2c** through **5.2e** provide statistical summaries of historical CHLAC, TN, and TP observations by station. **Table 5.3** presents a statistical summary of major water quality parameters from the available data.

Figure 5.1. Historical Sampling Sites in Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389)

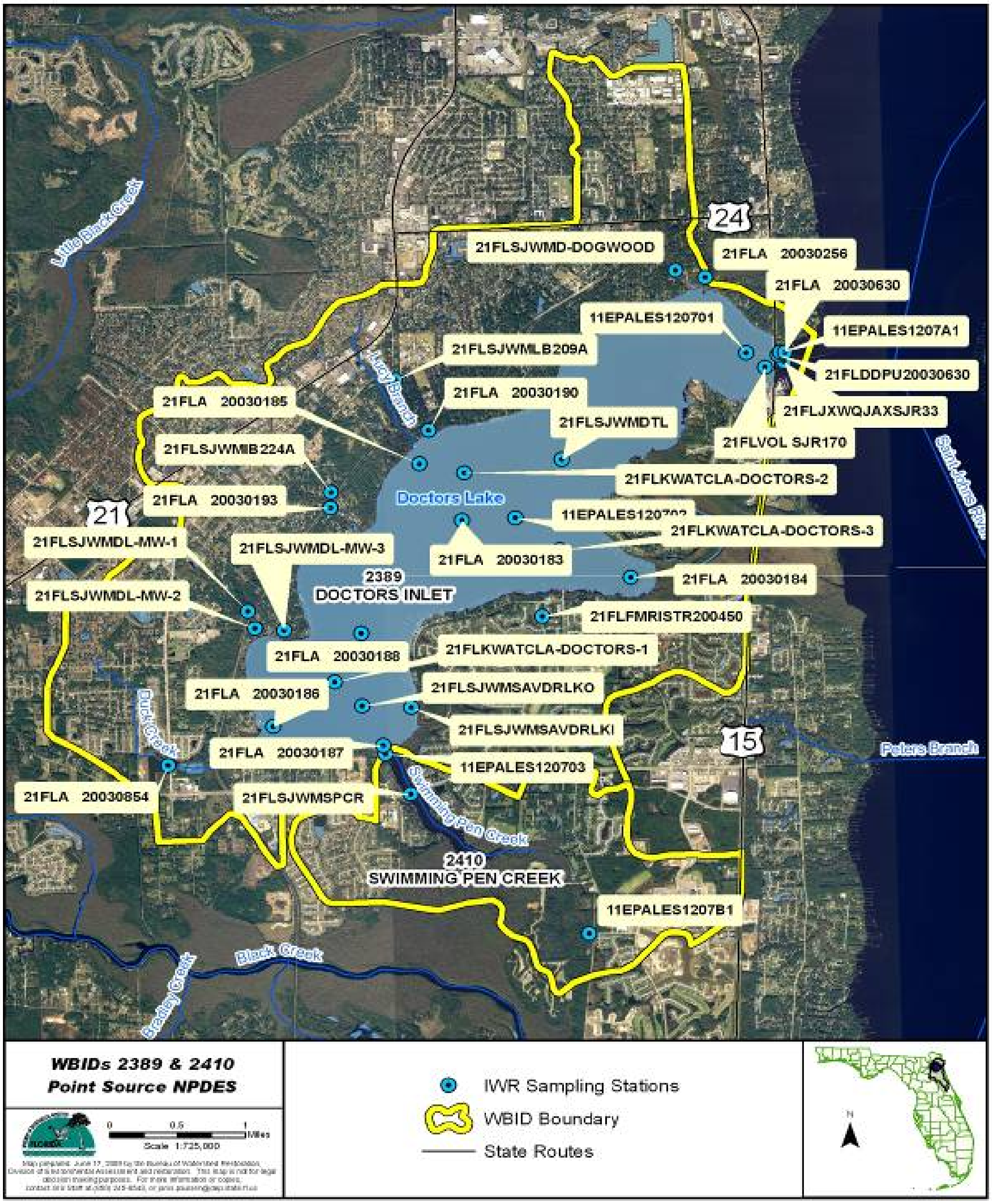


Table 5.1a. Sampling Station Summary for Swimming Pen Creek (WBID 2410)

- = Empty cell/no data
[1] BRA = Bream Fisherman's Association

Station	STORET ID	Station Owner	Years With Data	N
Swimming Pen Creek	11EPALES1207B1	EPA	1973–74	-
Swimming Pen Creek at Hwy 220	21FLSJWMSPCR	SJRWMD	1993–2007	163-
2410-Swimming Pen Creek at Hwy 220 Crossing	21FLBRA 2410-A	BRA[1]	2008	9-
2410-Swimming Pen Creek-Culvert on Eagle Creek Dr	21FLBRA 2410-B	BRA	2008	8-

Table 5.1b. Sampling Station Summary for Doctors Lake (WBID 2389)

- = Empty cell/no data

Station	STORET ID	Station Owner	Years With Data	N
Doctors Lake	11EPALES120701	EPA	1973	-
Doctors Lake	11EPALES120702	EPA	1973	-
Doctors Lake	11EPALES120703	EPA	1973	-
Doctors Inlet	11EPALES1207A1	EPA	1973–74	-
Doctors Lake W Side US 17	21FLA 20030182	Department	1973–74	1-
Doctors Lake Mill Cove Shallow C	21FLA 20030183	Department	1971–86	2-
Doctors Lake Center Mill Cove	21FLA 20030184	Department	1972–86	1-
Doctors Lake Shallow Cove	21FLA 20030185	Department	1971–86	1-
Doctors Lake W Side End Lake	21FLA 20030186	Department	1971–86	1-
Doctors Lake E Side End Lake	21FLA 20030187	Department	1971–86	1-
Doctors Lake Mid-Lake	21FLA 20030188	Department	1971–86	1-
Doctors Lake Northeast Area	21FLA 20030190	Department	1971–86	-
St. Johns River at Doctors Lake East of US 17	21FLA 20030630	Department	1977	5-
SJR at Doctors Lake East of US 17	21FLDDPU20030630	City of Jacksonville	1986–88	1-
SJR Inlet to Doctors Lake 100M West of Hwy 178 Brdg.	21FLJXWQJAXSJR33	City of Jacksonville	1987–91	11-
Clay-Doctors-1	21FLKWATCLA-DOCTORS-1	LakeWatch	1991–2001	-
Clay-Doctors-2	21FLKWATCLA-DOCTORS-2	LakeWatch	1996–2005	-
Clay-Doctors-3	21FLKWATCLA-DOCTORS-3	LakeWatch	1996–2005	-
Doctors Lake Inside Grassbed	21FLSJWMSAVDRLKI	SJRWMD	1987–2007	240-
Doctors Lake Outside Grassbed	21FLSJWMSAVDRLKO	SJRWMD	1997–2004	162-
Doctors Lake-Indigo Branch	21FLSJWMIB224A	SJRWMD	2001–04	-
Doctors Lake at Center	21FLSJWMDTL	SJRWMD	1984–2007	245-
Doctors Inlet at US 17/Marina	21FLVOL SJR170	Volunteer	1995–96	-
2389-Doctors Lake-Boat Ramp in Mill Cove	21FLBRA 2389-A	BRA	2008	-
2389-Doctors Lake-Ramp at End of Dogwood Ln	21FLBRA 2389-B	BRA	2008	-
2389-Doctors Lake-Camp Echocktee	21FLBRA 2389-C	BRA	2008	-

Table 5.2a. Statistical Summary of Historical DO Data for Swimming Pen Creek (WBID 2410)

DO is in mg/L.

Station	N	Minimum	Maximum	Median	Mean	Exceedances	% Exceedances
Swimming Pen Creek at Hwy 220	163	1.20	14.73	8.06	7.71	21	12.88%
2410-Swimming Pen Creek at Hwy 220 Crossing	9	5.63	12.08	9.97	9.29	0	0.00%
2410-Swimming Pen Creek-Culvert on Eagle Creek Dr	8	6.05	7.97	7.12	7.13	0	0.00%

Table 5.2b. Statistical Summary of Historical BOD5 Data for Swimming Pen Creek (WBID 2410)

BOD5 is in mg/L.
NA = Not applicable

Station	N	Minimum	Maximum	Median	Mean	Exceedances	% Exceedances
Swimming Pen Creek at Hwy 220	118	0.8	7.0	2.8	3.0	NA	NA

Table 5.2c. Statistical Summary of Historical CHLAC Data for Swimming Pen Creek (WBID 2410)

CHLAC is in ug/L.
NA = Not applicable

Station	N	Minimum	Maximum	Median	Mean	Exceedances	% Exceedances
Swimming Pen Creek at Hwy 220	168	1.5	134.3	22.9	32.4	NA	NA

Table 5.2d. Statistical Summary of Historical TN Data for Swimming Pen Creek (WBID 2410)

TN is in mg/L.
NA = Not applicable

Station	N	Minimum	Maximum	Median	Mean	Exceedances	% Exceedances
Swimming Pen Creek at Hwy 220	159	0.90	3.35	1.49	1.54	NA	NA
Swimming Pen Creek	7	0.34	3.81	1.61	2.00	NA	NA

Table 5.2e. Statistical Summary of Historical TP Data for Swimming Pen Creek (WBID 2410)

TP is in mg/L.
NA = Not applicable

Station	N	Minimum	Maximum	Median	Mean	Exceedances	% Exceedances
Swimming Pen Creek at Hwy 220	170	0.010	0.352	0.090	0.104	NA	NA
Swimming Pen Creek	7	0.011	0.030	0.015	0.020	NA	NA

Table 5.3. Summary Statistics for Major Water Quality Parameters Measured in Swimming Pen Creek (WBID 2410)

PARM	N	MIN	25%	MEDIAN	MEAN	75%	MAX
BOD (mg/L)	118	0.8	2.0	2.8	3.0	3.8	7.0
CHLAC (ug/L)	168	1.5	16.5	22.9	32.4	44.5	134.3
CHLORIDE (mg/L)	171	18.5	216.5	355.7	1173.6	1450.3	9266.2
COLOR (PCU)	170	30	70	100	134	150	500
COND (uS/cm)	186	66	850	1392	3597	4896	17722
DO (mg/L)	180	1.20	6.22	8.02	7.77	9.26	14.73
DOSAT (%)	181	15.06	75.00	91.59	91.37	104.86	185.50
NH4 (mg/L)	171	0.00	0.01	0.03	0.06	0.07	0.46
NO3O2 (mg/L)	166	0.00	0.01	0.01	0.06	0.05	1.59
PH (su)	182	0.50	7.14	7.48	7.52	8.01	9.26
SO4 (mg/L)	170	5.00	51.00	74.89	188.21	258.50	1309.20
TEMP (C)	186	8.95	18.64	24.69	23.65	28.52	34.66
TKN (mg/L)	179	0.30	1.20	1.44	1.51	1.69	3.78
TN (mg/L)	166	0.34	1.24	1.49	1.56	1.76	3.81
TOC (mg/L)	170	1.9	16.1	17.9	18.4	20.1	33.2
SALINITY (PPT)	109	0.0	0.4	0.8	2.1	3.1	10.6
TP (mg/L)	177	0.010	0.074	0.090	0.100	0.120	0.352
TSS (mg/L)	171	3	7	10	11	14	46
TURB (NTU)	171	1	4	6	7	8	49

Figure 5.2. Historical DO Observations for Swimming Pen Creek (WBID 2410)

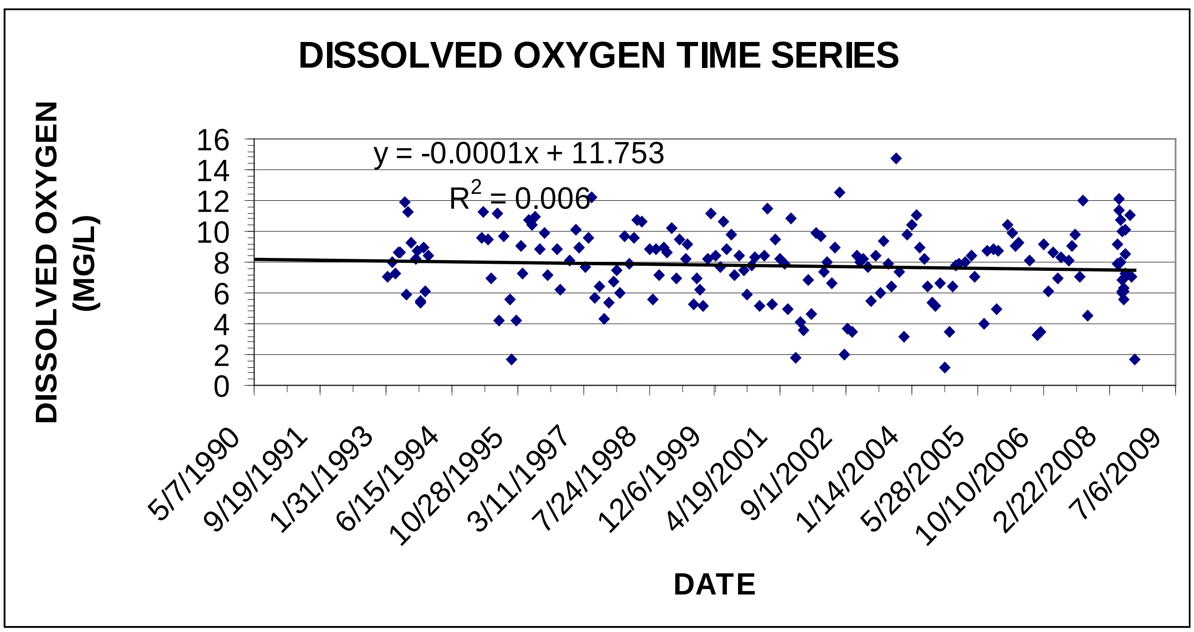


Figure 5.3. Historical CHLAC Observations for Swimming Pen Creek (WBID 2410)

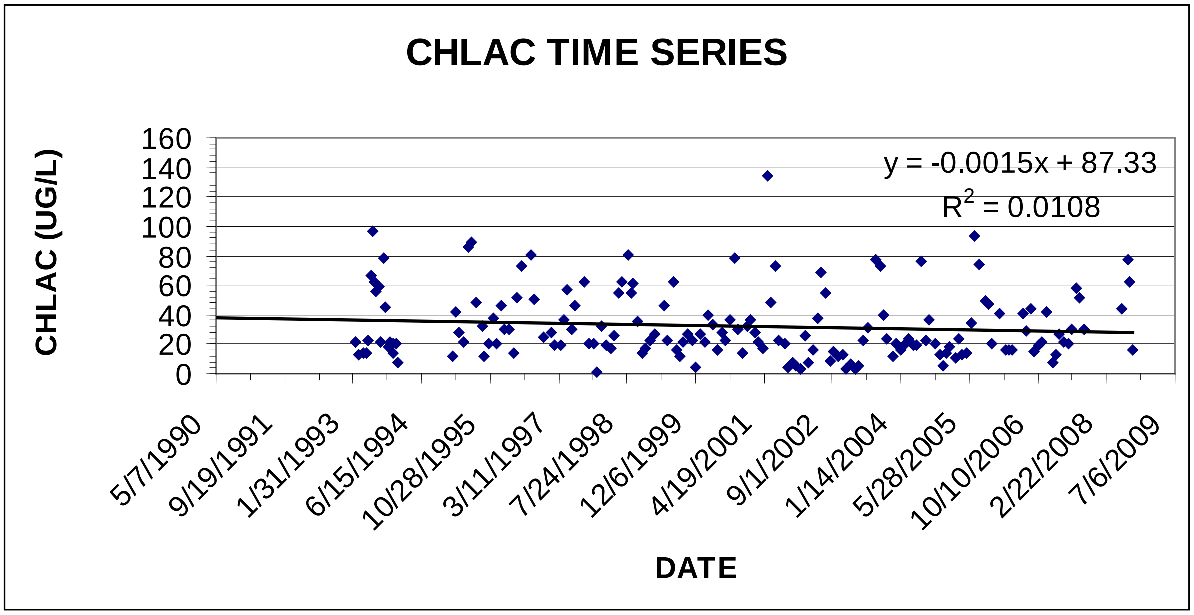


Figure 5.4. Historical TN Observations for Swimming Pen Creek (WBID 2410)

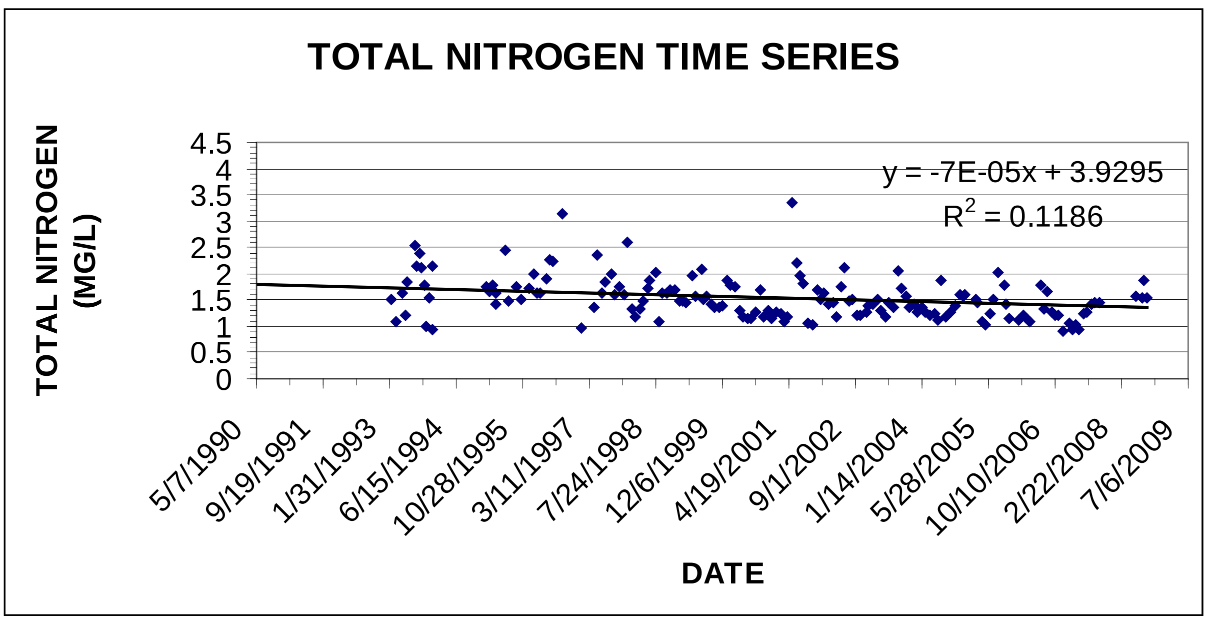


Figure 5.5. Historical TP Observations for Swimming Pen Creek (WBID 2410)

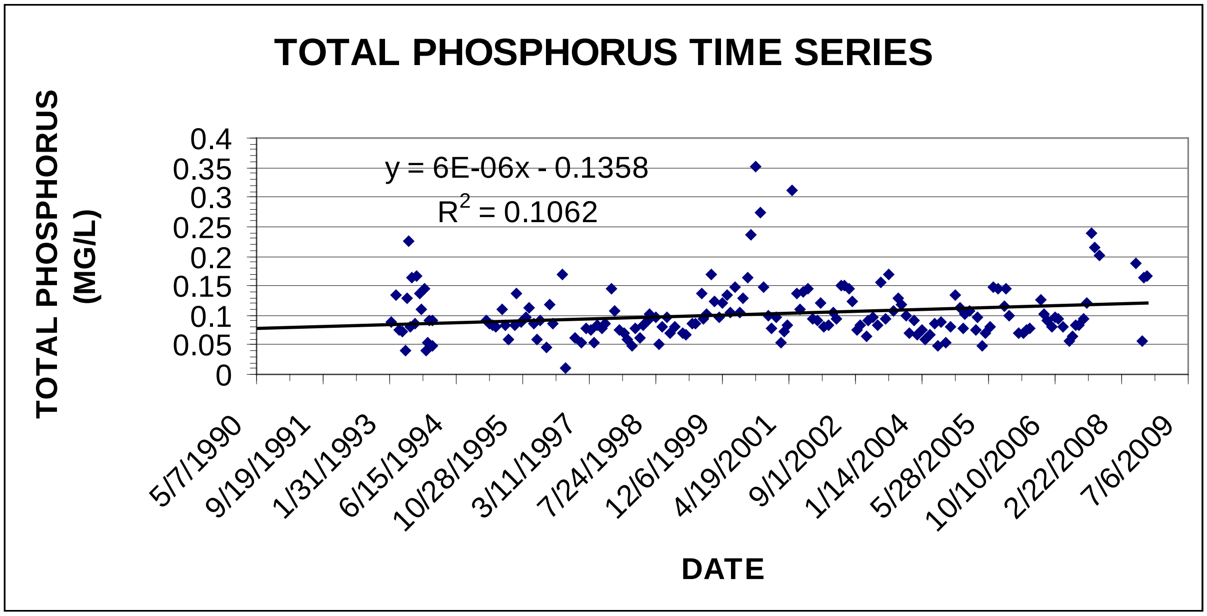
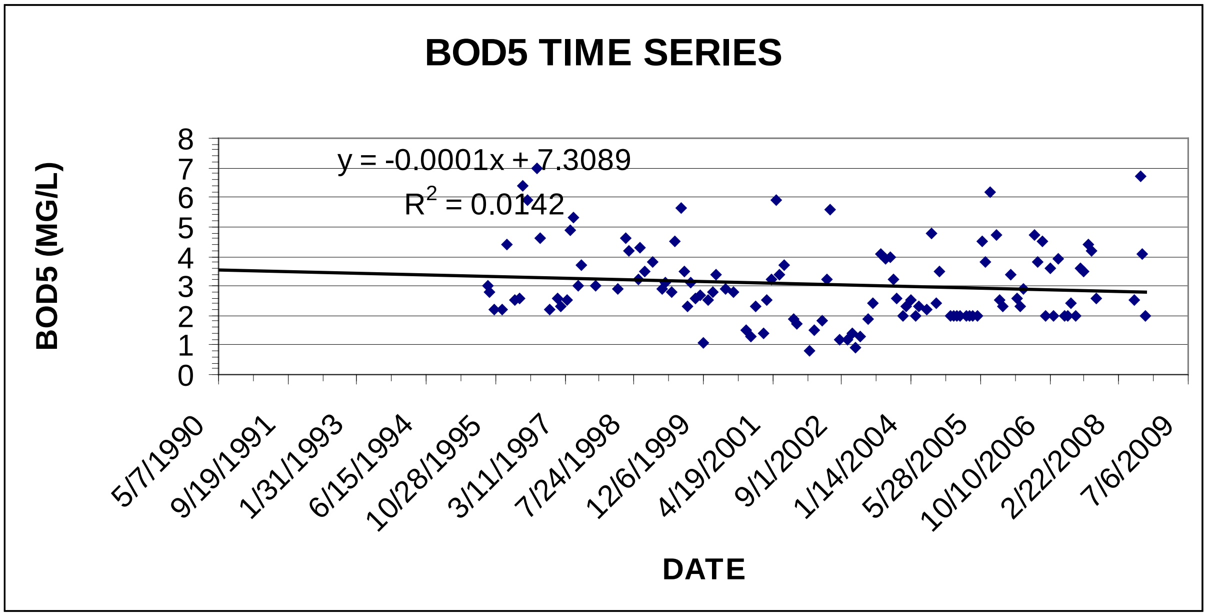


Figure 5.6. Historical BOD5 Observations for Swimming Pen Creek (WBID 2410)



TMDL Development Process for Swimming Pen Creek

A Spearman correlation matrix was used to assess potential relationships between DO and other water quality parameters (**Appendix G**). At an alpha (α) level of 0.05, correlations between DO and the parameters DOSAT, BOD5, CHLAC, color (COLOR), nitrogen ammonia (NH4), pH, total organic carbon (TOC), and water temperature (TEMP) were significant. A simple linear regression of DO versus TEMP explained only 5 percent of the variance in DO (**Appendix H**).

The Cycle 2 verified impairment for DO was linked to BOD5 and nutrients based on annual average chla concentrations above the IWR stream threshold of 20 μg/L. Nitrogen and phosphorus were both identified as the limiting nutrients.

Algal growth is influenced by water temperature, color, and nutrients. Based on a general linear model (GLM), the combination of TEMP and COLOR explained 32 percent of the variance in CHLAC. A GLM based on 151 observations that included TEMP, COLOR, and TN explained 62 percent of the variance in CHLAC and was significant at an α level of 0.05.

$$CHLAC = 52.166 - 2.339*TEMP - 0.006*COLOR - 31.867*TN - 0.001*TEMP*COLOR \; 0.013*COLOR*TN + 2.45*TEMP*TN$$

BOD5 was identified as a contributing factor in the DO impairment. There is a strong correlation between BOD5 and CHLAC ($R^2 = 0.632$, $p = 0.000$). In order to determine the influence of nitrogen and CHLAC on BOD5, without the confounding effects of water temperature on these variables, the GLM was used to develop an expression that included TEMP, CHLAC, and TN and interaction terms. Based on 108 cases with BOD5, TN, CHLAC, and TEMP observations, the following expression was significant at an α level of 0.05 and explained 71 percent of the variance in BOD_5:

$$BOD_5 = 1.725 - 0.074*TEMP - 0.086*CHLAC - 1.111*TN + 0.103*TN*TEMP - 0.013*TN*CHLAC - 0.001*CHLAC*TEMP$$

Because the adopted nutrient TMDL for the Lower St. Johns River requires a 30 to 50 percent reduction in anthropogenic nitrogen loads to the marine portion of the river, the GLM models for CHLAC and BOD5 were used to predict DO and CHLAC concentrations following a 30 percent reduction in TN. The historical averages for CHLAC and BOD5 are 32.4 μg/L and 3.0 mg/L, respectively. Applying the CHLAC GLM with the historical average TEMP (23.65 ^{o}C), COLOR (134 PCUs), and a 30 percent reduction in average TN (with the 1.56 mg/L historical average reduced to 1.09 mg/L) yielded a predicted CHLAC of 18.4 μg/L compared with the historical average of 32.4 μg/L. The substitution of this predicted CHLAC into the BOD5 GLM with the 30 percent reduction in TN resulted in a predicted BOD_5 concentration of 2.4 mg/L compared with the historical average of 3.0 mg/L.

The same procedure was applied to the summer average TEMP (29.57 ^{o}C), COLOR (128 PCUs), and a 30 percent reduction in the average TN (with the 1.64 mg/L historical average reduced to 1.15 mg/L) yielded a predicted CHLAC of 23.2 μg/L compared with a historical summer average of 45.7 μg/L. The predicted BOD5 concentration was 2.7 mg/L compared with the summer average of 3.6 mg/L.

A 30 percent reduction in TN was applied to the available observations for which there were corresponding COLOR, TN, and TEMP values (252 observations). With the reduction in TN, the CHLAC GLM predicted a shift in the distribution and predicted range (**Figure 5.7**). As seen in **Figure 5.7**, a reduction in TN is predicted to reduce the mean and median CHLAC concentrations by at least 10 μg/L compared with existing conditions. The 75^{th} percentile was reduced from 41.7 to 22.6 μg/L.

Predicted CHLAC changes with the 30 percent reduction in TN were then used in the BOD5 GLM to predict the corresponding changes in the BOD5 distribution (**Figure 5.8**). There is a shift in the distribution and a reduction in the elevated BOD5 concentrations. The predicted median BOD5 was 2.1 mg/L versus an existing median of 2.8 mg/L. The 75^{th} percentile concentration was 2.6 mg/L versus an existing value of 3.8 mg/L.

Paired observations of DO, TEMP, COLOR, and BOD5 were used to develop a DO GLM. The following expression was significant at an alpha level of 0.05 and explained 50 percent of the variance in DO:

DO = 11.744 – 0.157*TEMP + 0.004*COLOR - 0.121*BOD5 + 0.010*BOD5*TEMP + 0.006*BOD5*COLOR – 0.001*TEMP*COLOR

The BOD5 concentrations predicted from the 30 percent reduction in TN were substituted into the DO GLM expression to predict changes in DO. **Figure 5.9** shows a cumulative frequency plot. The predicted DO range is smaller than the existing distribution, with a 75^{th} percentile concentration of 8.02 mg/L (existing is 9.21 mg/L) and a maximum concentration of 12.2 mg/L (existing is 14.73 mg/L). The predicted distribution also shows an improvement in DO in the 3 to 5 mg/L interval relative to the existing distribution.

Although the DO GLM predicted that the minimum DO would be below the Class III freshwater criterion of 5.0 mg/L at times, reductions in CHLAC and BOD will also have indirect benefits to DO levels, such as reducing sediment oxygen demand. In addition, over 48 percent of the watershed area consists of natural land uses (forests, water, and wetlands). The TMDLs are not expected to cause an imbalance in the natural populations of flora and fauna, or cause nuisance conditions that depress DO below natural levels.

The implementation of TN reductions in the Swimming Pen Creek watershed required under the adopted nutrient TMDL for the Lower St. Johns River will address the DO and nutrient impairment in Swimming Pen Creek.

Critical Conditions/Seasonality

A nonparametric test (Kruskal-Wallis) was applied to the DO, DOSAT, CHLAC, TN, TP, and BOD5 dataset to determine whether there were significant differences among seasons or months. At an alpha (α) level of 0.05, there were significant differences among seasons (**Appendix C**) and months for all these parameters (**Appendix D**). The TMDLs were based on applying a 30 percent reduction in TN to the complete historical data record. Note that exceedances of the Class III DO criterion occurred in the summer and fall seasons (with two exceptions), and the IWR threshold of impairment for nutrients is based on an annual average chlorophyll concentration.

Figure 5.7. Cumulative Frequency Plot of Historical CHLAC Observations Versus CHLAC GLM Estimates Following a 30 Percent Reduction in TN

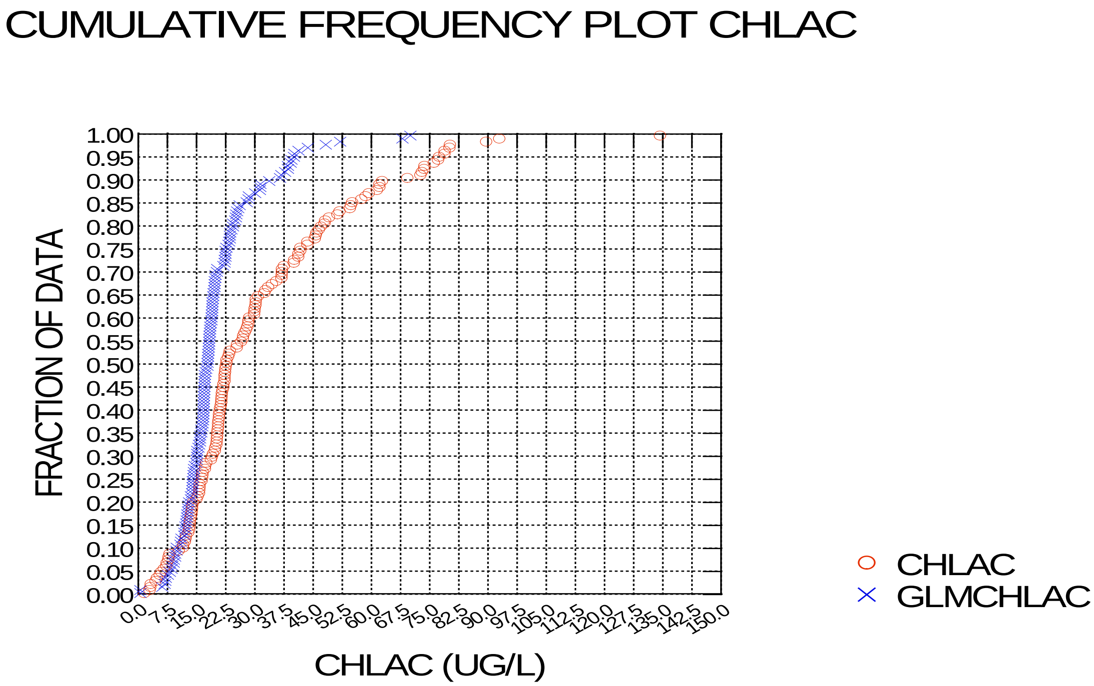


Figure 5.8. Cumulative Frequency Plot of Historical BOD5 Observations Versus BOD5 GLM Estimates Following a 30 Percent Reduction in TN and CHLAC Predicted Changes

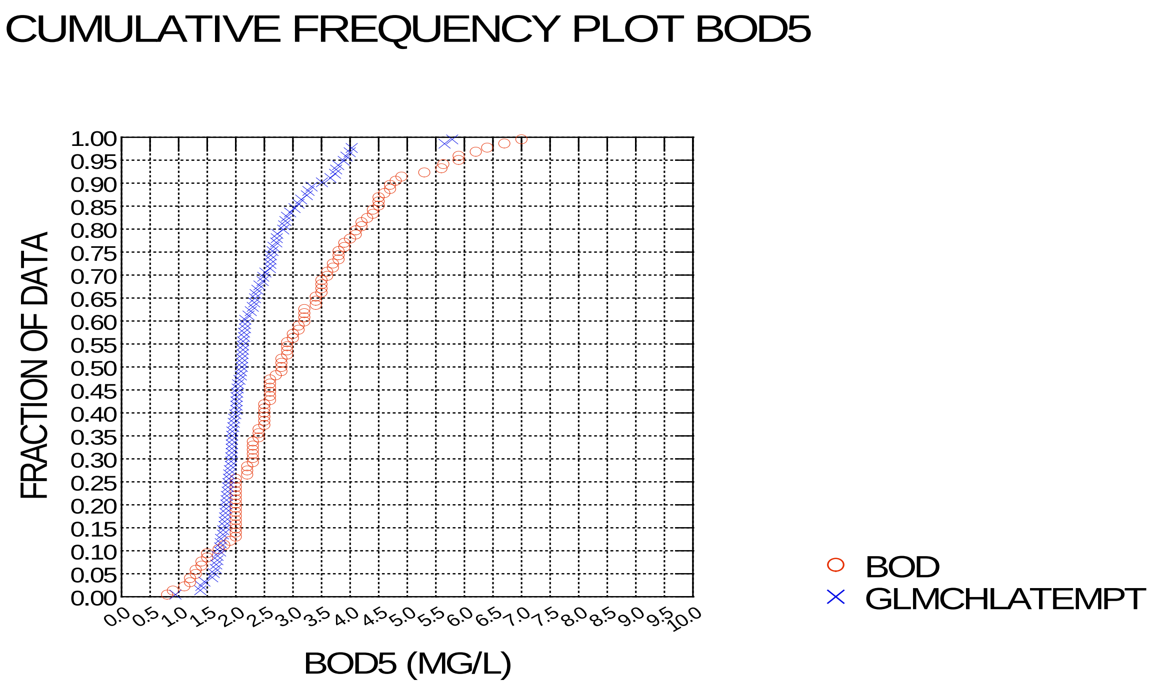
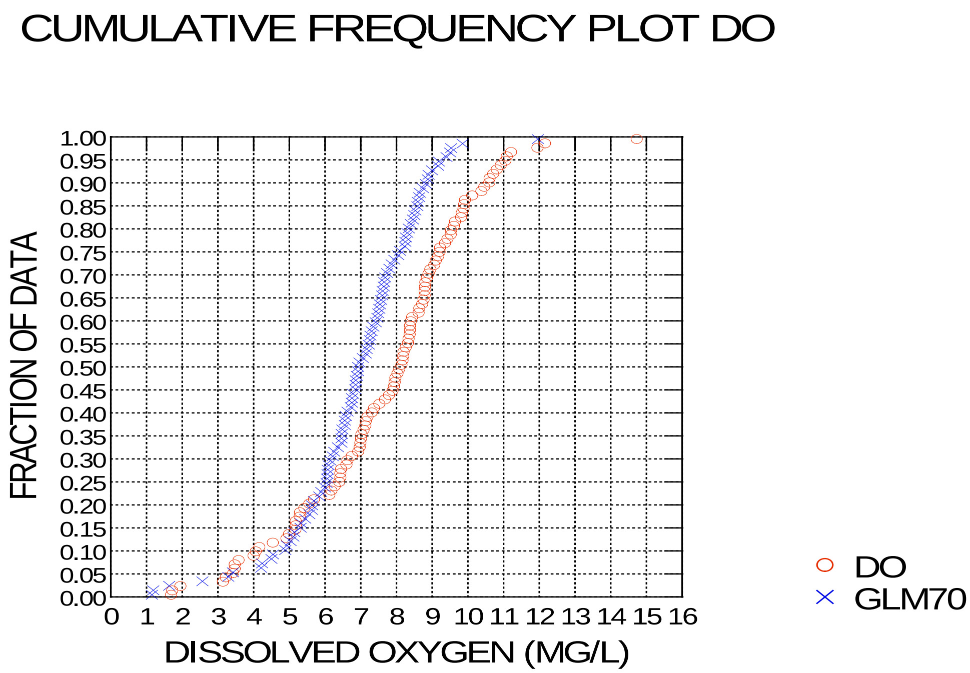


Figure 5.9. Cumulative Frequency Plot of Historical DO Observations Versus DO GLM Estimates Following a 30 Percent Reduction in TN



Doctors Lake

Tables 5.4a through **5.4d** provide a statistical summary of CHLAC, COLOR, TN, and TP observations at each station in Doctors Lake. **Figure 5.10** displays the calculated TSI over time based on historical observations of CHLAC, TN, and TP. **Figures 5.11** through **5.14** illustrate historical CHLAC, COLOR, TN, and TP observations, respectively. The simple linear regressions of TN and TP were significant at an α level of 0.05. **Appendix E** contains additional plots by season, station, and year.

Table 5.4a. Statistical Summary of Historical CHLAC Data for Doctors Lake (WBID 2389)

CHLAC is in ug/L
- = Empty cell/no data

Station	N	Minimum	Maximum	Median	Mean
21FLA 20030182	1	16.02	16.02	-	16.02
21FLA 20030184	1	48.06	48.06	-	48.06
21FLA 20030185	1	22.43	22.43	-	22.43
21FLA 20030186	1	38.27	38.27	-	38.27
21FLA 20030187	1	50.91	50.91	-	50.91
21FLA 20030188	1	35.85	35.85	-	35.85
21FLA 20030183	2	8.01	50	29.01	29.01
21FLSJWMDTL	346	1	161.18	26.30	31.44
21FLA 20030630	5	2.67	46.06	10.32	15.14
21FLDDPU20030630	1	2.7	2.7	-	2.70
21FLJXWQJAXSJR33	11	1.1	32.3	12.20	11.97
21FLSJWMSAVDRLKO	164	1	170.79	24.24	29.08
21FLSJWMSAVDRLKI	237	1.25	198.54	22.44	28.38

Table 5.4b. Statistical Summary of Historical Color Data for Doctors Lake (WBID 2389)

COLOR is in PCUs.
- = Empty cell/no data

Station	N	Minimum	Maximum	Median	Mean
21A20030182	21	50	160	100	97
21A20030184	21	60	200	90	101
21A20030185	21	50	160	90	97
21A20030186	20	60	200	98	105
21A20030187	21	40	240	100	110
21A20030188	24	60	260	90	105
21A20030183	5	70	200	90	114
21A20030190	1	80	80	-	80
SJWMDTL	358	5	300	70	95
21A20030630	11	80	200	100	113
DDPU20030630	25	50	160	80	91
JXWQJAXSJR33	20	40	200	80	93
SJWMSAVDRLKO	166	10	300	80	94
SJWMSAVDRLKI	242	20	400	80	96
SJWMIB224A	5	50	70	60	58

Table 5.4c. Statistical Summary of Historical TN Data for Doctors Lake (WBID 2389)

TN is in mg/L.
- = Empty cell/no data

Station	N	Minimum	Maximum	Median	Mean
21A20030182	9	0.36	2.00	0.93	1.01
21A20030184	8	0.28	2.67	1.36	1.50
21A20030185	9	0.81	2.26	1.13	1.30
21A20030186	8	0.97	3.63	1.65	1.79
21A20030187	8	1.11	3.34	1.53	1.75
21A20030188	14	0.71	2.30	1.25	1.34
21A20030183	5	0.77	2.79	1.55	1.54
11EPALES1207	21	0.93	9.62	1.48	2.25
21A20030190	1	0.94	0.94	-	0.94
SJWMDTL	362	0.29	6.68	1.41	1.46
21A20030630	11	0.65	1.35	0.94	0.92
DDPU20030630	34	0.45	1.91	1.05	1.13
JXWQJAXSJR33	92	0.33	6.47	1.08	1.22
KWATCLADOC2	57	0.57	2.29	1.03	1.14
KWATCLADOC1	57	0.00	2.27	1.08	1.15
KWATCLADOC3	57	0.61	2.27	1.03	1.12
SJWMSAVDRLKO	158	0.60	2.36	1.38	1.42
SJWMSAVDRLKI	260	0.31	3.64	1.40	1.46
SJWMIB224A	2	0.78	2.87	1.83	1.83

Table 5.4d. Statistical Summary of Historical TP Data for Doctors Lake (WBID 2389)

TP is in mg/L.
- = Empty cell

Station	N	Minimum	Maximum	Median	Mean
21A20030182	18	0.076	0.470	0.135	0.157
21A20030184	18	0.050	0.441	0.140	0.180
21A20030185	18	0.050	0.806	0.126	0.193
21A20030186	17	0.039	0.374	0.122	0.159
21A20030187	18	0.041	0.848	0.168	0.217
21A20030188	23	0.020	0.460	0.110	0.152
21A20030183	5	0.099	0.315	0.188	0.192
11EPALES1207	21	0.064	0.155	0.095	0.096
21A20030190	1	0.100	0.100	-	0.100
SJWMDTL	402	0.016	0.477	0.095	0.104
21A20030630	10	0.010	0.223	0.070	0.084
DDPU20030630	40	0.010	1.130	0.090	0.111
JXWQJAXSJR33	60	0.010	0.390	0.080	0.089
KWATCLADOC2	57	0.040	0.232	0.083	0.091
KWATCLADOC1	57	0.000	0.312	0.080	0.089
KWATCLADOC3	57	0.041	0.299	0.077	0.090
SJWMSAVDRLKO	160	0.026	0.360	0.086	0.097
SJWMSAVDRLKI	282	0.037	0.328	0.094	0.106
SJWMIB224A	2	0.061	0.440	0.251	0.251

Figure 5.10. Historical TSIs for Doctors Lake (WBID 2389)

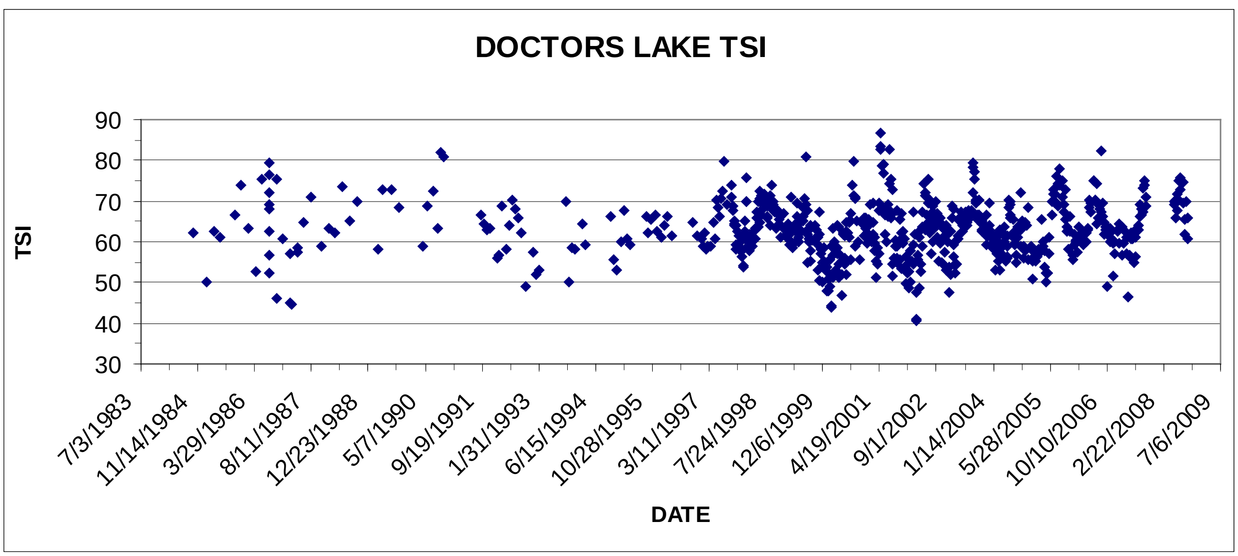


Figure 5.11. Historical CHLAC for Doctors Lake (WBID 2389)

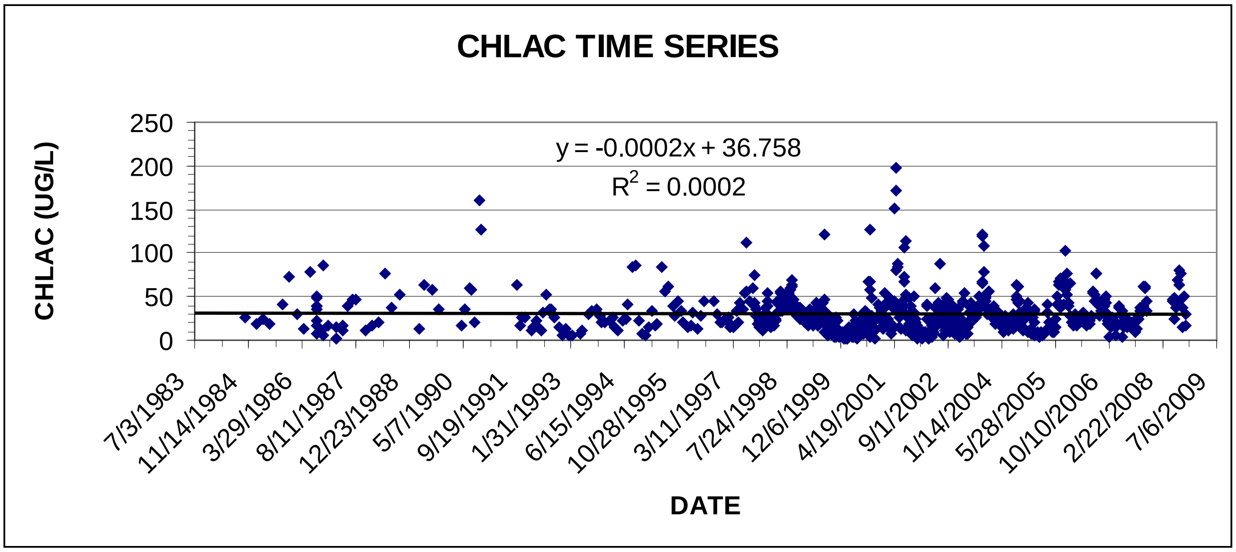


Figure 5.12. Historical COLOR for Doctors Lake (WBID 2389)

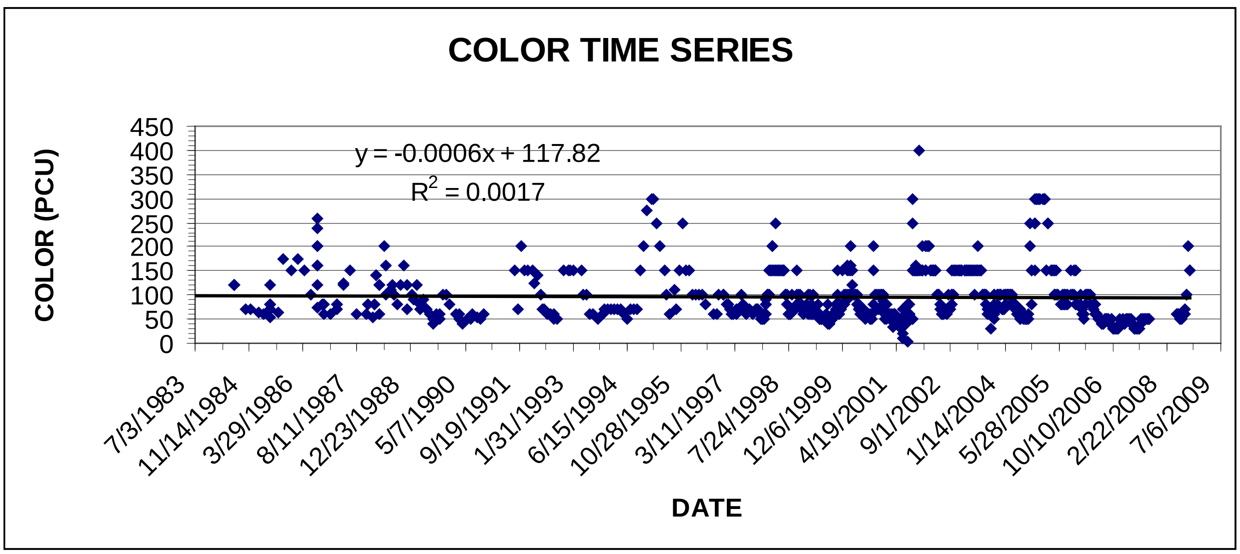


Figure 5.13. Historical TN for Doctors Lake (WBID 2389)

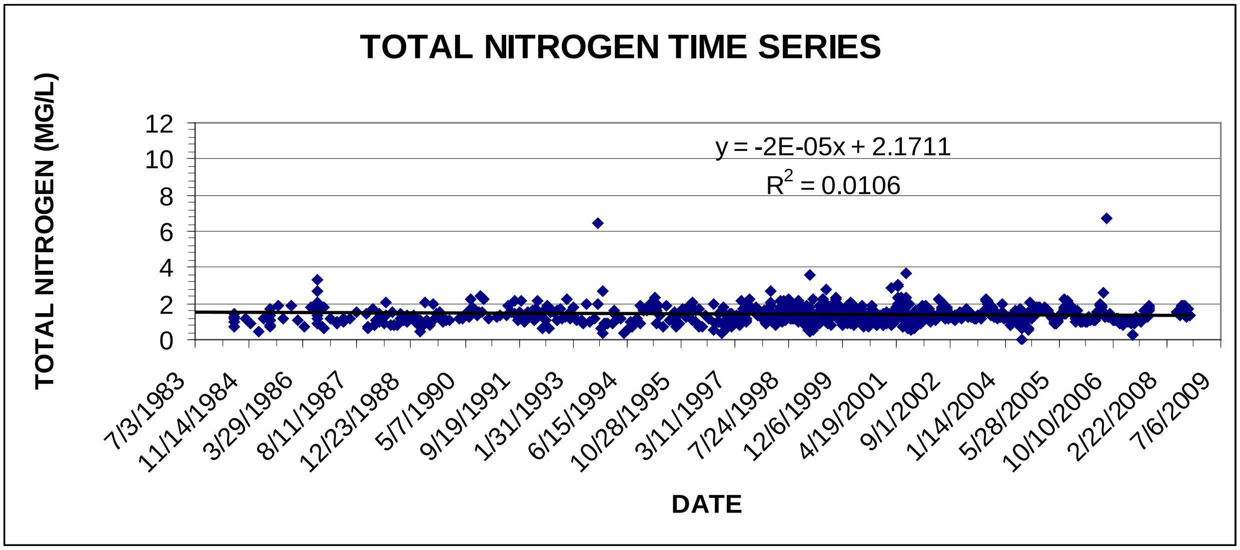
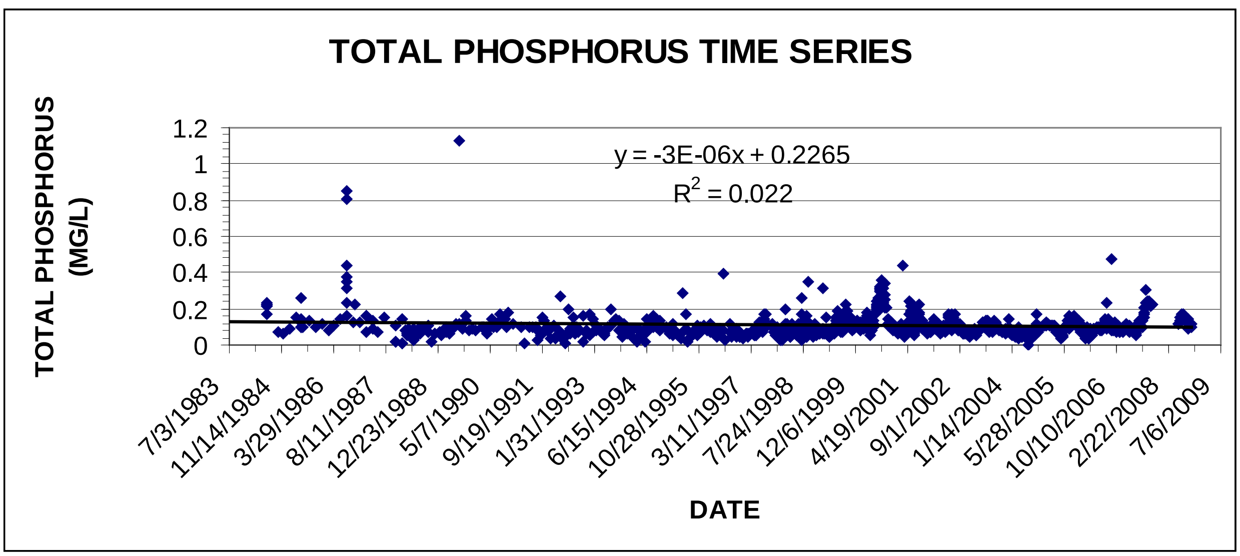


Figure 5.14. Historical TP for Doctors Lake (WBID 2389)



TMDL Development Process for Doctors Lake

A Spearman correlation matrix was used to assess potential relationships between CHLAC and other water quality parameters (**Appendix G**). At an alpha (α) level of 0.05, correlations between CHLAC and the parameters BOD5, chloride, COLOR, conductance, DO, DOSAT, NH4, nitrate nitrite (NO3NO2), pH, sulfate (SO4), TN, TP, and TEMP were significant. A multiple linear regression of CHLAC versus TEMP and COLOR explained 17 percent of the variance in CHLAC (**Appendix H**).

The Cycle 2 verified impairment for nutrients was based on annual average TSI values exceeding the IWR lake threshold of 60. Nitrogen and phosphorus were both identified as the limiting nutrients, since the median TN/TP ratio was 14.7 in the verified period.

A CHLAC GLM with COLOR, TN, and TEMP using a dataset of paired observation (721 cases) explained 34 percent of the variance in CHLAC:

CHLAC = -8.756 – 0.012*COLOR + 18.723*TN + 0.222*TEMP – 0.076TN*COLOR + 0.368*TN*TEMP + 0.003*COLOR*TEMP

A 30 percent reduction in TN was applied to the individual TN observations, and the CHLAC GLM was used to predict the resulting CHLAC concentrations. **Figure 5.15** shows the cumulative frequency plots of the historical CHLAC concentrations as well as GLM predictions with a 30 or 50 percent reduction in TN. There is a large reduction in the predicted CHLAC range with either the 30 or 50 percent reductions in TN. As a result, the existing mean and median CHLAC concentration are reduced from 29.7 and 24.6 μg/L, respectively, to 21.8 and 21.3 μg/L, respectively, under a 30 percent TN reduction (16.1 and 16.0 μg/L, respectively, for a 50 percent TN reduction). The existing 75^{th} percentile CHLAC concentration of 38.3 μg/L drops to 27.2 μg/L with the 30 percent TN reduction and to 20.4 μg/L under the 50 percent TN reduction.

Predicted changes in CHLAC with a 30 percent or 50 percent reduction in TN were combined with the reduced nitrogen concentrations and existing TP concentrations to evaluate the effect on the TSI. A TSI was calculated for each CHLAC, TN, and TP pair, and quarterly averages were calculated within each year; these quarterly averages were averaged to obtain the annual TSI. **Figure 5.16** illustrates the results. A 50 percent reduction in TN would be required to ensure that annual TSIs are below 60.

Implementation measures designed to achieve the required 30 to 50 percent reduction in TN associated with the Lower St. Johns River nutrient TMDL will improve Doctors Lake and result in annual TSI values below the IWR listing threshold of 60.

Critical Conditions/Seasonality

Nutrient assessments for lakes are based on an annual TSI. A minimum of 1 observation in each of the 4 quarters is required in order to calculate the TSI. The nutrient TMDL was based on applying a 30 or 50 percent reduction in TN to the complete historical data record.

Figure 5.15. Cumulative Frequency Plot of Historical CHLAC Observations for Doctors Lake (WBID 2389) Versus CHLAC GLM Estimates Following a 30 or 50 Percent Reduction in TN

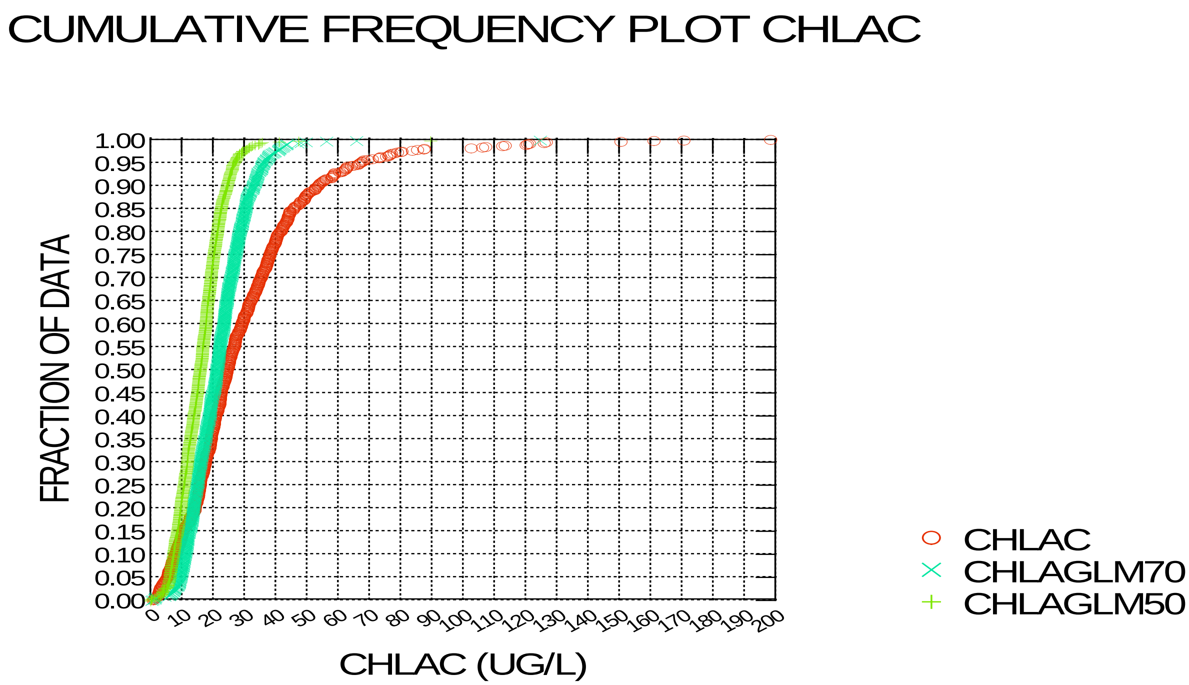
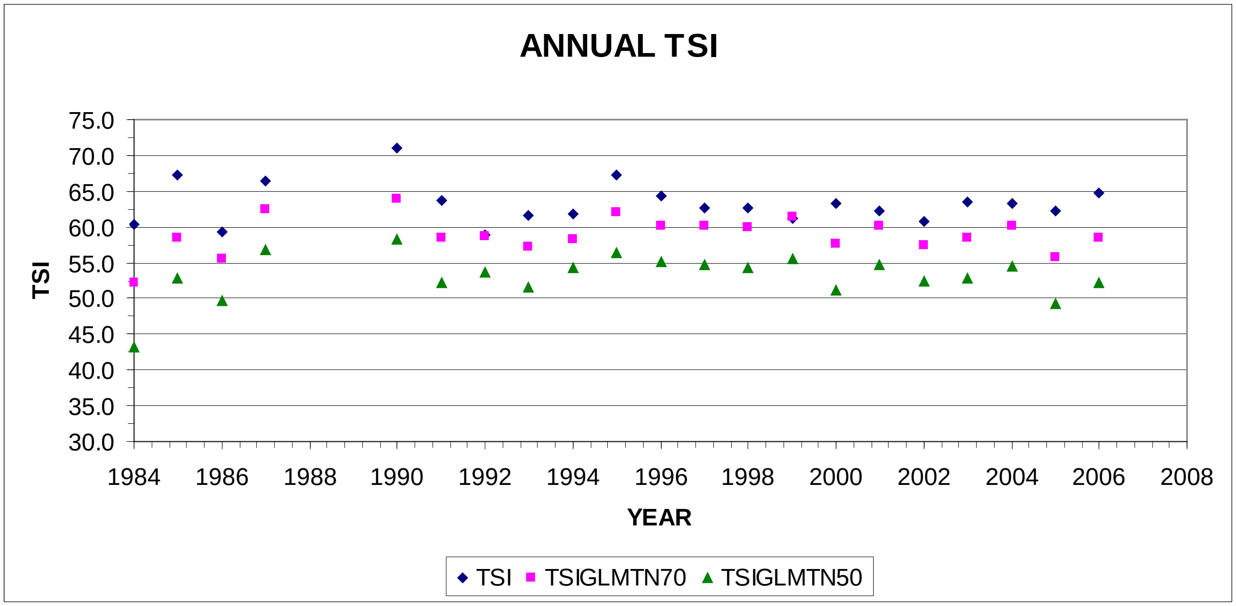


Figure 5.16. Annual TSIs for Historical Observations for Doctors Lake (WBID 2389) and Estimates Following a 30 or 50 Percent Reduction in TN



Chapter 6: DETERMINATION OF THE TMDL

6.1 Expression and Allocation of the TMDL

The objective of a TMDL is to provide a basis for allocating acceptable loads among all of the known pollutant sources in a watershed so that appropriate control measures can be implemented and water quality standards achieved. A TMDL is expressed as the sum of all point source loads (wasteload allocations, or WLAs), nonpoint source loads (load allocations, or LAs), and an appropriate margin of safety (MOS), which takes into account any uncertainty concerning the relationship between effluent limitations and water quality:

$$\textbf{TMDL} = \sum \square \text{WLAs} + \sum \square \text{LAs} + \text{MOS}$$

As discussed earlier, the WLA is broken out into separate subcategories for wastewater discharges and stormwater discharges regulated under the NPDES Program:

$$\textbf{TMDL} \cong \sum \square \text{WLAs}_{\textbf{wastewater}} + \sum \square \text{WLAs}_{\textbf{NPDES Stormwater}} + \sum \square \text{LAs} + \text{MOS}$$

It should be noted that the various components of the revised TMDL equation may not sum up to the value of the TMDL because (a) the WLA for NPDES stormwater is typically based on the percent reduction needed for nonpoint sources and is also accounted for within the LA, and (b) TMDL components can be expressed in different terms (for example, the WLA for stormwater is typically expressed as a percent reduction, and the WLA for wastewater is typically expressed as mass per day).

WLAs for stormwater discharges are typically expressed as “percent reduction” because it is very difficult to quantify the loads from MS4s (given the numerous discharge points) and to distinguish loads from MS4s from other nonpoint sources (given the nature of stormwater transport). The permitting of stormwater discharges also differs from the permitting of most wastewater point sources. Because stormwater discharges cannot be centrally collected, monitored, and treated, they are not subject to the same types of effluent limitations as wastewater facilities, and instead are required to meet a performance standard of providing treatment to the “maximum extent practical” through the implementation of BMPs.

This approach is consistent with federal regulations (40 CFR § 130.2[I]), which state that TMDLs can be expressed in terms of mass per time (e.g., pounds per day), toxicity, or **other appropriate measure**. The TMDLs for Swimming Pen Creek and Doctors Lake are expressed in terms of a percent reduction in TN to meet both the DO and nutrient criteria (**Table 6.1**).

Table 6.1. TMDL Components for Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389)

- = Empty cell/no data
NA = Not applicable
[1] As the TMDL represents a percent reduction, it also complies with EPA requirements to express the TMDL on a daily basis.

WBID	Parameter	TMDL (mg/L)	WLA for Wastewater (mg/L)	WLA for NPDES Stormwater (% reduction)[1]	LA (% reduction)[1]	MOS
2410	TN	-	NA	30%	30%	Implicit
2389	TN	-	NA	50%	50%	Implicit

6.2 Load Allocation

A TN reduction of 30 percent is required from nonpoint sources. It should be noted that the load allocation includes loading from stormwater discharges that are not part of the NPDES Stormwater Program.

6.3 Wasteload Allocation

6.3.1 NPDES Wastewater Discharges

There are currently no permitted NPDES discharges in the Swimming Pen Creek or Doctors Lake watersheds; however, any future discharge permits issued in the watershed will also be required to meet the state's Class III criterion for DO and contain appropriate discharge limitations on nitrogen that will comply with the TMDL.

6.3.2 NPDES Stormwater Discharges

Clay County (Permit FLR04E045), FDOT District 2 (Permit FLR04E020), and the town of Orange Park (Permit FLR04E075) have Phase II NPDES MS4 permits that include portions of the Swimming Pen Creek and Doctors Lake watersheds, and would be responsible for a 30 percent reduction in current anthropogenic TN loading. It should be noted that any MS4 permittee is only responsible for reducing the loads associated with stormwater outfalls that it owns or otherwise has responsible control over, and it is not responsible for reducing other nonpoint source loads in its jurisdiction.

6.4 Margin of Safety

Consistent with the recommendations of the Allocation Technical Advisory Committee (Department, 2001), an implicit MOS was used in the development of these TMDLs. An MOS was included in the DO and nutrient TMDLs for Swimming Pen Creek by using the complete historical data record and applying a 30 percent reduction in TN to all the observations. The nutrient TMDL for Doctors Lake also considered the complete data record and applied a 30 to 50 percent reduction in TN to all the observations. In both Swimming Pen Creek and Doctors Lake, the historical time series of TN and TP observations showed a statistically significant decline in concentration over the period of record.

Chapter 7: NEXT STEPS: IMPLEMENTATION PLAN DEVELOPMENT AND BEYOND

7.1 Basin Management Action Plan

Following the adoption of this TMDL by rule, the Department will determine the best course of action regarding its implementation. Depending on the pollutant(s) causing the waterbody impairment and the significance of the waterbody, the Department will select the best course of action leading to the development of a plan to restore the waterbody. Often this will be accomplished cooperatively with stakeholders by creating a Basin Management Action Plan, referred to as the BMAP. BMAPs are the primary mechanism through which TMDLs are implemented in Florida (see Subsection 403.067[7], F.S.). A single BMAP may provide the conceptual plan for the restoration of one or many impaired waterbodies.

If the Department determines that a BMAP is needed to support the implementation of this TMDL, a BMAP will be developed through a transparent, stakeholder-driven process intended to result in a plan that is cost-effective, technically feasible, and meets the restoration needs of the applicable waterbodies. Once adopted by order of the Department Secretary, BMAPs are enforceable through wastewater and municipal stormwater permits for point sources and through BMP implementation for nonpoint sources. Among other components, BMAPs typically include the following:

Water quality goals (based directly on the TMDL);

Refined source identification;

Load reduction requirements for stakeholders (quantitative detailed allocations, if technically feasible);

A description of the load reduction activities to be undertaken, including structural projects, nonstructural BMPs, and public education and outreach;

A description of further research, data collection, or source identification needed in order to achieve the TMDL;

Timetables for implementation;

Implementation funding mechanisms;

An evaluation of future increases in pollutant loading due to population growth;

Implementation milestones, project tracking, water quality monitoring, and adaptive management procedures; and

Stakeholder statements of commitment (typically a local government resolution).

BMAPs are updated through annual meetings and may be officially revised every five years. Completed BMAPs in the state have improved communication and cooperation among local stakeholders and state agencies; improved internal communication within local governments; applied high-quality science and local information in managing water resources; clarified the obligations of wastewater point source, MS4, and non-MS4 stakeholders in TMDL implementation; enhanced transparency in the Department's decision making; and built strong relationships between the Department and local stakeholders that have benefited other program areas.

7.2 Other TMDL Implementation Tools

However, in some basins, and for some parameters, particularly those with fecal coliform impairments, the development of a BMAP using the process described above will not be the most efficient way to restore a waterbody, such that it meets its designated uses. This is because fecal coliform impairments result from the cumulative effects of a multitude of potential sources, both natural and anthropogenic. Addressing these problems requires good old-fashioned detective work that is best done by those in the area.

A multitude of assessment tools is available to assist local governments and interested stakeholders in this detective work. The tools range from the simple (such as Walk the WBIDs and GIS mapping) to the complex (such as bacteria source tracking). Department staff will provide technical assistance, guidance, and oversight of local efforts to identify and minimize fecal coliform sources of pollution. Based on work in the Lower St Johns River tributaries and the Hillsborough Basin, the Department and local stakeholders have developed a logical process and tools to serve as a foundation for this detective work. In the near future, the Department will be releasing these tools to assist local stakeholders with the development of local implementation plans to address fecal coliform impairments. In such cases, the Department will rely on these local initiatives as a more cost-effective and simplified approach to identify the actions needed to put in place a road map for restoration activities, while still meeting the requirements of Subsection 403.067(7), F.S.

Earlier in the document, reference was made to the BMAP adopted in October 2008 that outlined implementation activities in the marine portion of the Lower St. Johns River to achieve the nutrient TMDL. Since the Swimming Pen Creek and Doctors Lake watersheds are contributing watersheds to the Lower St. Johns, applicable activities undertaken in these watersheds as part of the Lower St. Johns River BMAP should be beneficial in addressing the DO and nutrient impairment in Swimming Pen Creek and Doctors Lake.

References

Florida Administrative Code. *Rule 62-302, Surface water quality standards.*

———. *Rule 62-303, Identification of impaired surface waters.*

Florida Department of Environmental Protection. February 2001. *A report to the Governor and the Legislature on the allocation of Total Maximum Daily Loads in Florida.* Tallahassee, FL: Bureau of Watershed Management.

———. June 2002. *Basin status report: Lower St. Johns.* Tallahassee, FL: Bureau of Watershed Management.

———. 2004. *Water quality assessment report: Lower St. Johns.* Tallahassee, FL: Bureau of Watershed Management.

Florida Department of Health Website. 2008. Available: http://www.doh.state.fl.us/.

Florida Watershed Restoration Act. *Chapter 99-223, Laws of Florida.*

Gao, X. 2006 *Nutrient and unionized ammonia TMDLs for Lake Jesup WBIDs 2981 and 2981A*. Tallahassee, FL: Florida Department of Environmental Protection, Bureau of Watershed Management. Available: http://www.dep.state.fl.us/water/tmdl/docs/tmdls/final/gp2/lake-jessup-nutr_ammonia-tmdl.pdf.

Harper, H.H., and D.M. Baker. 2007. *Evaluation of current stormwater design criteria within the state of Florida.* Orlando, FL: Environmental Research & Design, Inc.

Magley, W., and D. Joyner. 2008. *Total Maximum Daily Load for nutrients for the Lower St. Johns River*. Tallahassee, FL: Florida Department of Environmental Protection, Bureau of Watershed Management Available: http://www.dep.state.fl.us/water/tmdl/docs/tmdls/final/gp2/lower-stjohns-nutrients.pdf.

U.S. Census Bureau Website. 2000. Available: http://www.census.gov/.

U.S. Environmental Protection Agency. 1999. *Protocol for developing nutrient TMDLs.* First Edition. EPA 841–B–99–007.

U.S. Environmental Protection Agency, Region 4. 2002. *Estimating water quality loadings from MS4 areas.*

Appendices

Appendix A: Background Information on Federal and State Stormwater Programs

In 1982, Florida became the first state in the country to implement statewide regulations to address the issue of nonpoint source pollution by requiring new development and redevelopment to treat stormwater before it is discharged. The Stormwater Rule, as authorized in Chapter 403, F.S., was established as a technology-based program that relies on the implementation of BMPs that are designed to achieve a specific level of treatment (i.e., performance standards) as set forth in Rule 62-40, F.A.C. In 1994, the Department's stormwater treatment requirements were integrated with the stormwater flood control requirements of the water management districts, along with wetland protection requirements, into the Environmental Resource Permit regulations.

Rule 62-40 also requires the state's water management districts to establish stormwater pollutant load reduction goals (PLRGs) and adopt them as part of a Surface Water Improvement and Management (SWIM) plan, other watershed plan, or rule. Stormwater PLRGs are a major component of the load allocation part of a TMDL. To date, stormwater PLRGs have been established for Tampa Bay, Lake Thonotosassa, the Winter Haven Chain of Lakes, the Everglades, Lake Okeechobee, and Lake Apopka.

In 1987, the U.S. Congress established Section 402(p) as part of the federal Clean Water Act Reauthorization. This section of the law amended the scope of the federal NPDES permitting program to designate certain stormwater discharges as "point sources" of pollution. The EPA promulgated regulations and began implementing the Phase I NPDES Stormwater Program in 1990. These stormwater discharges include certain discharges that are associated with industrial activities designated by specific standard industrial classification (SIC) codes, construction sites disturbing 5 or more acres of land, and the master drainage systems of local governments with a population above 100,000, which are better known as MS4s. However, because the master drainage systems of most local governments in Florida are interconnected, the EPA implemented Phase I of the MS4 permitting program on a countywide basis, which brought in all cities (incorporated areas), Chapter 298 urban water control districts, and the FDOT throughout the 15 counties meeting the population criteria. The Department received authorization to implement the NPDES Stormwater Program in 2000.

An important difference between the federal NPDES and the state's stormwater/environmental resource permitting programs is that the NPDES Program covers both new and existing discharges, while the state's program focus on new discharges only. Additionally, Phase II of the NPDES Program, implemented in 2003, expands the need for these permits to construction sites between 1 and 5 acres, and to local governments with as few as 1,000 people. While these urban stormwater discharges are now technically referred to as "point sources" for the purpose of regulation, they are still diffuse sources of pollution that cannot be easily collected and treated by a central treatment facility, as are other point sources of pollution such as domestic and industrial wastewater discharges. It should be noted that all MS4 permits issued in Florida include a reopener clause that allows permit revisions to implement TMDLs when the implementation plan is formally adopted.

Appendix B: Historical DO, BOD5, CHLAC, TN, and TP Observations in Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389), 1971–2008

Swimming Pen Creek

- = Empty cell/no data

Station	Sample Date	DO (mg/L)	BOD5 (mg/L)	CHLAC (µg/L)	TN (mg/L)	TP (mg/L)
11EPALES1207B1	3/17/1973	-	-	-	3.625	0.025
11EPALES1207B1	5/20/1973	-	-	-	2.325	0.03
11EPALES1207B1	6/14/1973	-	-	-	3.813	0.03
11EPALES1207B1	7/16/1973	-	-	-	0.731	0.015
11EPALES1207B1	8/18/1973	-	-	-	1.614	0.015
11EPALES1207B1	9/15/1973	-	-	-	1.552	0.011
11EPALES1207B1	2/17/1974	-	-	-	0.344	0.015
21FLSJWMSPCR	2/16/1993	7.03	-	21.2505	1.507	0.089
21FLSJWMSPCR	3/17/1993	8.01	-	13.231	1.1	0.133
21FLSJWMSPCR	4/13/1993	7.25	-	13.499	-	0.075
21FLSJWMSPCR	5/12/1993	8.6	-	13.632	1.628	0.073
21FLSJWMSPCR	5/25/1993	8.59	-	22.7205	1.2045	0.0405
21FLSJWMSPCR	6/9/1993	-	-	66.825	1.848	0.13
21FLSJWMSPCR	6/20/1993	11.88	-	96.763	-	0.225
21FLSJWMSPCR	7/8/1993	5.9	-	62.4	-	0.081
21FLSJWMSPCR	7/14/1993	11.23	-	55.3315	-	0.163
21FLSJWMSPCR	8/11/1993	9.3	-	59.341	2.543	0.087
21FLSJWMSPCR	8/18/1993	-	-	21.9185	2.131	0.1655
21FLSJWMSPCR	9/15/1993	8.18	-	78.853	2.401	0.137
21FLSJWMSPCR	9/23/1993	8.7	-	45.441	2.122	0.11
21FLSJWMSPCR	10/20/1993	5.49	-	18.711	1.792	0.145
21FLSJWMSPCR	10/28/1993	5.4	-	21.5175	1.01	0.0415
21FLSJWMSPCR	11/16/1993	8.97	-	13.632	-	0.053
21FLSJWMSPCR	11/22/1993	6.08	-	20.315	1.53	0.09
21FLSJWMSPCR	12/14/1993	-	-	20.4485	0.929	0.048
21FLSJWMSPCR	12/19/1993	8.38	-	7.752	2.146	0.091
21FLSJWMSPCR	1/26/1995	9.61	-	12.2955	1.765	0.09
21FLSJWMSPCR	2/16/1995	11.28	-	41.699	1.673	0.087
21FLSJWMSPCR	3/16/1995	9.52	-	28.334	1.796	0.084
21FLSJWMSPCR	4/6/1995	-	-	-	1.62	-
21FLSJWMSPCR	4/13/1995	6.98	-	21.91	1.43	0.08
21FLSJWMSPCR	5/25/1995	11.19	-	86.071	-	0.111
21FLSJWMSPCR	6/15/1995	4.21	-	89.546	2.432	0.084
21FLSJWMSPCR	7/18/1995	9.71	-	48.114	1.487	0.059
21FLSJWMSPCR	8/31/1995	5.61	3	32.521	-	0.083
21FLSJWMSPCR	9/14/1995	1.72	2.8	12.02	1.76	0.137
21FLSJWMSPCR	10/19/1995	4.16	2.2	20.559	1.517	0.089
21FLSJWMSPCR	11/20/1995	9.07	-	37.38	-	0.097
21FLSJWMSPCR	12/11/1995	7.31	2.2	20.559	1.723	0.113
21FLSJWMSPCR	1/18/1996	10.71	4.4	46.458	1.994	0.087

Station	Sample Date	DO (mg/L)	BOD5 (mg/L)	CHLAC (µg/L)	TN (mg/L)	TP (mg/L)
21FLSJWMSPCR	2/15/1996	10.46	-	30.171	1.637	0.06
21FLSJWMSPCR	3/12/1996	10.92	2.5	30.26	1.621	0.09
21FLSJWMSPCR	4/18/1996	8.85	2.6	13.884	1.912	0.046
21FLSJWMSPCR	5/16/1996	9.9	6.4	51.798	2.264	0.119
21FLSJWMSPCR	6/13/1996	7.13	5.9	72.98	2.237	0.085
21FLSJWMSPCR	8/20/1996	8.79	7	80.1	3.144	0.168
21FLSJWMSPCR	9/19/1996	6.26	4.6	50.73	-	0.01
21FLSJWMSPCR	11/25/1996	8.06	2.2	24.297	-	0.062
21FLSJWMSPCR	1/16/1997	10.12	2.6	27.768	0.957	0.053
21FLSJWMSPCR	2/13/1997	9	2.3	19.224	-	0.077
21FLSJWMSPCR	3/26/1997	7.69	2.5	19.224	-	0.076
21FLSJWMSPCR	4/17/1997	9.53	4.9	36.846	1.357	0.053
21FLSJWMSPCR	5/15/1997	12.16	5.3	57.405	2.367	0.084
21FLSJWMSPCR	6/12/1997	5.69	3	29.815	1.639	0.078
21FLSJWMSPCR	7/10/1997	6.43	3.7	45.657	1.848	0.086
21FLSJWMSPCR	8/21/1997	4.29	-	-	2.007	0.145
21FLSJWMSPCR	9/18/1997	5.4	-	62.745	1.609	0.108
21FLSJWMSPCR	10/23/1997	6.75	3	20.92607	1.763	0.074
21FLSJWMSPCR	11/24/1997	7.45	-	20.10505	1.597	0.07
21FLSJWMSPCR	12/18/1997	6.01	-	1.521967	2.596	0.058
21FLSJWMSPCR	1/22/1998	9.72	-	32.7341	1.327	0.048
21FLSJWMSPCR	2/25/1998	7.87	-	19.8112	1.19	0.077
21FLSJWMSPCR	3/26/1998	9.61	2.9	17.22125	1.337	0.061
21FLSJWMSPCR	4/23/1998	10.76	-	25.33815	1.487	0.083
21FLSJWMSPCR	5/26/1998	10.61	4.6	54.735	1.727	0.091
21FLSJWMSPCR	6/11/1998	-	4.2	62.3178	1.867	0.102
21FLSJWMSPCR	7/28/1998	8.81	-	80.23375	2.02	0.097
21FLSJWMSPCR	8/20/1998	5.56	3.2	55.0552	1.087	0.05
21FLSJWMSPCR	9/10/1998	8.8	4.3	61.41	1.627	0.08
21FLSJWMSPCR	10/13/1998	7.19	3.5	35.53785	1.637	0.097
21FLSJWMSPCR	11/12/1998	8.93	-	13.7771	1.687	0.07
21FLSJWMSPCR	12/8/1998	8.62	3.8	17.16805	1.677	0.08
21FLSJWMSPCR	1/14/1999	10.18	-	22.5349	1.487	-
21FLSJWMSPCR	2/11/1999	6.97	2.9	27.36775	1.487	0.071
21FLSJWMSPCR	3/11/1999	9.52	3.1	-	1.447	0.067
21FLSJWMSPCR	4/26/1999	8.26	2.8	45.8708	1.967	0.085
21FLSJWMSPCR	5/13/1999	9.21	4.5	22.2142	1.567	0.087
21FLSJWMSPCR	6/29/1999	5.29	5.633333	62.06867	2.098333	0.137
21FLSJWMSPCR	7/21/1999	6.93	3.5	15.67295	1.497	0.093
21FLSJWMSPCR	8/12/1999	6.18	2.3	12.1751	1.557	0.102
21FLSJWMSPCR	9/8/1999	5.18	3.1	21.4669	1.409	0.169
21FLSJWMSPCR	10/13/1999	8.2	2.6	27.0202	1.352	0.124
21FLSJWMSPCR	11/10/1999	11.21	2.7	22.72419	1.344	0.097
21FLSJWMSPCR	12/7/1999	8.38	1.1	4.819175	1.403	0.12
21FLSJWMSPCR	1/11/2000	7.68	2.5	26.92981	1.866	0.134
21FLSJWMSPCR	2/8/2000	10.6	2.8	21.40286	1.771	0.106

Station	Sample Date	DO (mg/L)	BOD5 (mg/L)	CHLAC (µg/L)	TN (mg/L)	TP (mg/L)
21FLSJWMSPCR	3/7/2000	8.81	3.4	40.02882	1.766	0.147
21FLSJWMSPCR	4/11/2000	9.84	-	33.43504	1.298	0.104
21FLSJWMSPCR	5/9/2000	7.14	2.9	16.43676	1.173	0.128
21FLSJWMSPCR	6/13/2000	8.44	-	28.0708	1.15	0.163
21FLSJWMSPCR	7/11/2000	7.52	2.8	22.24389	1.151	0.236
21FLSJWMSPCR	8/8/2000	5.88	-	36.96608	1.283	0.352
21FLSJWMSPCR	9/12/2000	7.84	-	78.80786	1.699	0.273
21FLSJWMSPCR	10/10/2000	8.34	1.5	29.89316	1.182	0.147
21FLSJWMSPCR	11/14/2000	5.18	1.3	13.87316	1.299	0.099
21FLSJWMSPCR	12/13/2000	8.4	2.3	32.42024	1.15	0.079
21FLSJWMSPCR	1/10/2001	11.51	-	36.98609	1.275	0.096
21FLSJWMSPCR	2/13/2001	5.3	1.4	28.34486	1.227	0.055
21FLSJWMSPCR	3/12/2001	9.43	2.5	21.38118	1.09	0.073
21FLSJWMSPCR	4/11/2001	8.19	3.2	17.49676	1.177	0.084
21FLSJWMSPCR	5/16/2001	7.89	5.9	134.2879	3.347	0.311
21FLSJWMSPCR	6/12/2001	4.92	3.4	47.92108	2.207	0.137
21FLSJWMSPCR	7/9/2001	10.81	3.7	72.61316	1.977	0.11
21FLSJWMSPCR	8/7/2001	1.74	-	22.23105	1.8	0.139
21FLSJWMSPCR	9/13/2001	4.06	1.9	20.648	1.072	0.145
21FLSJWMSPCR	10/10/2001	3.58	1.7	4.46979	1.013	0.095
21FLSJWMSPCR	11/15/2001	6.89	-	7.33191	1.698	0.09
21FLSJWMSPCR	12/10/2001	4.65	-	5.865995	1.51	0.12
21FLSJWMSPCR	1/9/2002	9.88	0.8	3.099935	1.637	0.081
21FLSJWMSPCR	2/13/2002	9.64	1.5	25.42904	1.411	0.083
21FLSJWMSPCR	3/13/2002	7.32	-	7.23018	1.443	0.105
21FLSJWMSPCR	4/9/2002	7.97	1.8	15.71014	1.18	0.094
21FLSJWMSPCR	5/14/2002	6.63	3.2	37.49207	1.747	0.15
21FLSJWMSPCR	6/11/2002	8.9	5.6	69.24906	2.105	0.15
21FLSJWMSPCR	7/17/2002	12.51	-	54.45199	1.48	0.144
21FLSJWMSPCR	8/14/2002	1.95	1.2	8.055195	1.497	0.123
21FLSJWMSPCR	9/9/2002	3.69	-	14.99205	1.22	0.075
21FLSJWMSPCR	10/10/2002	3.47	1.2	11.57178	1.215	0.083
21FLSJWMSPCR	11/20/2002	8.37	1.4	12.8694	1.261	0.064
21FLSJWMSPCR	12/10/2002	7.95	0.9	2.91564	1.379	0.09
21FLSJWMSPCR	1/7/2003	8.17	1.3	6.56553	1.41	0.096
21FLSJWMSPCR	2/12/2003	7.69	-	3.20667	1.511	0.083
21FLSJWMSPCR	3/10/2003	5.43	1.9	5.85798	1.292	0.155
21FLSJWMSPCR	4/16/2003	8.44	2.4	22.41732	1.177	0.094
21FLSJWMSPCR	5/13/2003	6.03	-	30.82782	1.449	0.168
21FLSJWMSPCR	6/10/2003	9.36	4.1	-	1.345	0.107
21FLSJWMSPCR	7/16/2003	7.93	3.9	77.39796	2.056	0.129
21FLSJWMSPCR	8/14/2003	6.45	4	73.54515	1.727	0.119
21FLSJWMSPCR	9/11/2003	14.73	3.2	40.15013	1.578	0.099
21FLSJWMSPCR	10/6/2003	7.37	2.6	23.39005	1.3593	0.07103
21FLSJWMSPCR	11/13/2003	3.14	2	11.5344	1.42709	0.09066
21FLSJWMSPCR	12/10/2003	9.81	2.3	20.80598	1.28141	0.06824

Station	Sample Date	DO (mg/L)	BOD5 (mg/L)	CHLAC (μg/L)	TN (mg/L)	TP (mg/L)
21FLSJWMSPCR	1/15/2004	10.46	2.5	16.58833	1.36916	0.07432
21FLSJWMSPCR	2/11/2004	11.05	2	20.25004	1.25464	0.05776
21FLSJWMSPCR	3/9/2004	8.95	2.3	23.56985	1.19343	0.06579
21FLSJWMSPCR	4/15/2004	8.24	-	18.94174	1.23069	0.08555
21FLSJWMSPCR	5/11/2004	6.4	2.2	19.236	1.13004	0.04856
21FLSJWMSPCR	6/9/2004	5.42	4.8	76.07759	1.86818	0.08759
21FLSJWMSPCR	7/13/2004	5.17	2.4	22.35791	1.18171	0.05262
21FLSJWMSPCR	8/10/2004	6.6	3.5	36.91788	1.27665	0.08059
21FLSJWMSPCR	9/15/2004	1.2	-	20.32671	1.39197	0.13387
21FLSJWMSPCR	10/21/2004	3.43	2	13.19514	1.61291	0.11398
21FLSJWMSPCR	11/17/2004	6.43	2	5.53491	1.57452	0.07782
21FLSJWMSPCR	12/6/2004	7.79	2	14.1243	1.60224	0.1026
21FLSJWMSPCR	1/6/2005	7.91	2	18.6366	-	0.10766
21FLSJWMSPCR	2/16/2005	8.03	2	10.4397	1.51375	0.07628
21FLSJWMSPCR	3/9/2005	-	2	23.1489	1.45116	0.09784
21FLSJWMSPCR	4/6/2005	8.38	2	13.1097	1.07784	0.04875
21FLSJWMSPCR	5/4/2005	7.02	2	13.5369	1.01905	0.06883
21FLSJWMSPCR	6/8/2005	-	4.5	34.40583	1.24363	0.08039
21FLSJWMSPCR	7/7/2005	4	3.8	92.916	1.50667	0.14728
21FLSJWMSPCR	8/3/2005	8.72	6.2	73.67021	2.02228	0.14576
21FLSJWMSPCR	9/19/2005	8.79	4.7	49.09462	1.76927	0.11577
21FLSJWMSPCR	10/11/2005	4.99	2.5	46.99201	1.43191	0.14453
21FLSJWMSPCR	11/2/2005	8.76	2.3	20.7815	1.13521	0.10025
21FLSJWMSPCR	1/4/2006	10.38	3.4	41.18476	1.12351	0.06917
21FLSJWMSPCR	2/15/2006	9.92	2.6	16.287	1.21304	0.06897
21FLSJWMSPCR	3/8/2006	9.1	2.3	15.7797	1.14875	0.07627
21FLSJWMSPCR	4/6/2006	9.22	2.9	16.5095	1.07826	0.07685
21FLSJWMSPCR	6/20/2006	8.08	4.7	41.207	1.79225	0.1255
21FLSJWMSPCR	7/20/2006	-	3.8	28.569	1.31593	0.1026
21FLSJWMSPCR	8/17/2006	3.22	4.5	43.521	1.64728	0.09168
21FLSJWMSPCR	9/13/2006	3.47	2	15.28575	1.27628	0.0802
21FLSJWMSPCR	10/10/2006	9.17	3.6	19.7135	1.20354	0.09624
21FLSJWMSPCR	11/8/2006	6.12	2	21.0485	1.19645	0.09401
21FLSJWMSPCR	12/14/2006	8.64	3.9	41.69649	0.89532	0.08104
21FLSJWMSPCR	1/25/2007	6.99	2	7.832	1.0591	0.05665
21FLSJWMSPCR	2/14/2007	8.32	2	13.3055	0.94098	0.06391
21FLSJWMSPCR	3/15/2007	-	2.4	26.4775	1.03724	0.08229
21FLSJWMSPCR	4/12/2007	8.14	2	21.6715	0.9512	0.08449
21FLSJWMSPCR	5/16/2007	9.06	3.6	20.203	1.25048	0.09514
21FLSJWMSPCR	6/7/2007	9.83	3.5	30.23775	1.25776	0.12105
21FLSJWMSPCR	7/12/2007	7.01	4.4	58.5175	1.42659	0.23786
21FLSJWMSPCR	8/6/2007	11.95	4.2	51.264	1.46397	0.21596
21FLSJWMSPCR	9/13/2007	4.536667	2.6	29.97075	1.46264	0.20135
21FLBRA 2410-A	4/18/2008	9.11	-	-	-	-
21FLBRA 2410-B	4/22/2008	7.93	-	-	-	-
21FLBRA 2410-A	4/30/2008	11.38	-	-	-	-

Station	Sample Date	DO (mg/L)	BOD5 (mg/L)	CHLAC (µg/L)	TN (mg/L)	TP (mg/L)
21FLBRA 2410-B	4/30/2008	7.88	-	-	-	-
21FLBRA 2410-A	5/6/2008	12.08	-	-	-	-
21FLBRA 2410-B	5/14/2008	7.97	-	-	-	-
21FLBRA 2410-A	5/15/2008	10.77	-	-	-	-
21FLBRA 2410-A	5/22/2008	9.97	-	-	-	-
21FLBRA 2410-B	5/22/2008	6.05	-	-	-	-
21FLBRA 2410-A	5/29/2008	6.12	-	-	-	-
21FLBRA 2410-B	5/29/2008	6.86	-	-	-	-
21FLSJWMSPCR	6/12/2008	6.27	2.5	43.521	1.5604	0.1867
21FLBRA 2410-A	6/13/2008	5.63	-	-	-	-
21FLBRA 2410-B	6/13/2008	6.14	-	-	-	-
21FLBRA 2410-A	6/17/2008	10.08	-	-	-	-
21FLBRA 2410-B	6/17/2008	7.22	-	-	-	-
21FLBRA 2410-A	6/23/2008	8.5	-	-	-	-
21FLBRA 2410-B	6/23/2008	7.01	-	-	-	-
21FLSJWMSPCR	7/24/2008	11.09	6.7	77.16301	1.55	0.0567
21FLSJWMSPCR	8/7/2008	7.08	4.1	62.0775	1.8581	0.1647
21FLSJWMSPCR	9/4/2008	1.69	2	15.7975	1.5294	0.166

Doctors Lake

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLA 20030182	3/24/1971	-	80	18	-	0.1
21FLA 20030184	3/24/1971	-	80	18	-	0.31
21FLA 20030185	3/24/1971	-	80	17	-	0.11
21FLA 20030186	3/24/1971	-	80	18	-	0.17
21FLA 20030187	3/24/1971	-	75	18	-	0.38
21FLA 20030188	3/24/1971	-	85	17	-	0.1
21FLA 20030182	4/26/1971	-	50	25	-	0.13
21FLA 20030184	4/26/1971	-	75	28	-	0.2
21FLA 20030185	4/26/1971	-	50	28	-	0.13
21FLA 20030186	4/26/1971	-	70	28	-	0.1
21FLA 20030187	4/26/1971	-	80	28	-	0.37
21FLA 20030188	4/26/1971	-	60	28	-	0.09
21FLA 20030182	6/7/1971	-	160	29	-	0.08
21FLA 20030184	6/7/1971	-	160	29	-	0.16
21FLA 20030185	6/7/1971	-	160	29	-	0.08
21FLA 20030186	6/7/1971	-	160	31	-	0.09
21FLA 20030187	6/7/1971	-	160	30	-	0.08
21FLA 20030188	6/7/1971	-	160	31	-	0.13
21FLA 20030182	7/14/1971	-	140	35	-	0.09
21FLA 20030184	7/14/1971	-	140	31	-	0.13
21FLA 20030185	7/14/1971	-	140	35	-	0.15
21FLA 20030186	7/14/1971	-	140	36	-	0.13
21FLA 20030187	7/14/1971	-	160	33	-	0.13
21FLA 20030188	7/14/1971	-	140	35	-	0.15
21FLA 20030182	8/2/1971	-	100	30	-	0.08
21FLA 20030184	8/2/1971	-	100	30	-	0.07
21FLA 20030185	8/2/1971	-	100	29	-	0.09
21FLA 20030186	8/2/1971	-	100	29	-	0.09
21FLA 20030187	8/2/1971	-	100	30	-	0.11
21FLA 20030188	8/2/1971	-	100	29	-	0.09
21FLA 20030182	12/8/1971	-	70	23	-	0.2
21FLA 20030184	12/8/1971	-	90	23	-	0.14
21FLA 20030185	12/8/1971	-	70	24	-	0.18
21FLA 20030186	12/8/1971	-	96	20	-	0.16
21FLA 20030187	12/8/1971	-	200	22	-	0.18
21FLA 20030188	12/8/1971	-	84	24	-	0.1
21FLA 20030182	1/5/1972	-	100	21	-	0.1
21FLA 20030184	1/5/1972	-	100	21	-	0.1
21FLA 20030185	1/5/1972	-	100	21	-	0.1
21FLA 20030186	1/5/1972	-	100	21	-	0.08
21FLA 20030187	1/5/1972	-	100	21	-	0.08
21FLA 20030188	1/5/1972	-	100	21	-	0.1
21FLA 20030183	7/18/1972	-	-	29	-	-

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLA 20030183	7/19/1972	-	-	29	-	-
21FLA 20030183	7/20/1972	-	-	30	-	-
21FLA 20030182	10/18/1972	-	120	25	-	0.17
21FLA 20030184	10/18/1972	-	140	26	-	0.085
21FLA 20030185	10/18/1972	-	120	26	-	0.14
21FLA 20030186	10/18/1972	-	140	25	-	0.12
21FLA 20030187	10/18/1972	-	120	27	-	0.175
21FLA 20030188	10/18/1972	-	100	25	-	0.19
11EPALES120701	3/7/1973	-	-	18.4	1.66	0.09
11EPALES120702	3/7/1973	-	-	18.9	1.476667	0.064333
11EPALES120703	3/7/1973	-	-	22.2	1.545	0.0665
11EPALES1207A1	3/17/1973	-	-	-	9.618	0.155
11EPALES1207A1	4/13/1973	-	-	-	5.32	0.085
21FLA 20030182	5/16/1973	-	100	23	-	0.076
21FLA 20030184	5/16/1973	-	100	23	-	0.05
21FLA 20030185	5/16/1973	-	110	23	-	0.05
21FLA 20030186	5/16/1973	-	130	23	-	0.039
21FLA 20030187	5/16/1973	-	100	23	-	0.041
21FLA 20030188	5/16/1973	-	130	24	-	0.05
11EPALES1207A1	5/20/1973	-	-	-	3.123	0.11
11EPALES1207A1	6/14/1973	-	-	-	5.342	0.105
11EPALES1207A1	7/16/1973	-	-	-	0.99	0.095
21FLA 20030182	8/7/1973	-	100	28	-	-
21FLA 20030184	8/7/1973	-	60	29	-	-
21FLA 20030185	8/7/1973	-	70	28	-	-
21FLA 20030186	8/7/1973	-	90	30	-	-
21FLA 20030187	8/7/1973	-	100	30	-	-
21FLA 20030188	8/7/1973	-	80	28	-	-
11EPALES1207A1	8/18/1973	-	-	-	1.39	0.1
11EPALES120701	9/7/1973	-	-	29.55	1.63	0.0925
11EPALES120702	9/7/1973	-	-	29.65	2.03	0.084
11EPALES120703	9/7/1973	-	-	29.3	2.03	0.083
11EPALES1207A1	9/15/1973	-	-	-	1.603	0.095
11EPALES1207A1	10/14/1973	-	-	-	0.969	0.085
11EPALES120701	11/8/1973	-	-	21.7	1.4825	0.10775
11EPALES120702	11/8/1973	-	-	20.85	1.315	0.081
11EPALES120703	11/8/1973	-	-	20.4	1.265	0.0785
11EPALES1207A1	11/16/1973	-	-	-	0.934	0.1
11EPALES1207A1	12/14/1973	-	-	-	0.968	0.115
11EPALES1207A1	1/19/1974	-	-	-	1.4	0.105
11EPALES1207A1	2/17/1974	-	-	-	1.26	0.11
21FLA 20030182	2/18/1974	-	80	16.5	-	-
21FLA 20030184	2/18/1974	-	100	17	-	-
21FLA 20030185	2/18/1974	-	90	18.5	-	-
21FLA 20030186	2/18/1974	-	100	17	-	-
21FLA 20030187	2/18/1974	-	110	17	-	-

Station	Sample Date	CHLAC (μg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLA 20030188	2/18/1974	-	90	17	-	-
21FLA 20030188	7/29/1975	-	140	-	0.93	0.11
21FLA 20030188	8/18/1976	-	-	27.5	0.707	0.02
21FLA 20030188	4/6/1977	-	-	20.5	0.975	0.04
21FLA 20030182	7/11/1977	-	90	27.4	0.93	0.12
21FLA 20030184	7/11/1977	-	80	31	1.13	0.14
21FLA 20030185	7/11/1977	-	70	30	0.82	0.11
21FLA 20030187	7/11/1977	-	80	28.9	-	0.16
21FLA 20030188	7/11/1977	-	80	27.8	1.18	0.13
21FLA 20030190	7/11/1977	-	80	30.05	0.94	0.1
21FLA 20030188	10/19/1977	-	70	20	1.215	0.18
21FLA 20030182	10/28/1977	-	60	20.9	-	-
21FLA 20030184	10/28/1977	-	60	21.5	-	-
21FLA 20030185	10/28/1977	-	80	21	-	-
21FLA 20030186	10/28/1977	-	60	21.2	-	-
21FLA 20030187	10/28/1977	-	80	21.5	-	-
21FLA 20030188	10/28/1977	-	80	21.4	-	-
21FLA 20030188	1/4/1978	-	80	11.5	1.02	0.11
21FLA 20030188	7/20/1978	-	-	27	-	-
21FLA 20030182	7/31/1978	-	60	28.4	1.09	0.1
21FLA 20030184	7/31/1978	-	100	28.3	1.67	0.1
21FLA 20030185	7/31/1978	-	100	25.4	1.04	0.09
21FLA 20030186	7/31/1978	-	100	28.4	1.59	0.1
21FLA 20030187	7/31/1978	-	100	29	1.64	0.1
21FLA 20030188	7/31/1978	-	100	28.4	1.53	0.09
21FLA 20030182	8/13/1979	-	100	29	1.33	0.16
21FLA 20030184	8/13/1979	-	80	28	2.2	0.13
21FLA 20030185	8/13/1979	-	80	29	1.94	0.11
21FLA 20030186	8/13/1979	-	80	30	2.05	0.09
21FLA 20030187	8/13/1979	-	40	29	1.56	0.1
21FLA 20030188	8/13/1979	-	80	27.5	1.87	0.09
21FLA 20030182	8/19/1980	-	90	26.2	0.36	0.19
21FLA 20030183	8/19/1980	-	90	29.5	2.79	0.26
21FLA 20030184	8/19/1980	-	90	30	0.28	0.26
21FLA 20030185	8/19/1980	-	90	29.5	2.26	0.26
21FLA 20030186	8/19/1980	-	90	29.5	3.63	0.24
21FLA 20030187	8/19/1980	-	90	30.2	2.395	0.25
21FLA 20030188	8/19/1980	-	90	30	2.3	0.21
21FLA 20030182	7/15/1981	-	65	29	1.03	0.47
21FLA 20030184	7/15/1981	-	80	30.5	1.3	0.36
21FLA 20030185	7/15/1981	-	80	30.5	1.06	0.47
21FLA 20030186	7/15/1981	-	80	30.5	1.2	0.36
21FLA 20030187	7/15/1981	-	80	30.5	1.23	0.33
21FLA 20030188	7/15/1981	-	80	29	1.42	0.46
21FLA 20030188	7/16/1981	-	-	-	-	-
21FLA 20030182	7/6/1982	-	120	29	2.002	0.215

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLA 20030183	7/6/1982	-	90	31	1.546	0.188
21FLA 20030184	7/6/1982	-	-	-	-	-
21FLA 20030185	7/6/1982	-	90	32	1.478	0.261
21FLA 20030186	7/6/1982	-	90	32	1.708	0.21
21FLA 20030187	7/6/1982	-	90	31	1.49	0.226
21FLA 20030188	7/6/1982	-	90	31	1.018	0.204
21FLA 20030184	7/8/1982	-	90	30.5	-	0.247
21FLA 20030182	6/27/1984	-	120	29.5	0.75	0.171
21FLA 20030184	6/27/1984	-	120	30	1.404	0.222
21FLA 20030185	6/27/1984	-	120	30.5	1.129	0.215
21FLA 20030186	6/27/1984	-	120	30.5	0.969	0.227
21FLA 20030187	6/27/1984	-	120	30.5	1.239	0.212
21FLA 20030188	6/27/1984	-	120	30	1.277	0.237
21FLSJWMDTL	10/8/1984	26.9973	70	24	1.195	0.072
21FLSJWMDTL	12/5/1984	-	70	16	0.935	0.062
21FLSJWMDTL	2/4/1985	18.2655	65	13.7	0.431	0.087
21FLSJWMDTL	4/1/1985	24.3243	60	22.9	1.145	0.149
21FLA 20030182	5/22/1985	-	80	26.2	0.69	0.14
21FLA 20030183	5/22/1985	-	70	28.2	0.77	0.099
21FLA 20030184	5/22/1985	-	70	28.4	1.32	0.099
21FLA 20030185	5/22/1985	-	80	28.5	0.81	0.122
21FLA 20030186	5/22/1985	-	70	26.3	1.1	0.122
21FLA 20030187	5/22/1985	-	80	27.2	1.11	0.134
21FLA 20030188	5/22/1985	-	120	26.7	1.71	0.264
21FLSJWMDTL	6/3/1985	19.51	55	29	1.095	0.101
21FLSJWMDTL	8/9/1985	-	65	28.5	1.925	0.138
21FLSJWMDTL	10/1/1985	40.6296	175	26.9	1.155	0.102
21FLSJWMDTL	12/3/1985	73.2402	150	21	1.893	0.116
21FLSJWMDTL	2/7/1986	30.2	175	16.1	1.09	0.085
21FLSJWMDTL	4/4/1986	12.8304	150	23	0.69	0.103
21FLSJWMDTL	6/6/1986	79.1208	100	28.5	1.755	0.145
21FLA 20030182	8/5/1986	16.02	160	30.5	0.873	0.234
21FLA 20030183	8/5/1986	8.01	120	30	0.91	0.315
21FLA 20030184	8/5/1986	48.06	200	31.5	2.67	0.441
21FLA 20030185	8/5/1986	22.43	160	30	1.19	0.806
21FLA 20030186	8/5/1986	38.27	200	30	2.06	0.374
21FLA 20030187	8/5/1986	50.91	240	30	3.34	0.848
21FLA 20030188	8/5/1986	35.85	260	30	1.64	0.348
21FLSJWMDTL	8/8/1986	38.9494	75	30	1.368	0.164
21FLA 20030630	9/22/1986	10.32	80	28	0.731	-
21FLSJWMDTL	10/6/1986	85.536	60	29.2	1.815	0.124
21FLA 20030630	10/13/1986	5.82	80	27	0.65	0.223
21FLSJWMDTL	12/1/1986	17.1072	60	21	1.2	0.121
21FLA 20030630	2/2/1987	2.67	80	13.1	0.96	0.158
21FLSJWMDTL	2/5/1987	15.7707	70	15.5	0.93	0.071
21FLDDPU20030630	2/11/1987	2.7	80	13.1	0.94	0.16

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLA 20030630	4/6/1987	10.84	120	14.5	1.198	0.132
21FLSJWMDTL	4/6/1987	16.038	125	16.5	1.003	0.088
21FLSJWMDTL	6/1/1987	40.095	150	28	1.12	0.07
21FLA 20030630	7/13/1987	46.06	-	-	-	-
21FLSJWMDTL	8/3/1987	45.9756	60	31	1.565	0.154
21FLSJWMDTL	11/5/1987	12.0285	60	23	1.43	0.103
21FLA 20030630	11/17/1987	-	80	19.5	0.667	0.02
21FLDDPU20030630	11/17/1987	-	80	19.5	0.74	0.02
21FLSJWMDTL	1/7/1988	16.038	55	12	1.66	0.146
21FLA 20030630	1/12/1988	-	80	11.1	0.789	0.01
21FLDDPU20030630	1/12/1988	-	80	11.1	0.79	0.01
21FLA 20030630	2/10/1988	-	140	12	1.03	0.08
21FLDDPU20030630	2/10/1988	-	140	12	1.03	0.08
21FLA 20030630	3/8/1988	-	120	17	1.008	0.06
21FLDDPU20030630	3/8/1988	-	120	16.8	1.1	0.05
21FLSJWMDTL	3/10/1988	20.5821	60	17.7	1.39	0.088
21FLA 20030630	4/26/1988	-	200	24.5	0.938	0.03
21FLDDPU20030630	4/26/1988	-	-	24.5	-	0.03
21FLSJWMDTL	5/6/1988	77.2497	100	21.5	2.055	0.086
21FLA 20030630	5/10/1988	-	160	23	1.35	0.04
21FLDDPU20030630	5/10/1988	-	-	23	-	0.04
21FLDDPU20030630	6/21/1988	-	110	27.6	0.85	0.09
21FLSJWMDTL	7/7/1988	37.42	120	27.5	1.538	0.061
21FLA 20030630	7/20/1988	-	100	30.2	0.8	0.09
21FLDDPU20030630	7/20/1988	-	100	30.2	0.85	0.09
21FLDDPU20030630	8/16/1988	-	80	29	0.85	0.09
21FLSJWMDTL	9/15/1988	52.6581	-	29.2	1.443	0.105
21FLDDPU20030630	9/20/1988	-	120	28	1.14	0.07
21FLDDPU20030630	10/18/1988	-	160	20.5	1.04	0.02
21FLDDPU20030630	11/15/1988	-	120	21	0.96	0.06
21FLSJWMDTL	11/16/1988	-	70	21.7	1.305	0.067
21FLSJWMDTL	1/5/1989	-	100	16.7	1.294	0.076
21FLDDPU20030630	1/17/1989	-	90	17	1.34	0.05
21FLDDPU20030630	2/14/1989	-	120	17.5	0.86	0.07
21FLDDPU20030630	3/14/1989	-	80	17	0.45	0.07
21FLSJWMDTL	3/15/1989	13.098	70	17.6	1.115	0.096
21FLDDPU20030630	4/17/1989		90	21	0.85	0.06
21FLSJWMDTL	5/4/1989	62.548	75	24.9	2.075	0.102
21FLDDPU20030630	5/16/1989	-	70	25.5	1.05	0.09
21FLDDPU20030630	6/12/1989	-	60	29.5	0.85	0.12
21FLDDPU20030630	7/10/1989	-	50	31	1.05	1.13
21FLSJWMDTL	7/14/1989	58.271	40	29.5	1.995	0.12
21FLDDPU20030630	8/14/1989	-	60	28	1.46	0.09
21FLDDPU20030630	9/11/1989	-	60	29	1.31	0.16
21FLSJWMDTL	9/13/1989	36.353	50	28.8	1.498	0.136
21FLDDPU20030630	10/9/1989	-	100	26	0.95	0.08

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLDDPU20030630	11/13/1989	-	100	20.5	1.04	0.09
21FLDDPU20030630	12/11/1989	-	80	13	1.037	0.08
21FLDDPU20030630	1/16/1990	-	-	13	-	-
21FLDDPU20030630	2/12/1990	-	60	18	-	0.1
21FLDDPU20030630	3/12/1990	-	60	19	-	0.1
21FLSJWMDTL	3/13/1990	-	50	20.7	1.155	-
21FLDDPU20030630	4/9/1990	-	-	20	-	0.1
21FLSJWMDTL	4/12/1990	17.642	40	20.4	1.175	0.066
21FLDDPU20030630	5/14/1990	-	-	25.5	-	0.1
21FLSJWMDTL	5/23/1990	36.086	50	26.6	1.485	0.146
21FLDDPU20030630	6/11/1990	-	-	28	1.24	0.1
21FLSJWMDTL	6/27/1990	59.341	50	28.7	2.241	-
21FLDDPU20030630	7/16/1990	-	-	27.5	1.5	0.1
21FLSJWMDTL	7/18/1990	58.36	60	28.7	1.786	0.122
21FLDDPU20030630	8/13/1990	-	-	29	1.58	0.17
21FLSJWMDTL	8/21/1990	19.78	55	30.4	1.314	0.131
21FLDDPU20030630	9/17/1990	-	-	30	1.49	0.14
21FLSJWMDTL	9/25/1990	161.182	50	25.7	2.405	0.146
21FLDDPU20030630	10/15/1990	-	-	26	1.52	0.1
21FLSJWMDTL	10/22/1990	126.7	60	24.9	2.245	0.18
21FLDDPU20030630	12/10/1990	-	-	13.5	1.18	0.12
21FLDDPU20030630	2/25/1991	-	-	16.5	1.27	0.1
21FLDDPU20030630	3/26/1991	-	-	21	1.32	0.01
21FLDDPU20030630	5/20/1991	-	-	27	1.34	0.1
21FLDDPU20030630	6/17/1991	-	-	27.5	1.91	0.1
21FLDDPU20030630	7/15/1991	-	-	28	1.48	0.1
21FLJXWQJAXSJR33	8/6/1991	-	-	29.11	1.47	0.03
21FLSJWMDTL	8/6/1991	-	150	30	2.188	0.082
21FLSJWMDTL	9/9/1991	63.083	70	29.2	1.035	0.057
21FLJXWQJAXSJR33	9/18/1991	-	-	29.31	1.54	0.15
21FLJXWQJAXSJR33	10/8/1991	-	-	22.43333	1.4	0.08
21FLSJWMDTL	10/9/1991	16.319	200	22.1	2.118	0.133
21FLJXWQJAXSJR33	11/5/1991	-	-	19.18667	0.99	0.1
21FLSJWMDTL	11/5/1991	25.394	150	18.7	1.386	0.078
21FLSJWMDTL	12/5/1991	25.394	150	15.6	1.387	0.086
21FLJXWQJAXSJR33	12/10/1991	-	-	17.94333	1.51	0.04
21FLJXWQJAXSJR33	1/14/1992	-	-	15.02333	1.52	0.11
21FLSJWMDTL	1/28/1992	10.692	150	13.2	1.598	0.036
21FLSJWMDTL	2/12/1992	15.771	125	14.3	1.104	0.056
21FLJXWQJAXSJR33	2/18/1992	-	-	15.90667	1.74	0.08
21FLSJWMDTL	3/11/1992	21.6515	140	17.7	2.1665	0.2685
21FLJXWQJAXSJR33	3/17/1992	-	-	16.34667	1.32	0.04
21FLSJWMDTL	4/1/1992	14.96	100	19.2	-	-
21FLJXWQJAXSJR33	4/21/1992	-	-	23.7	0.59	0.01
21FLSJWMDTL	4/23/1992	10.425	70	25	1.497	0.045
21FLSJWMDTL	5/11/1992	31.274	70	25.4	1.597	0.061

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLJXWQJAXSJR33	5/26/1992	-	-	25.49333	1.05	0.2
21FLSJWMDTL	6/10/1992	52.925	60	30	1.877	0.087
21FLJXWQJAXSJR33	6/16/1992	-	-	28.25667	0.66	0.06
21FLSJWMDTL	7/13/1992	35.016	60	31.7	1.717	0.11
21FLJXWQJAXSJR33	7/14/1992	-	-	30.58	1.51	0.15
21FLSJWMDTL	8/4/1992	35.751	50	30.4	-	0.064
21FLSJWMDTL	8/10/1992	29.93	60	29.9	1.527	0.1
21FLJXWQJAXSJR33	9/1/1992	-	-	28.72667	1.65	0.07
21FLSJWMDTL	9/2/1992	25.39	50	29.5	1.045	0.088
21FLJXWQJAXSJR33	10/13/1992	-	-	22.09	1.74	0.16
21FLSJWMDTL	10/14/1992	15.771		23.1	1.203	0.016
21FLSJWMDTL	11/9/1992	5.881	150	18.8	-	0.063
21FLJXWQJAXSJR33	11/17/1992	-	-	16.47667	1.26	0.08
21FLJXWQJAXSJR33	12/8/1992	-	-	15.17667	2.21	0.17
21FLSJWMDTL	12/17/1992	13.9	150	14.8	1.462	0.057
21FLJXWQJAXSJR33	1/12/1993	-	-	18.18333	1.14	0.14
21FLSJWMDTL	1/12/1993	5.969667	150	18.73333	1.339	0.069667
21FLJXWQJAXSJR33	2/9/1993	-	-	13.69	1.8	0.11
21FLSJWMDTL	2/10/1993	6.415	150	14	1.321	0.082
21FLJXWQJAXSJR33	3/9/1993	-	-	16.22667	1.05	0.1
21FLJXWQJAXSJR33	4/13/1993	-	-	20.24667	1.05	0.06
21FLSJWMDTL	4/19/1993	6.816	150	20.8	-	0.067
21FLJXWQJAXSJR33	5/11/1993	-	-	24.65333	0.9	0.05
21FLSJWMDTL	5/11/1993	11.494	100	25.1	-	0.064
21FLJXWQJAXSJR33	6/8/1993	-	-	29.44	1.98	0.09
21FLSJWMDTL	6/8/1993	-	100	-	-	0.097
21FLSJWMDTL	7/9/1993	30.2	60	31.1	-	0.103
21FLJXWQJAXSJR33	7/12/1993	-	-	29.48667	1	0.2
21FLSJWMDTL	8/10/1993	33.145	60	30.2	-	0.131
21FLJXWQJAXSJR33	8/17/1993	-	-	29.81333	1.12	0.14
21FLJXWQJAXSJR33	9/21/1993	-	-	29.36	6.47	0.08
21FLSJWMDTL	9/23/1993	36.085	50	31.2	1.987	0.132
21FLJXWQJAXSJR33	10/12/1993	-	-	24.86667	0.66	0.09
21FLSJWMDTL	10/28/1993	27.532	60	22.5	0.327	0.047
21FLJXWQJAXSJR33	11/2/1993	-	-	17.46	2.72	0.12
21FLSJWMDTL	11/16/1993	20.315	70	21.5	0.858	0.071
21FLJXWQJAXSJR33	12/7/1993	-	-	16.14667	0.93	0.1
21FLSJWMDTL	12/16/1993	20.315	70	13.57	0.881	0.064
21FLSJWMDTL	1/24/1994	21.919	70	10.5	-	0.085
21FLJXWQJAXSJR33	2/8/1994	-	-	14.48	0.89	0.04
21FLSJWMDTL	2/17/1994	26.463	70	16.9	1.574	0.088
21FLJXWQJAXSJR33	3/8/1994	-	-	17.97	1.36	0.02
21FLSJWMDTL	3/15/1994	15.503	70	18.4	1.173	0.089
21FLJXWQJAXSJR33	4/12/1994	-	-	23.57	1.12	0.05
21FLSJWMDTL	4/14/1994	11.494	70	23.5	-	0.08
21FLJXWQJAXSJR33	5/18/1994	-	-	27.6	0.33	0.08

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLSJWMDTL	5/25/1994	22.453	60	27.2	-	0.021
21FLJXWQJAXSJR33	6/14/1994	-	-	28.14	0.52	0.07
21FLSJWMDTL	6/20/1994	25.126	50	29.2	-	0.146
21FLJXWQJAXSJR33	7/12/1994	-	-	29.4	0.99	0.11
21FLSJWMDTL	7/14/1994	40.897	70	30.5	-	0.132
21FLJXWQJAXSJR33	8/9/1994	-	-	28.18	0.76	0.1
21FLSJWMDTL	8/18/1994	83.308	70	28.2	-	0.163
21FLSJWMDTL	9/15/1994	86.204	70	28.2	-	0.147
21FLJXWQJAXSJR33	9/21/1994	-	-	25.76	1.17	0.1
21FLJXWQJAXSJR33	10/12/1994	-	-	24.34	0.9135	0.085
21FLSJWMDTL	10/20/1994	23.255	150	24.2	1.891	0.134
21FLJXWQJAXSJR33	11/8/1994	-	-	-	1.576	0.11
21FLSJWMDTL	11/22/1994	6.683	200	21	1.69	0.1
21FLSJWMDTL	12/19/1994	5.079	275	15.2	1.646	0.0945
21FLJXWQJAXSJR33	1/18/1995	-	-	-	1.946	0.067
21FLSJWMDTL	1/26/1995	14.969	300	12	1.686	0.075
21FLSJWMDTL	2/16/1995	34.348	300	16.5	1.6695	0.1125
21FLJXWQJAXSJR33	2/22/1995	-	-	13.9425	2.352	0.0535
21FLJXWQJAXSJR33	3/14/1995	-	-	17.37667	0.884	0.0795
21FLSJWMDTL	3/16/1995	16.8395	250	19.3	1.618	0.076
21FLVOL SJR170	4/3/1995	-	-	20.5	-	-
21FLVOL SJR170	4/4/1995	-	-	20.5	-	-
21FLJXWQJAXSJR33	4/5/1995	-	-	20.86333	1.873	0.058
21FLVOL SJR170	4/11/1995	-	-	22.5	-	-
21FLVOL SJR170	4/12/1995	-	-	22.5	-	-
21FLSJWMDTL	4/13/1995	17.9	200	24.1	1.35	0.06
21FLVOL SJR170	4/17/1995	-	-	23.5	-	-
21FLVOL SJR170	4/24/1995	-	-	25	-	-
21FLVOL SJR170	5/1/1995	-	-	26	-	-
21FLJXWQJAXSJR33	5/9/1995	-	-	25.3625	0.721	0.036
21FLSJWMDTL	5/25/1995	84.1995	150	26.5	-	0.288
21FLVOL SJR170	6/14/1995	-	-	28.5	-	-
21FLSJWMDTL	6/15/1995	55.8655	100	28.1	-	0.085
21FLJXWQJAXSJR33	6/20/1995	-	-	28.07667	1.855	0.166
21FLVOL SJR170	6/29/1995	-	-	27.5	-	-
21FLJXWQJAXSJR33	7/11/1995	-	-	30.32667	1.085	0.018
21FLVOL SJR170	7/16/1995	-	-	29	-	-
21FLSJWMDTL	7/18/1995	62.281	60	30.33	-	0.079
21FLVOL SJR170	7/22/1995	-	-	29.5	-	-
21FLVOL SJR170	7/28/1995	-	-	29.5	-	-
21FLJXWQJAXSJR33	8/8/1995	-	-	29.725	1.07	0.042
21FLVOL SJR170	8/11/1995	-	-	29	-	-
21FLVOL SJR170	8/20/1995	-	-	28	-	-
21FLVOL SJR170	8/29/1995	-	-	27.5	-	-
21FLSJWMDTL	8/31/1995	39.872	110	28.1	1.557	0.0715
21FLJXWQJAXSJR33	9/12/1995	-	-	27.71875	0.753	0.061

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLSJWMDTL	9/14/1995	27.53	70	29.6	1.357	0.061
21FLVOL SJR170	9/28/1995	-	-	26	-	-
21FLVOL SJR170	10/2/1995	-	-	26	-	-
21FLVOL SJR170	10/12/1995	-	-	24.5	-	-
21FLJXWQJAXSJR33	10/16/1995	-	-	24.81	0.871	0.1115
21FLSJWMDTL	10/19/1995	44.1885	150	23.9	1.4625	0.0535
21FLVOL SJR170	10/19/1995	-	-	23.5	-	-
21FLVOL SJR170	10/23/1995	-	-	23.5	-	-
21FLVOL SJR170	10/31/1995	-	-	22.5	-	-
21FLJXWQJAXSJR33	11/14/1995	-	-	17.455	1.739	0.071
21FLSJWMDTL	11/20/1995	33.108	250	16	1.589	0.0945
21FLVOL SJR170	11/27/1995	-	-	15.5	-	-
21FLVOL SJR170	12/7/1995	-	-	18	-	-
21FLSJWMDTL	12/11/1995	20.4255	150	14.7	1.5325	0.087
21FLJXWQJAXSJR33	12/12/1995	-	-	-	-	-
21FLJXWQJAXSJR33	12/13/1995	-	-	13.9525	1.231	0.104
21FLSJWMDTL	1/18/1996	15.6195	150	13.25	1.8565	0.084
21FLVOL SJR170	1/24/1996	-	-	15	-	-
21FLVOL SJR170	1/31/1996	-	-	15.5	-	-
21FLJXWQJAXSJR33	2/13/1996	-	-	12.82333	1.116	0.07
21FLSJWMDTL	2/15/1996	17.4885	100	14.7	2.066	0.1155
21FLSJWMDTL	3/12/1996	31.3725	100	12.1	1.609	0.096
21FLJXWQJAXSJR33	3/14/1996	-	-	13.015	0.984	0.062
21FLJXWQJAXSJR33	4/10/1996	-	-	18.5675	0.722	0.043
21FLSJWMDTL	4/18/1996	13.617	100	21.7	1.677	0.05
21FLJXWQJAXSJR33	5/14/1996	-	-	26.77	0.68	0.057
21FLSJWMDTL	5/16/1996	27.3675	100	27.6	-	0.086
21FLJXWQJAXSJR33	6/11/1996	-	-	26.9	1.328	0.39
21FLSJWMDTL	6/13/1996	45.39	80	29.7	-	0.085
21FLJXWQJAXSJR33	7/9/1996	-	-	27.50333	1.1505	0.0245
21FLJXWQJAXSJR33	8/20/1996	-	-	29.10333	0.559	0.069
21FLSJWMDTL	8/20/1996	-	60	29.2	1.9995	0.115
21FLJXWQJAXSJR33	9/10/1996	-	-	28.88667	0.877	0.046
21FLSJWMDTL	9/19/1996	44.945	60	28	-	-
21FLKWATCLA-DOCTORS-1	10/16/1996	-	-	-	0.99	0.053
21FLKWATCLA-DOCTORS-2	10/16/1996	-	-	-	1.02	0.055
21FLKWATCLA-DOCTORS-3	10/16/1996	-	-	-	0.97	0.048
21FLSJWMDTL	10/16/1996	29.37	100	23.2	1.455	0.088
21FLJXWQJAXSJR33	11/5/1996	-	-	21.21	0.348	0.058
21FLKWATCLA-DOCTORS-1	11/21/1996	-	-	-	0.9	0.047
21FLKWATCLA-DOCTORS-2	11/21/1996	-	-	-	0.9	0.052
21FLKWATCLA-DOCTORS-3	11/21/1996	-	-	-	0.84	0.055
21FLSJWMDTL	11/21/1996	19.758	100	19.2	-	0.049
21FLSJWMDTL	11/25/1996	19.6245	100	18.6	1.7645	0.0655
21FLJXWQJAXSJR33	12/3/1996	-	-	16.98667	1.11	0.059
21FLKWATCLA-DOCTORS-1	12/21/1996	-	-	-	0.72	0.042

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLKWATCLA-DOCTORS-2	12/21/1996	-	-	-	0.67	0.045
21FLKWATCLA-DOCTORS-3	12/21/1996	-	-	-	0.8	0.042
21FLSJWMDTL	12/30/1996	25.098	80	17.67	1.367	0.032
21FLSJWMDTL	1/16/1997	21.627	80	15.8	0.952	0.06
21FLSJWMDTL	1/30/1997	25.365	70	14.94	1.465	0.063
21FLKWATCLA-DOCTORS-1	2/1/1997	-	-	-	0.92	0.051
21FLKWATCLA-DOCTORS-2	2/1/1997	-	-	-	0.96	0.061
21FLKWATCLA-DOCTORS-3	2/1/1997	-	-	-	0.76	0.043
21FLSJWMDTL	2/13/1997	15.486	60	15.6	1.405	0.057
21FLSJWMDTL	2/26/1997	17.355	60	18.46	1.258	0.064
21FLSJWMDTL	3/25/1997	14.351	70	21.5	1.383	0.079
21FLSJWMDTL	3/26/1997	16.02	60	22.09	-	0.065
21FLKWATCLA-DOCTORS-1	4/6/1997	-	-	-	0.91	0.054
21FLKWATCLA-DOCTORS-2	4/6/1997	-	-	-	0.88	0.061
21FLKWATCLA-DOCTORS-3	4/6/1997	-	-	-	0.93	0.058
21FLSJWMDTL	4/17/1997	33.375	70	21.8	1.307	0.083
21FLSJWMDTL	4/30/1997	20.025	70	-	1.217	0.077
21FLKWATCLA-DOCTORS-1	5/2/1997	-	-	-	1.05	0.053
21FLKWATCLA-DOCTORS-2	5/2/1997	-	-	-	0.95	0.06
21FLKWATCLA-DOCTORS-3	5/2/1997	-	-	-	0.8	0.054
21FLSJWMDTL	5/15/1997	42.34925	100	25.5	2.167	0.101333
21FLSJWMDTL	5/28/1997	34.71	80	26.2	1.737	0.123
21FLSJWMDTL	6/12/1997	34.888	70	25.2	1.441	0.095
21FLSJWMDTL	6/21/1997	-	60	30.4	1.8035	0.126
21FLKWATCLA-DOCTORS-1	6/24/1997	-	-	-	1.12	0.076
21FLKWATCLA-DOCTORS-2	6/24/1997	-	-	-	1	0.092
21FLKWATCLA-DOCTORS-3	6/24/1997	-	-	-	1.11	0.085
21FLSJWMDTL	6/25/1997	54.06775	70	30.81	1.727	0.098
21FLSJWMDTL	7/10/1997	55.269	70	30.8	1.987	0.121
21FLKWATCLA-DOCTORS-1	7/19/1997	-	-	-	1.65	0.166
21FLKWATCLA-DOCTORS-2	7/19/1997	-	-	-	1.83	0.146
21FLKWATCLA-DOCTORS-3	7/19/1997	-	-	-	1.7	0.136
21FLSJWMDTL	7/23/1997	112.8075	70	30.83	2.247	0.1675
21FLSJWMDTL	8/20/1997	44.5	60	30.61	1.637	0.107
21FLSJWMDTL	9/18/1997	58.8201	70	28.9	1.4635	0.1102
21FLSJWMDTL	9/25/1997	73.75888	70	29.43	1.807	0.118
21FLSJWMSAVDRLKI	10/7/1997	43.32088	70	26.62	1.577	0.102
21FLSJWMSAVDRLKO	10/7/1997	40.05	70	26.59	1.367	0.105
21FLSJWMSAVDRLKI	10/21/1997	35.11075	60	25.75	1.487	0.07
21FLSJWMSAVDRLKO	10/21/1997	27.70138	60	22.91	1.627	0.0725
21FLSJWMDTL	10/23/1997	28.32417	60	20.7	1.643333	0.073667
21FLSJWMDTL	10/28/1997	29.637	60	21.51	1.487	0.073
21FLSJWMSAVDRLKI	11/5/1997	19.32407	60	19.62	1.437	0.052
21FLSJWMSAVDRLKO	11/5/1997	18.34295	50	19.87	1.247	0.05
21FLSJWMSAVDRLKI	11/19/1997	14.2579	50	16.17	1.317	0.085
21FLSJWMSAVDRLKO	11/19/1997	22.46119	50	16.21	1.207	0.102

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLSJWMDTL	11/24/1997	18.72386	54	17.375	1.487	0.0588
21FLSJWMSAVDRLKI	12/3/1997	17.59515	60	19.29	1.254	0.055
21FLSJWMSAVDRLKO	12/3/1997	19.224	50	18.39	1.637	0.04
21FLSJWMSAVDRLKI	12/16/1997	14.38482	80	12.69	1.529	0.057
21FLSJWMSAVDRLKO	12/16/1997	15.58607	60	12.62	1.527	0.058
21FLSJWMDTL	12/18/1997	11.44098	90	11.8	1.534	0.057
21FLKWATCLA-DOCTORS-1	12/21/1997	-	-	-	0.88	0.042
21FLKWATCLA-DOCTORS-2	12/21/1997	-	-	-	0.92	0.05
21FLKWATCLA-DOCTORS-3	12/21/1997	-	-	-	0.93	0.051
21FLSJWMDTL	12/22/1997	22.4812	80	14.89	1.315	0.027
21FLSJWMSAVDRLKI	1/7/1998	14.98519	100	17.73	0.973	0.037
21FLSJWMSAVDRLKO	1/7/1998	14.3111	100	16.34	0.953	0.026
21FLSJWMSAVDRLKI	1/21/1998	30.9188	100	14.8	1.18	0.062
21FLSJWMSAVDRLKO	1/21/1998	37.42475	100	15.23	1.418	0.069
21FLSJWMDTL	1/22/1998	24.48395	150	15.4	1.349	0.053
21FLSJWMDTL	2/2/1998	44.61585	150	14.68	1.882	0.102
21FLSJWMSAVDRLKI	2/4/1998	53.667	150	13.99	2.65	0.198
21FLSJWMSAVDRLKO	2/4/1998	39.91675	150	14.95	2.052	0.112
21FLSJWMSAVDRLKI	2/19/1998	17.12119	200	21	1.005	0.115
21FLSJWMSAVDRLKO	2/19/1998	19.5979	200	21	1.002	0.068
21FLSJWMDTL	2/23/1998	17.3817	150	16.71	1.503	0.053
21FLSJWMDTL	2/25/1998	14.81875	150	16.7	1.367	0.061
21FLSJWMSAVDRLKI	3/4/1998	16.0732	150	18.72	1.377	0.059
21FLSJWMSAVDRLKO	3/4/1998	24.63088	150	17.33	1.4595	0.0585
21FLSJWMSAVDRLKI	3/19/1998	22.5349	150	19.87	1.357	0.064
21FLSJWMSAVDRLKO	3/19/1998	22.5349	150	19.51	1.327	0.058
21FLSJWMDTL	3/26/1998	17.60858	250	19.2	1.097	0.072
21FLKWATCLA-DOCTORS-1	3/27/1998	-	-	-	0.9	0.045
21FLKWATCLA-DOCTORS-2	3/27/1998	-	-	-	0.97	0.053
21FLKWATCLA-DOCTORS-3	3/27/1998	-	-	-	0.85	0.041
21FLSJWMDTL	4/2/1998	24.04335	150	24.67	1.377	0.051
21FLSJWMSAVDRLKI	4/7/1998	22.117	150	24.5	-	0.117
21FLSJWMSAVDRLKO	4/7/1998	28.5025	150	23.9	-	0.079
21FLSJWMDTL	4/20/1998	-	-	25.385	1.292	0.078
21FLSJWMSAVDRLKI	4/20/1998	-	-	26.17	1.327	0.079
21FLSJWMSAVDRLKI	4/21/1998	21.67175	150	25.48	1.487	0.093
21FLSJWMSAVDRLKO	4/21/1998	22.82875	150	25.41	1.322	0.062
21FLSJWMDTL	4/23/1998	24.39707	150	22.2	1.517	0.084
21FLSJWMDTL	5/6/1998	-	-	25	1.397	0.0685
21FLSJWMSAVDRLKI	5/6/1998	42.67575	150	26.795	1.722	0.0715
21FLSJWMSAVDRLKO	5/6/1998	44.09975	150	27.68	1.317	0.064
21FLSJWMDTL	5/13/1998	-	-	26.9	2.147	0.084
21FLSJWMSAVDRLKI	5/13/1998	-	-	28.7	1.807	0.085
21FLKWATCLA-DOCTORS-1	5/17/1998	-	-	-	1.15	0.064
21FLKWATCLA-DOCTORS-2	5/17/1998	-	-	-	1.18	0.063
21FLKWATCLA-DOCTORS-3	5/17/1998	-	-	-	0.96	0.056

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLSJWMDTL	5/20/1998	-	-	27.4	1.547	0.073
21FLSJWMSAVDRLKI	5/20/1998	-	-	30.5	1.547	0.059
21FLSJWMSAVDRLKI	5/21/1998	33.74893	150	27.12	1.567	0.053
21FLSJWMSAVDRLKO	5/21/1998	40.851	150	28.16	1.657	0.052
21FLSJWMDTL	5/26/1998	33.51737	150	29.7	1.622	0.063333
21FLSJWMDTL	5/27/1998	-	-	29.01	1.827	0.102
21FLSJWMSAVDRLKI	5/27/1998	-	-	29.09	1.747	0.076
21FLSJWMDTL	6/1/1998	42.59993	150	29.42	1.692	0.0725
21FLSJWMSAVDRLKI	6/2/1998	55.269	150	33.19	2.147	0.115
21FLSJWMSAVDRLKO	6/2/1998	54.6905	150	31.1	1.947	0.088
21FLSJWMDTL	6/3/1998	-	-	29.84	1.721667	0.098
21FLSJWMSAVDRLKI	6/3/1998	-	-	30.94	1.877	0.093
21FLSJWMDTL	6/10/1998	-	-	28.14	1.331	0.092
21FLSJWMSAVDRLKI	6/10/1998	-	-	29.07	1.262	0.102
21FLSJWMDTL	6/11/1998	54.38345	150	-	1.757	0.111
21FLSJWMDTL	6/17/1998	-	-	29.57	1.737	0.102
21FLSJWMSAVDRLKI	6/17/1998	37.60275	100	31.335	1.737	0.0945
21FLSJWMSAVDRLKO	6/17/1998	33.82	100	30.83	1.527	0.1
21FLSJWMDTL	6/24/1998	-	-	30.33	1.043	0.095
21FLSJWMSAVDRLKI	6/24/1998	-	-	32.34	1.225	0.101
21FLSJWMDTL	6/30/1998	48.01575	100	31.43	1.667	0.09
21FLSJWMDTL	7/1/1998	-	-	30.39	1.727	0.076
21FLSJWMSAVDRLKI	7/1/1998	-	-	31.71	2.117	0.093
21FLSJWMDTL	7/8/1998	-	-	31.45	1.317	0.069
21FLSJWMSAVDRLKI	7/8/1998	50.32975	80	31.8	1.622	0.1715
21FLSJWMSAVDRLKO	7/8/1998	39.72743	80	31.58	1.527	0.2625
21FLSJWMDTL	7/15/1998	-	-	29.69	2.277	0.029
21FLSJWMSAVDRLKI	7/15/1998	-	-	30.3	1.767	0.123
21FLSJWMDTL	7/22/1998	-	-	30.31	1.567	0.082
21FLSJWMSAVDRLKI	7/22/1998	-	-	30.16	1.797	0.08
21FLSJWMDTL	7/28/1998	48.238	60	30.6	1.727	0.086
21FLSJWMDTL	7/29/1998	-	-	30.67	1.587	0.082
21FLSJWMSAVDRLKI	7/29/1998	49.128	60	32.295	1.687	0.078
21FLSJWMSAVDRLKO	7/29/1998	44.6422	60	31.85	1.237	0.072
21FLKWATCLA-DOCTORS-1	7/30/1998	-	-	-	1.41	0.079
21FLKWATCLA-DOCTORS-2	7/30/1998	-	-	-	1.15	0.073
21FLKWATCLA-DOCTORS-3	7/30/1998	-	-	-	1.33	0.067
21FLSJWMDTL	8/3/1998	36.11193	60	28.38	1.499	0.077
21FLSJWMDTL	8/5/1998	-	-	28.5	1.707	0.082
21FLSJWMSAVDRLKI	8/5/1998	-	-	27.7	1.917	0.094
21FLSJWMDTL	8/12/1998	-	-	30.2	1.647	0.07
21FLSJWMSAVDRLKI	8/12/1998	55.6429	60	31.09	1.732	0.096
21FLSJWMSAVDRLKO	8/12/1998	52.7591	60	29.9	1.597	0.095
21FLSJWMDTL	8/19/1998	-	-	29.61	1.157	0.046
21FLSJWMSAVDRLKI	8/19/1998	-	-	29.33	1.587	0.05
21FLSJWMDTL	8/20/1998	54.25413	70	29.2	1.677	0.081

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLSJWMDTL	8/24/1998	59.007	70	30.28	1.807	0.095
21FLSJWMDTL	8/26/1998	-	-	29.39	1.877	0.113
21FLSJWMSAVDRLKI	8/26/1998	-	-	30.2	1.667	0.085
21FLSJWMSAVDRLKI	8/27/1998	58.206	100	32.53	1.727	0.077
21FLSJWMSAVDRLKO	8/27/1998	49.88475	70	31.02	1.167	0.041
21FLKWATCLA-DOCTORS-1	9/1/1998	-	-	-	1.26	0.092
21FLKWATCLA-DOCTORS-2	9/1/1998	-	-	-	1.78	0.157
21FLKWATCLA-DOCTORS-3	9/1/1998	-	-	-	1.15	0.091
21FLSJWMDTL	9/2/1998	-	-	29.64	1.507	0.346
21FLSJWMSAVDRLKI	9/2/1998	-	-	29.99	1.567	0.072
21FLSJWMDTL	9/9/1998	-	-	28.35	1.487	0.085
21FLSJWMSAVDRLKI	9/9/1998	-	-	28.45	1.457	0.078
21FLSJWMDTL	9/10/1998	68.36987	66.66667	26.8	1.897	0.129
21FLSJWMDTL	9/16/1998			27.74	1.617	0.102
21FLSJWMSAVDRLKI	9/16/1998	64.347	70	28.265	1.532	0.075
21FLSJWMSAVDRLKO	9/16/1998	60.6759	70	28.59	1.157	0.085
21FLKWATCLA-DOCTORS-1	9/21/1998	-	-	-	1.27	0.085
21FLKWATCLA-DOCTORS-2	9/21/1998	-	-	-	1.31	0.099
21FLKWATCLA-DOCTORS-3	9/21/1998	-	-	-	1.19	0.092
21FLSJWMDTL	9/22/1998	40.27275	70	27.66333	1.857	0.107
21FLSJWMDTL	9/23/1998	-	-	28.32	1.698	0.096
21FLSJWMSAVDRLKI	9/23/1998	-	-	28.60333	1.681	0.099
21FLSJWMDTL	9/30/1998	-	-	27.922	1.827	0.114
21FLSJWMSAVDRLKI	9/30/1998	35.333	150	27.44	1.625667	0.107
21FLSJWMSAVDRLKO	9/30/1998	46.4135	100	27.51	1.643667	0.112
21FLSJWMDTL	10/7/1998	-	-	28.75	-	0.087
21FLSJWMSAVDRLKI	10/7/1998	-	-	29.08	-	0.081
21FLSJWMSAVDRLKI	10/8/1998	41.4382	80	28.96	1.497	0.105
21FLSJWMSAVDRLKO	10/8/1998	37.40685	80	30.1	1.537	0.099
21FLSJWMDTL	10/13/1998	37.647	100	27.6	1.687	0.103
21FLSJWMDTL	10/14/1998	-	-	28.6	-	0.07
21FLSJWMSAVDRLKI	10/14/1998	-	-	28.39	-	0.059
21FLSJWMSAVDRLKI	10/21/1998	32.3602	80	26.2	2.107	0.05
21FLSJWMSAVDRLKO	10/21/1998	31.6661	80	26.37	2.127	0.049
21FLKWATCLA-DOCTORS-1	10/26/1998	-	-	-	1.19	0.081
21FLKWATCLA-DOCTORS-2	10/26/1998	-	-	-	1.21	0.083
21FLKWATCLA-DOCTORS-3	10/26/1998	-	-	-	1.02	0.078
21FLSJWMDTL	10/28/1998	32.80293	100	22.9975	1.197	0.065
21FLSJWMSAVDRLKI	11/3/1998	27.26719	80	23.27	1.947	0.113
21FLSJWMSAVDRLKO	11/3/1998	31.10575	75	23.37	1.467	0.0655
21FLSJWMDTL	11/12/1998	30.9188	80	22.9	1.807	0.11
21FLSJWMSAVDRLKI	11/16/1998	31.97313	70	22.47	1.437	0.089
21FLSJWMSAVDRLKO	11/16/1998	35.64475	70	23.2	1.527	0.089
21FLSJWMDTL	11/24/1998	37.38	70	22.36	1.277	0.093
21FLSJWMSAVDRLKI	12/1/1998	27.01175	70	23.37	1.657	0.074
21FLSJWMSAVDRLKO	12/1/1998	24.25275	60	22.88	1.417	0.054

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLKWATCLA-DOCTORS-1	12/6/1998	-	-	-	0.97	0.069
21FLKWATCLA-DOCTORS-2	12/6/1998	-	-	-	1.07	0.073
21FLKWATCLA-DOCTORS-3	12/6/1998	-	-	-	0.88	0.06
21FLSJWMDTL	12/8/1998	26.166	70	23.1	1.587	0.076
21FLKWATCLA-DOCTORS-1	12/20/1998	-	-	-	0.86	0.066
21FLKWATCLA-DOCTORS-2	12/20/1998	-	-	-	0.97	0.074
21FLKWATCLA-DOCTORS-3	12/20/1998	-	-	-	1.02	0.062
21FLSJWMDTL	12/28/1998	33.95375	70	15.48333	1.847	0.085
21FLSJWMSAVDRLKI	1/6/1999	20.737	80	10.46	1.487	0.07
21FLSJWMSAVDRLKO	1/6/1999	24.98688	70	11.73	1.487	0.075
21FLJXWQJAXSJR33	1/12/1999		100	11.7975	0.536	-
21FLSJWMDTL	1/14/1999	21.11087	73.33333	14.9	1.502	-
21FLSJWMSAVDRLKI	1/20/1999	24.3502	70	16.27	1.227	0.074
21FLSJWMSAVDRLKO	1/20/1999	22.9088	60	16.54	1.587	0.07
21FLSJWMDTL	1/27/1999	22.29475	60	19.37	1.377	0.085
21FLKWATCLA-DOCTORS-1	2/1/1999	-	-	-	1.11	0.08
21FLKWATCLA-DOCTORS-2	2/1/1999	-	-	-	0.93	0.066
21FLKWATCLA-DOCTORS-3	2/1/1999	-	-	-	1.02	0.077
21FLSJWMSAVDRLKI	2/2/1999	-	70	19.67	3.597	0.314
21FLSJWMSAVDRLKO	2/2/1999	22.6418	70	19.42	1.827	0.091
21FLJXWQJAXSJR33	2/10/1999	-	100	19.8475	0.463	-
21FLSJWMDTL	2/11/1999	26.3798	60	20.7	1.477	0.068
21FLSJWMSAVDRLKI	2/17/1999	17.9959	80	16.65	1.467	0.07
21FLSJWMSAVDRLKO	2/17/1999	17.622	70	16.48	1.337	0.066
21FLSJWMDTL	2/24/1999	22.3211	60	14.57667	1.387	0.082
21FLSJWMSAVDRLKI	3/3/1999	35.91175	70	17.22	2.237	0.155
21FLSJWMSAVDRLKO	3/3/1999	25.56513	60	16.65	1.361	0.077
21FLJXWQJAXSJR33	3/10/1999	-	100	16.15333	0.565	-
21FLSJWMDTL	3/11/1999	-	60	19.1	1.467	0.076
21FLKWATCLA-DOCTORS-1	3/14/1999	-	-	-	0.99	0.061
21FLKWATCLA-DOCTORS-2	3/14/1999	-	-	-	1.24	0.08
21FLKWATCLA-DOCTORS-3	3/14/1999	-	-	-	1.05	0.065
21FLSJWMSAVDRLKI	3/17/1999	20.559	70	17.46	1.227	0.058
21FLSJWMSAVDRLKO	3/17/1999	19.87222	60	17.29	1.147	0.052
21FLSJWMDTL	3/30/1999	16.732	60	20.97	1.457	0.071
21FLKWATCLA-DOCTORS-1	4/4/1999	-	-	-	1.02	0.044
21FLKWATCLA-DOCTORS-2	4/4/1999	-	-	-	1	0.052
21FLKWATCLA-DOCTORS-3	4/4/1999	-	-	-	1.04	0.041
21FLSJWMDTL	4/7/1999	-	-	25.56	-	0.071
21FLSJWMSAVDRLKI	4/7/1999	-	-	26.36	-	0.068
21FLSJWMSAVDRLKI	4/12/1999	25.187	60	26.7	1.407	0.07
21FLSJWMSAVDRLKO	4/12/1999	30.1178	60	26.02	1.367	0.068
21FLSJWMDTL	4/14/1999	-	-	24.04	-	0.075
21FLSJWMSAVDRLKI	4/14/1999	-	-	24.88	-	0.07
21FLJXWQJAXSJR33	4/20/1999	-	80	19.8575	0.908	-
21FLSJWMDTL	4/21/1999	-	-	22.93	-	0.073

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLSJWMSAVDRLKI	4/21/1999	-	-	23.67	-	0.062
21FLSJWMDTL	4/26/1999	33.4282	60	25.2	1.287	0.081
21FLSJWMDTL	4/28/1999	-	-	27.48	-	0.078
21FLSJWMSAVDRLKI	4/28/1999	43.74375	60	27.15667	1.347	0.071
21FLSJWMSAVDRLKO	4/28/1999	36.89075	60	26.08	1.287	0.06
21FLSJWMDTL	4/29/1999	42.453	50	25.24333	1.887	0.1
21FLKWATCLA-DOCTORS-1	5/2/1999	-	-	-	1.13	0.069
21FLKWATCLA-DOCTORS-2	5/2/1999	-	-	-	0.99	0.059
21FLKWATCLA-DOCTORS-3	5/2/1999	-	-	-	0.98	0.066
21FLSJWMDTL	5/5/1999	-	-	21.96	-	0.088
21FLSJWMSAVDRLKI	5/5/1999	-	-	22.66	-	0.084
21FLSJWMSAVDRLKI	5/11/1999	16.74095	50	26.23	1.527	0.087
21FLSJWMSAVDRLKO	5/11/1999	16.20695	50	26.27	1.417	0.078
21FLJXWQJAXSJR33	5/12/1999	-	60	25.1675	0.89	-
21FLSJWMDTL	5/12/1999	-	-	27.17	-	0.087
21FLSJWMSAVDRLKI	5/12/1999	-	-	27.68	-	0.097
21FLSJWMDTL	5/13/1999	16.06475	50	27	1.557	0.074
21FLSJWMDTL	5/19/1999	-	-	26.49	1.305	0.088
21FLSJWMSAVDRLKI	5/19/1999	-	-	27.42	-	0.085
21FLSJWMSAVDRLKI	5/21/1999	21.093	50	26.26	1.787	0.066
21FLSJWMSAVDRLKO	5/21/1999	23.7098	50	26.49	1.727	0.068
21FLSJWMDTL	5/26/1999	-	-	27.97	-	0.097
21FLSJWMSAVDRLKI	5/26/1999	-	-	28.94	-	0.089
21FLSJWMDTL	5/27/1999	19.7847	50	27.74	1.492	0.0945
21FLSJWMDTL	6/2/1999	-	-	28.21	-	0.103
21FLSJWMSAVDRLKI	6/2/1999	-	-	28.09	-	0.1
21FLSJWMDTL	6/9/1999	-	-	28.71	-	0.131
21FLSJWMSAVDRLKI	6/9/1999	-	-	29.25	-	0.151
21FLKWATCLA-DOCTORS-1	6/10/1999	-	-	-	2.27	0.113
21FLKWATCLA-DOCTORS-2	6/10/1999	-	-	-	2.21	0.114
21FLKWATCLA-DOCTORS-3	6/10/1999	-	-	-	2.27	0.105
21FLSJWMSAVDRLKI	6/15/1999	37.1662	50	29.66	1.617	0.117
21FLSJWMSAVDRLKO	6/15/1999	29.9572	50	30.38	1.518	0.111
21FLSJWMDTL	6/16/1999	-	-	31.17	-	0.145
21FLSJWMSAVDRLKI	6/16/1999	-	-	30.18	-	0.108
21FLSJWMSAVDRLKI	6/21/1999	25.365	50	26.68	1.587	0.105
21FLSJWMSAVDRLKO	6/21/1999	26.0325	50	27.11	1.737	0.1225
21FLSJWMDTL	6/23/1999	-	-	29.19	-	0.143
21FLSJWMSAVDRLKI	6/23/1999	-	-	29.38	-	0.188
21FLSJWMDTL	6/29/1999	42.63214	50	27.556	1.7	0.1405
21FLJXWQJAXSJR33	6/30/1999	-	60	25	0.95	-
21FLSJWMDTL	6/30/1999	-	-	26.87	-	0.1315
21FLSJWMSAVDRLKI	6/30/1999	-	-	27.35	-	0.113
21FLSJWMSAVDRLKI	7/6/1999	120.7909	50	34.2	2.757	0.154
21FLSJWMSAVDRLKO	7/6/1999	45.8708	50	32.47	1.557	0.107
21FLSJWMDTL	7/7/1999	-	-	29.83	-	0.129

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLSJWMSAVDRLKI	7/7/1999	-	50	29.47231	-	0.159
21FLKWATCLA-DOCTORS-1	7/13/1999	-	-	-	1.67	0.071
21FLKWATCLA-DOCTORS-2	7/13/1999	-	-	-	1.75	0.089
21FLKWATCLA-DOCTORS-3	7/13/1999	-	-	-	1.65	0.084
21FLJXWQJAXSJR33	7/14/1999	-	80	29.1225	0.89	-
21FLSJWMDTL	7/14/1999	-	-	31.49	1.87	0.116
21FLSJWMSAVDRLKI	7/14/1999	-	-	32.7	1.427	0.096
21FLSJWMSAVDRLKI	7/20/1999	20.15875	50	31.41	1.46	0.085
21FLSJWMSAVDRLKO	7/20/1999	8.610625	50	31.64	1.372	0.0765
21FLSJWMDTL	7/21/1999	31.47617	40	32.1	1.797667	0.118
21FLSJWMSAVDRLKI	7/21/1999	-	-	-	-	0.09
21FLSJWMDTL	7/27/1999	22.29475	50	32.28333	1.337	0.089
21FLSJWMDTL	7/28/1999	-	-	32.66	-	0.11
21FLSJWMSAVDRLKI	7/28/1999	-	-	33.3	-	0.076
21FLSJWMSAVDRLKI	8/3/1999	16.1801	40	32.75	1.387	0.082
21FLSJWMSAVDRLKO	8/3/1999	17.2481	40	32.38	1.477	0.079
21FLSJWMDTL	8/4/1999	-	-	30.2	-	0.103
21FLSJWMSAVDRLKI	8/4/1999	-	-	30.15	-	0.095
21FLSJWMDTL	8/11/1999	-	-	29.34	-	0.139
21FLSJWMSAVDRLKI	8/11/1999	-	-	30.23	1.749	0.114
21FLSJWMDTL	8/12/1999	20.78793	50	30.4	1.357	0.141
21FLSJWMSAVDRLKI	8/16/1999	9.90585	50	31.41	1.327	0.173
21FLSJWMSAVDRLKO	8/16/1999	5.95405	50	31.2	1.497	0.127
21FLJXWQJAXSJR33	8/17/1999	-	50	31.185	0.83	-
21FLSJWMDTL	8/18/1999	-	-	30.49	-	0.102
21FLSJWMSAVDRLKI	8/18/1999	-	-	32.15	-	0.12
21FLSJWMSAVDRLKO	8/18/1999	19.14395	50	-	-	-
21FLSJWMDTL	8/25/1999	-	-	30.76	1.378	0.142
21FLSJWMSAVDRLKI	8/25/1999	-	-	31.33	-	0.173
21FLSJWMDTL	8/26/1999	24.6709	60	30.36667	1.307	0.171
21FLSJWMDTL	9/1/1999	-	-	29.39	1.681	0.192
21FLSJWMSAVDRLKI	9/1/1999	-	-	29.94	1.993	0.221
21FLSJWMDTL	9/8/1999	14.44485	50	29.49	1.3235	0.17225
21FLSJWMSAVDRLKI	9/8/1999	-	-	29.74	1.621	0.181
21FLSJWMDTL	9/22/1999	-	-	25.73	1.702	0.1555
21FLSJWMSAVDRLKI	9/22/1999	-	-	25.68	1.641	0.163
21FLSJWMDTL	9/23/1999	16.47395	60	24.85	1.712	0.191
21FLKWATCLA-DOCTORS-1	9/28/1999	-	-	-	2.23	0.132
21FLKWATCLA-DOCTORS-2	9/28/1999	-	-	-	2.29	0.131
21FLKWATCLA-DOCTORS-3	9/28/1999	-	-	-	2.02	0.113
21FLSJWMDTL	9/29/1999	-	-	28.42	1.636	0.148
21FLSJWMSAVDRLKI	9/29/1999	-	-	28.67	1.869	0.158
21FLSJWMSAVDRLKI	10/5/1999	16.63405	80	26.21	1.284	0.139
21FLSJWMSAVDRLKO	10/5/1999	14.92515	70	26.54	1.396	0.148
21FLJXWQJAXSJR33	10/13/1999	-	80	26.1875	1.63	-
21FLSJWMDTL	10/13/1999	17.75575	80	27.29	1.476	0.127

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLSJWMSAVDRLKI	10/19/1999	4.46412	100	25.51	1.429	0.133
21FLSJWMSAVDRLKO	10/19/1999	12.87721	150	24.51	1.52	0.139
21FLSJWMDTL	10/26/1999	10.38098	70	20.4025	1.49	0.131
21FLSJWMSAVDRLKI	11/2/1999	25.83213	80	23.24	1.919	0.142
21FLSJWMSAVDRLKO	11/2/1999	3.085093	80	22.77	1.68	0.113
21FLJXWQJAXSJR33	11/8/1999	-	60	21.2475	1.04	-
21FLSJWMDTL	11/10/1999	22.23446	70	21.83	1.269	0.085
21FLSJWMSAVDRLKI	11/15/1999	9.84698	70	21.36	1.255	0.104
21FLSJWMSAVDRLKO	11/15/1999	12.79716	70	21.2	1.181	0.099
21FLSJWMSAVDRLKO	11/16/1999	7.168975	70	20.28	-	-
21FLSJWMDTL	11/22/1999	-	80	19.13667	1.157	0.097
21FLKWATCLA-DOCTORS-1	11/25/1999	-	-	-	1.13	0.106
21FLKWATCLA-DOCTORS-2	11/25/1999	-	-	-	0.98	0.091
21FLKWATCLA-DOCTORS-3	11/25/1999	-	-	-	1.03	0.094
21FLJXWQJAXSJR33	12/1/1999	-	-	15.4425	0.79	-
21FLSJWMSAVDRLKI	12/1/1999	3.804875	80	16.57	1.19	0.111
21FLSJWMSAVDRLKO	12/1/1999	6.39331	80	16.48	1.241	0.114
21FLSJWMDTL	12/7/1999	6.79224	150	16.71	1.374	0.109
21FLKWATCLA-DOCTORS-1	12/15/1999	-	-	-	0.9	0.123
21FLKWATCLA-DOCTORS-2	12/15/1999	-	-	-	0.94	0.105
21FLKWATCLA-DOCTORS-3	12/15/1999	-	-	-	1	0.105
21FLSJWMSAVDRLKI	12/15/1999	5.77277	80	19.66	1.477	0.134
21FLSJWMSAVDRLKO	12/15/1999	10.1154	80	19.63	1.3915	0.125
21FLSJWMDTL	12/20/1999	9.407745	100	16.62667	1.394	0.1365
21FLSJWMSAVDRLKI	1/5/2000	2.5631	100	16.12	1.453	0.104
21FLSJWMSAVDRLKO	1/5/2000	5.18104	100	16.32	1.549	0.1115
21FLSJWMDTL	1/11/2000	4.12266	150	17.6	1.762	0.113
21FLJXWQJAXSJR33	1/12/2000	-	160	17.6525	1.575	-
21FLSJWMSAVDRLKI	1/18/2000	5.44123	100	16.49	1.88	0.117
21FLSJWMSAVDRLKO	1/18/2000	1.93842	90	14.9	1.864	0.125
21FLKWATCLA-DOCTORS-1	1/22/2000	-	-	-	1.01	0.108
21FLKWATCLA-DOCTORS-2	1/22/2000	-	-	-	1.03	0.085
21FLKWATCLA-DOCTORS-3	1/22/2000	-	-	-	0.9	0.101
21FLSJWMDTL	1/26/2000	3.232285	150	11.02	1.817	0.105
21FLSJWMSAVDRLKI	2/1/2000	3.780907	100	10.08	1.536	0.105
21FLSJWMSAVDRLKO	2/1/2000	2.48609	100	11.1	1.732667	0.110333
21FLSJWMDTL	2/8/2000	6.853885	200	13.33	1.7415	0.099
21FLSJWMSAVDRLKO	2/8/2000	5.70306	150	12.14	-	-
21FLJXWQJAXSJR33	2/9/2000	-	160	13.0325	1.7	-
21FLSJWMSAVDRLKI	2/15/2000	1.42589	100	15.93	1.676	0.093
21FLSJWMSAVDRLKO	2/15/2000	1.39387	100	15.74	1.72	0.097
21FLKWATCLA-DOCTORS-1	2/19/2000	-	-	-	0.92	0.112
21FLKWATCLA-DOCTORS-2	2/19/2000	-	-	-	1.03	0.118
21FLKWATCLA-DOCTORS-3	2/19/2000	-	-	-	1.04	0.098
21FLSJWMDTL	2/22/2000	8.58285	100	17.13667	2.0405	0.113
21FLSJWMSAVDRLKI	3/1/2000	14.41517	100	22.67	1.959	0.14

Station	Sample Date	CHLAC (μg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLSJWMSAVDRLKO	3/1/2000	2.810338	100	21.16	1.899	0.1325
21FLSJWMDTL	3/7/2000	7.05924	150	20.51	1.81	0.111
21FLJXWQJAXSJR33	3/8/2000		120	21.1675	1.54	-
21FLSJWMSAVDRLKI	3/20/2000	7.88192	100	22.95	1.862	0.178
21FLSJWMSAVDRLKO	3/20/2000	2.906465	100	21.02	1.79	0.1655
21FLKWATCLA-DOCTORS-1	3/24/2000	-	-	-	0.89	0.132
21FLKWATCLA-DOCTORS-2	3/24/2000	-	-	-	0.81	0.129
21FLKWATCLA-DOCTORS-3	3/24/2000	-	-	-	0.98	0.145
21FLSJWMDTL	3/28/2000	7.43595	100	21.03667	1.652	0.128
21FLSJWMSAVDRLKI	4/5/2000	5.305	100	22.36	1.521	0.098
21FLSJWMSAVDRLKO	4/5/2000	4.646	100	23.43	1.556	0.099
21FLSJWMDTL	4/11/2000	30.02939	100	20.01	1.256	0.083
21FLJXWQJAXSJR33	4/12/2000	-	-	24	1.303	-
21FLSJWMSAVDRLKI	4/18/2000	16.98583	80	25.57	1.108	0.071
21FLSJWMSAVDRLKO	4/18/2000	17.62884	80	24.38	0.976	0.056
21FLSJWMDTL	4/25/2000	22.36646	80	23.17	1.356	0.114
21FLKWATCLA-DOCTORS-1	4/30/2000	-	-	-	1.47	0.082
21FLKWATCLA-DOCTORS-2	4/30/2000	-	-	-	1.44	0.07
21FLKWATCLA-DOCTORS-3	4/30/2000	-	-	-	1.41	0.075
21FLSJWMSAVDRLKI	5/1/2000	4.81684	70	24.57	1.153	0.098
21FLSJWMSAVDRLKO	5/1/2000	8.578855	80	24.51	1.128	0.085
21FLSJWMSAVDRLKO	5/2/2000	19.46982	70	23.03	-	-
21FLJXWQJAXSJR33	5/9/2000	9.7	-	24.325	1.17	-
21FLSJWMDTL	5/9/2000	12.53816	60	29.18	1.056	0.083
21FLSJWMSAVDRLKI	5/16/2000	4.88605	70	27.41	1.262	0.13
21FLSJWMSAVDRLKO	5/16/2000	2.272005	60	28.02	1.21	0.121
21FLSJWMDTL	5/23/2000	8.274165	70	27.15333	1.131	0.102
21FLKWATCLA-DOCTORS-1	5/28/2000	-	-	-	1.86	0.115
21FLKWATCLA-DOCTORS-2	5/28/2000	-	-	-	1.67	0.109
21FLKWATCLA-DOCTORS-3	5/28/2000	-	-	-	1.55	0.132
21FLSJWMSAVDRLKI	6/6/2000	19.55221	60	27.65	1.284	0.183
21FLSJWMSAVDRLKO	6/6/2000	20.86886	60	28.07	1.161	0.179
21FLJXWQJAXSJR33	6/13/2000	-	-	27.7425	0.717	-
21FLSJWMDTL	6/13/2000	22.59494	60	31.84	1.097	0.168
21FLSJWMSAVDRLKI	6/19/2000	11.21117	70	33.95	1.032	0.218
21FLSJWMSAVDRLKO	6/19/2000	10.3208	60	32.25	0.967	0.1985
21FLKWATCLA-DOCTORS-1	6/26/2000	-	-	-	1.08	0.209
21FLKWATCLA-DOCTORS-2	6/26/2000	-	-	-	0.84	0.186
21FLKWATCLA-DOCTORS-3	6/26/2000	-	-	-	1.22	0.243
21FLSJWMDTL	6/27/2000	29.56012	50	29.24	1.219	0.227
21FLSJWMSAVDRLKI	7/5/2000	7.008875	60	33.72	0.966	0.22
21FLSJWMSAVDRLKO	7/5/2000	24.23013	60	33.11	1.156	0.251
21FLSJWMDTL	7/11/2000	22.41483	60	31.27	1.143	0.259
21FLJXWQJAXSJR33	7/19/2000	15.3		30.8	0.9	-
21FLSJWMSAVDRLKO	7/19/2000	21.72918	60	30.73	-	-
21FLSJWMDTL	7/25/2000	31.34907	60	28.88	1.183	0.324

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLKWATCLA-DOCTORS-1	7/28/2000	-	-	-	1.19	0.312
21FLKWATCLA-DOCTORS-2	7/28/2000	-	-	-	0.74	0.201
21FLKWATCLA-DOCTORS-3	7/28/2000	-	-	-	1.06	0.299
21FLSJWMSAVDRLKI	7/31/2000	18.31093	60	31.61	1.214	0.316
21FLSJWMSAVDRLKO	7/31/2000	32.97709	60	30.98	1.185	0.308
21FLSJWMDTL	8/8/2000	32.04	60	32.12	1.195	0.276
21FLSJWMSAVDRLKI	8/14/2000	9.881835	50	33.41	1.101	0.328
21FLSJWMSAVDRLKO	8/14/2000	30.9188	50	31.7	1.436	0.36
21FLJXWQJAXSJR33	8/15/2000	-	-	29.7875	-	-
21FLSJWMDTL	8/23/2000	67.00383	50	28.73	1.673	0.315
21FLKWATCLA-DOCTORS-1	8/27/2000	-	-	-	0.98	0.229
21FLKWATCLA-DOCTORS-2	8/27/2000	-	-	-	1.04	0.232
21FLKWATCLA-DOCTORS-3	8/27/2000	-	-	-	0.95	0.246
21FLSJWMSAVDRLKI	9/5/2000	58.03223	60	29.88	1.461	0.281
21FLSJWMSAVDRLKO	9/5/2000	126.0641	60	29.42	1.868	0.34
21FLSJWMDTL	9/12/2000	66.74317	80	28.92	1.203	0.205
21FLJXWQJAXSJR33	9/13/2000	4.1	-	27.96	0.99	-
21FLSJWMSAVDRLKI	9/19/2000	47.971	200	24.82	1.568	0.249
21FLSJWMSAVDRLKO	9/19/2000	13.47683	150	25.77	1.1885	0.2175
21FLSJWMDTL	9/27/2000	27.43885	100	27.15	1.327	0.204
21FLSJWMDTL	10/10/2000	20.55233	100	20.97	1.0095	0.1405
21FLKWATCLA-DOCTORS-1	10/18/2000	-	-	-	0.82	0.108
21FLKWATCLA-DOCTORS-2	10/18/2000	-	-	-	0.84	0.117
21FLKWATCLA-DOCTORS-3	10/18/2000	-	-	-	0.81	0.119
21FLJXWQJAXSJR33	10/24/2000	11.6		21.305	0.873	-
21FLSJWMSAVDRLKO	10/24/2000	1	100	22.03	-	-
21FLSJWMDTL	10/30/2000	13.85198	70	22.53	0.883	0.106
21FLJXWQJAXSJR33	11/8/2000	-	-	23.565	1.2	-
21FLSJWMDTL	11/14/2000	25.45823	100	20.91	1.359	0.121
21FLKWATCLA-DOCTORS-1	11/26/2000	-	-	-	1.29	0.087
21FLKWATCLA-DOCTORS-2	11/26/2000	-	-	-	1.23	0.088
21FLKWATCLA-DOCTORS-3	11/26/2000	-	-	-	1.16	0.103
21FLSJWMDTL	11/30/2000	41.25976	70	15.39667	1.097	0.088
21FLSJWMSAVDRLKI	12/6/2000	25.13802	100	11.54	1.014	0.083
21FLSJWMSAVDRLKO	12/6/2000	36.47935	100	12.73	1.134667	0.089
21FLJXWQJAXSJR33	12/12/2000	-	80	15.775	1.42	-
21FLSJWMDTL	12/13/2000	37.69038	100	15.2	1.154	0.097333
21FLKWATCLA-DOCTORS-1	12/18/2000	-	-	-	1.14	0.086
21FLKWATCLA-DOCTORS-2	12/18/2000	-	-	-	0.79	0.103
21FLKWATCLA-DOCTORS-3	12/18/2000	-	-	-	0.78	0.086
21FLSJWMSAVDRLKI	12/18/2000	27.30092	70	14.04	1.181	0.091
21FLSJWMSAVDRLKO	12/18/2000	34.31093	86.66667	14.99	1.149667	0.093333
21FLSJWMDTL	1/2/2001	22.80581	60	8.246667	1.129	0.085
21FLSJWMSAVDRLKI	1/4/2001	16.04685	50	6.07	1.136	0.096
21FLSJWMSAVDRLKO	1/4/2001	22.80084	60	7.37	1.185	0.093
21FLJXWQJAXSJR33	1/9/2001	12.3	80	9.0275	1.52	-

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21FLSJWMDTL	1/10/2001	26.7432	80	9.55	1.299	0.098
21FLKWATCLA-DOCTORS-1	1/16/2001	-	-	-	0.89	0.079
21FLKWATCLA-DOCTORS-2	1/16/2001	-	-	-	1.04	0.084
21FLKWATCLA-DOCTORS-3	1/16/2001	-	-	-	1.04	0.064
21FLSJWMSAVDRLKI	1/16/2001	38.15888	50	13.17	1.113	0.085
21FLSJWMSAVDRLKO	1/16/2001	40.5482	60	13.55	1.091	0.082
21FLSJWMDTL	1/24/2001	53.8982	60	11.97	1.407	0.093
21FLSJWMSAVDRLKI	2/5/2001	-	50	12.97	0.932	0.072
21FLSJWMSAVDRLKO	2/5/2001	-	50	13.44	1.216	0.08
21FLSJWMDTL	2/13/2001	18.23889	60	16.58	1.207	0.082
21FLSJWMSAVDRLKI	2/19/2001	23.32215	60	16.69	1.178	0.083
21FLSJWMSAVDRLKO	2/19/2001	49.45158	60	17.16	1.398333	0.112
21FLSJWMDTL	2/26/2001	40.44603	50	20.7225	0.977	0.08
21FLKWATCLA-DOCTORS-1	2/28/2001	-	-	-	1.22	0.081
21FLKWATCLA-DOCTORS-2	2/28/2001	-	-	-	1.14	0.079
21FLKWATCLA-DOCTORS-3	2/28/2001	-	-	-	0.81	0.074
21FLSJWMIB224A	3/4/2001		60	-	2.872	0.44
21FLSJWMSAVDRLKI	3/8/2001	15.10584	50	14.04	1.047	0.077
21FLSJWMSAVDRLKO	3/8/2001	20.53817	33.33333	15.01	1.137	0.086667
21FLSJWMDTL	3/12/2001	19.58189	60	18.71	1.089	0.073
21FLJXWQJAXSJR33	3/14/2001	12.2	-	19.07	0.93	-
21FLSJWMIB224A	3/19/2001	-	50	-	-	-
21FLSJWMSAVDRLKI	3/22/2001	6.695015	60	17.59	1.078	0.063
21FLSJWMSAVDRLKO	3/22/2001	14.37114	60	17.96	0.988	0.053
21FLSJWMIB224A	3/25/2001	-	50	-	-	-
21FLSJWMDTL	3/26/2001	13.73024	50	18.44	0.945	0.048
21FLSJWMSAVDRLKI	4/2/2001	13.38319	60	18.67	1.227	0.09
21FLSJWMSAVDRLKO	4/2/2001	16.31385	60	18.66	1.077	0.062
21FLJXWQJAXSJR33	4/11/2001	-	40	24.285	1.04	-
21FLSJWMDTL	4/11/2001	14.39482	50	26.54	1.127	0.065
21FLSJWMSAVDRLKI	4/19/2001	35.70797	50	20.22	1.757	0.098
21FLSJWMSAVDRLKO	4/19/2001	44.67354	50	21.4	1.697	0.107667
21FLKWATCLA-DOCTORS-1	4/23/2001	-	-	-	1.93	0.119
21FLKWATCLA-DOCTORS-2	4/23/2001	-	-	-	1.89	0.12
21FLKWATCLA-DOCTORS-3	4/23/2001	-	-	-	1.81	0.127
21FLSJWMDTL	4/30/2001	150.6412	50	23.14	3.087	0.171
21FLSJWMSAVDRLKI	5/2/2001	198.5411	50	23.14	2.927	0.244
21FLSJWMSAVDRLKO	5/2/2001	170.7868	50	23.36	2.297	0.166
21FLSJWMDTL	5/16/2001	80.23375	50	27.74	2.277	0.219
21FLKWATCLA-DOCTORS-1	5/18/2001	-	-	-	1.42	0.184
21FLKWATCLA-DOCTORS-2	5/18/2001	-	-	-	1.36	0.175
21FLKWATCLA-DOCTORS-3	5/18/2001	-	-	-	1.39	0.189
21FLSJWMSAVDRLKI	5/21/2001	87.56283	50	26.63	2.267	0.232
21FLSJWMSAVDRLKO	5/21/2001	83.89593	50	26.75	1.827	0.18
21FLSJWMDTL	5/29/2001	38.84592	30	27.94667	1.497	0.093
21FLSJWMSAVDRLKI	6/4/2001	33.81895	50	29.81	2.317	0.093

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLSJWMSAVDRLKO	6/4/2001	26.89086	50	29.21	2.357	0.091
21FLJXWQJAXSJR33	6/6/2001	14.3	40	29.2475	0.685	-
21FLSJWMIB224A	6/7/2001	-	70	-	-	-
21FLSJWMDTL	6/12/2001	14.46389	50	27.59	1.717	0.115
21FLSJWMSAVDRLKI	6/18/2001	12.25125	20	28.18	2.049	0.085
21FLSJWMSAVDRLKO	6/18/2001	41.4919	10	28.78	1.857	0.068
21FLKWATCLA-DOCTORS-1	6/20/2001	-	-	-	1.18	0.062
21FLKWATCLA-DOCTORS-2	6/20/2001	-	-	-	0.7	0.058
21FLKWATCLA-DOCTORS-3	6/20/2001	-	-	-	1.15	0.068
21FLSJWMDTL	6/26/2001	34.7279	50	31.09	1.557	0.086
21FLSJWMSAVDRLKI	7/5/2001	36.97975	50	30.73	2.067	0.085
21FLSJWMSAVDRLKO	7/5/2001	44.39121	50	30.9	1.947	0.086
21FLSJWMDTL	7/9/2001	40.19497	50	30.52	1.317	0.142
21FLJXWQJAXSJR33	7/10/2001		40	30.025	0.768	-
21FLSJWMSAVDRLKI	7/16/2001	106.3261	50	28.59	3.637	0.211
21FLSJWMSAVDRLKO	7/16/2001	67.72478	60	28.32	2.327	0.108
21FLKWATCLA-DOCTORS-1	7/19/2001	-	-	-	1.5	0.107
21FLKWATCLA-DOCTORS-2	7/19/2001	-	-	-	1.42	0.141
21FLKWATCLA-DOCTORS-3	7/19/2001	-	-	-	1.52	0.123
21FLSJWMDTL	7/25/2001	73.41983	5	29.77	1.847	0.159
21FLSJWMSAVDRLKI	8/1/2001	30.72013	80	29.63	1.326	0.154
21FLSJWMSAVDRLKO	8/1/2001	113.5923	80	29.09	0.597	0.22
21FLSJWMDTL	8/7/2001	51.86721	60	28.76	2.007	0.15
21FLJXWQJAXSJR33	8/8/2001	13.3	-	22.98	0.82	-
21FLSJWMDTL	8/8/2001	-	60	28.945	0.867	0.166
21FLSJWMSAVDRLKI	8/8/2001	-	80	29.3	1.107	0.178
21FLSJWMSAVDRLKI	8/13/2001	12.8592	60	30.61	0.837	0.142
21FLSJWMSAVDRLKO	8/13/2001	10.86695	60	31.15	0.707	0.124
21FLSJWMDTL	8/21/2001	27.96813	50	31.88	0.557	0.101
21FLKWATCLA-DOCTORS-1	8/30/2001	-	-	-	1.2	0.091
21FLKWATCLA-DOCTORS-2	8/30/2001	-	-	-	1.02	0.118
21FLKWATCLA-DOCTORS-3	8/30/2001	-	-	-	1.15	0.105
21FLSJWMSAVDRLKI	9/5/2001	18.80324	150	28.11	1.085	0.135
21FLSJWMSAVDRLKO	9/5/2001	23.8162	50	29.73	0.817	0.094
21FLSJWMDTL	9/13/2001	49.17085	50	27.89	1.144	0.125333
21FLJXWQJAXSJR33	9/19/2001	32.3	-	26.645	1.27	-
21FLSJWMSAVDRLKI	9/19/2001	10.1912	250	25.15	1.008	0.101
21FLSJWMSAVDRLKO	9/19/2001	19.26207	300	25.2	0.724	0.101
21FLSJWMDTL	9/24/2001	39.09924	150	28.6	0.597	0.09
21FLSJWMSAVDRLKI	10/1/2001	9.53195	150	21.65	1.065	0.087
21FLSJWMSAVDRLKO	10/1/2001	17.06916	150	21.67	1.062	0.103
21FLJXWQJAXSJR33	10/9/2001	5.5	160	23.96	1.626	-
21FLSJWMDTL	10/10/2001	29.28678	150	22.82	0.813	0.09
21FLKWATCLA-DOCTORS-1	10/13/2001	-	-	-	0.94	0.081
21FLKWATCLA-DOCTORS-2	10/13/2001	-	-	-	1.1	0.1
21FLKWATCLA-DOCTORS-3	10/13/2001	-	-	-	1	0.082

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLSJWMSAVDRLKI	10/18/2001	8.888215	150	20.63	1.516	0.074
21FLSJWMSAVDRLKO	10/18/2001	31.02643	150	21.08	1.649	0.083667
21FLSJWMDTL	10/22/2001	49.64516	150	23.46	1.441	0.064
21FLSJWMSAVDRLKI	10/31/2001	6.773895	150	18.24	1.343	0.077
21FLSJWMSAVDRLKO	10/31/2001	21.44322	150	18.35	1.543	0.076
21FLSJWMSAVDRLKI	11/12/2001	17.10118	400	20.4	1.385	0.069
21FLSJWMSAVDRLKO	11/12/2001	24.08963	150	20.14	1.453	0.075
21FLSJWMDTL	11/15/2001	16.18577	150	18.99	1.599	0.092
21FLJXWQJAXSJR33	11/19/2001	1.1		21.805	1.46	-
21FLKWATCLA-DOCTORS-1	11/20/2001	-	-	-	1.04	0.071
21FLKWATCLA-DOCTORS-2	11/20/2001	-	-	-	1.03	0.073
21FLKWATCLA-DOCTORS-3	11/20/2001	-	-	-	0.94	0.071
21FLSJWMDTL	11/28/2001	15.04523	150	21.74	1.729	0.087
21FLSJWMSAVDRLKI	12/4/2001	2.928995	150	20.89	1.533	0.115
21FLSJWMSAVDRLKO	12/4/2001	7.58804	150	21.01	1.538333	0.105333
21FLSJWMDTL	12/10/2001	5.695055	150	22.37	1.574	0.092
21FLJXWQJAXSJR33	12/18/2001	-	200	20.4725	1.325	-
21FLSJWMSAVDRLKI	12/18/2001	4.13875	150	20.97	1.922	0.143
21FLSJWMSAVDRLKO	12/18/2001	3.79124	150	20.95	1.691	0.123667
21FLSJWMSAVDRLKI	1/3/2002	3.93579	200	10.16	1.86	0.114
21FLSJWMSAVDRLKO	1/3/2002	2.640815	200	10.64	1.674	0.096
21FLSJWMDTL	1/9/2002	9.70806	150	10.58	1.756	0.092
21FLSJWMSAVDRLKI	1/16/2002	3.30523	150	12.86	1.649	0.094
21FLSJWMSAVDRLKO	1/16/2002	8.81799	150	13.16	1.730667	0.104
21FLKWATCLA-DOCTORS-1	1/22/2002	-	-	-	1.35	0.098
21FLKWATCLA-DOCTORS-2	1/22/2002	-	-	-	1.3	0.094
21FLKWATCLA-DOCTORS-3	1/22/2002	-	-	-	1.39	0.092
21FLSJWMDTL	1/22/2002	7.06491	200	15.78	1.709	0.089
21FLSJWMSAVDRLKI	2/4/2002	5.812795	200	17.26	1.657	0.103
21FLSJWMSAVDRLKO	2/4/2002	10.22524	200	17.9	1.698667	0.115
21FLSJWMDTL	2/13/2002	39.11292	200	16.13	1.45	0.098
21FLSJWMSAVDRLKI	2/19/2002	23.86707	150	15.52	1.191	0.077
21FLSJWMSAVDRLKO	2/19/2002	40.18174	150	15.3	-	0.092667
21FLKWATCLA-DOCTORS-1	2/24/2002	-	-	-	0.97	0.064
21FLKWATCLA-DOCTORS-2	2/24/2002	-	-	-	1.09	0.083
21FLKWATCLA-DOCTORS-3	2/24/2002	-	-	-	1.05	0.071
21FLSJWMSAVDRLKI	3/6/2002	1.25495	150	13.58	1.252	0.076
21FLSJWMSAVDRLKO	3/6/2002	3.062447	150	-	1.270667	0.085
21FLSJWMDTL	3/13/2002	1	150	19.88	1.472	0.096
21FLSJWMSAVDRLKI	3/20/2002	11.78803	150	24.31	1.189	0.076
21FLSJWMSAVDRLKO	3/20/2002	10.34379	150	24.31	1.201	0.076
21FLSJWMDTL	3/28/2002	20.82317	150	23.45	1.349	0.101
21FLSJWMSAVDRLKI	4/1/2002	2.97419	150	23.94	1.211	0.111
21FLSJWMSAVDRLKO	4/1/2002	17.00395	150	24.12	1.226	0.1065
21FLSJWMDTL	4/9/2002	24.27015	150	22.04	1.192	0.088
21FLSJWMSAVDRLKI	4/16/2002	9.053985	150	25.35	1.123	0.078

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLSJWMSAVDRLKO	4/16/2002	7.51319	150	25.35	1.098	0.075
21FLSJWMDTL	4/30/2002	15.8519	100	28.015	1.133	0.085
21FLSJWMSAVDRLKI	5/6/2002	22.24906	100	26.88	1.313	0.116
21FLSJWMSAVDRLKO	5/6/2002	38.09578	100	26.91	1.39	0.107
21FLSJWMDTL	5/14/2002	58.94813	100	27.37	2.224	0.149
21FLSJWMSAVDRLKI	5/22/2002	38.65897	80	22.37	2.124	0.161
21FLSJWMSAVDRLKO	5/22/2002	39.30787	80	22.21	2.163	0.17
21FLSJWMDTL	5/30/2002	22.83676	70	27.325	1.369	0.09
21FLSJWMSAVDRLKI	6/3/2002	27.18314	70	29.25	1.7	0.126
21FLSJWMSAVDRLKO	6/3/2002	22.29192	70	29.83	1.598	0.115
21FLSJWMDTL	6/11/2002	42.10879	60	27.69	1.668	0.158
21FLSJWMSAVDRLKI	6/17/2002	33.69003	60	28.76	2.062	0.17
21FLSJWMSAVDRLKO	6/17/2002	37.19047	60	28.73	1.785	0.1335
21FLKWATCLA-DOCTORS-1	6/19/2002	-	-	-	1.43	0.088
21FLKWATCLA-DOCTORS-2	6/19/2002	-	-	-	1.37	0.083
21FLKWATCLA-DOCTORS-3	6/19/2002	-	-	-	1.45	0.091
21FLSJWMDTL	6/27/2002	87.76295	60	28.845	1.538	0.15
21FLSJWMSAVDRLKI	7/8/2002	18.42017	70	30.31	1.257	0.119
21FLSJWMSAVDRLKO	7/8/2002	22.13982	70	30.84	1.149	0.107
21FLSJWMDTL	7/17/2002	24.32385	70	33.73	1.206	0.102
21FLSJWMSAVDRLKI	7/22/2002	5.711065	70	30.2	1.793	0.167
21FLSJWMSAVDRLKO	7/22/2002	20.97293	60	30.58	1.745	0.138
21FLSJWMDTL	7/29/2002	39.56687	70	31.105	1.305	0.106
21FLSJWMSAVDRLKI	8/5/2002	11.99099	100	27.93	1.495	0.126
21FLSJWMSAVDRLKO	8/5/2002	43.6851	70	29.22	1.470333	0.1125
21FLSJWMDTL	8/14/2002	31.506	70	29.26	1.168	0.086
21FLSJWMSAVDRLKI	8/19/2002	27.27403	70	30.37	1.228	0.082
21FLSJWMSAVDRLKO	8/19/2002	43.61423	70	30.22	1.246	0.084
21FLSJWMDTL	8/27/2002	49.42437	70	29.98	1.474	0.112
21FLSJWMSAVDRLKI	9/2/2002	19.60824	80	28.46	1.327	0.08
21FLSJWMSAVDRLKO	9/2/2002	46.18583	80	28.47	1.261	0.083
21FLSJWMDTL	9/9/2002	37.88063	100	28.77	1.2885	0.0815
21FLSJWMSAVDRLKI	9/16/2002	9.14475	150	27.9	1.259	0.08
21FLSJWMSAVDRLKO	9/16/2002	37.10499	100	28.25	1.292	0.092
21FLSJWMDTL	9/30/2002	40.99518	150	29.4	1.243	0.076
21FLSJWMSAVDRLKI	10/1/2002	19.23468	150	29.33	1.143	0.07
21FLSJWMSAVDRLKO	10/1/2002	35.39085	100	29.11	1.2	0.07
21FLKWATCLA-DOCTORS-1	10/4/2002	-	-	-	1.34	0.059
21FLKWATCLA-DOCTORS-2	10/4/2002	-	-	-	1.16	0.066
21FLKWATCLA-DOCTORS-3	10/4/2002	-	-	-	1.03	0.061
21FLSJWMDTL	10/10/2002	35.17058	150	28.22	1.26	0.0765
21FLSJWMSAVDRLKI	10/16/2002	10.09794	150	25.85	1.22	0.064
21FLSJWMSAVDRLKO	10/16/2002	28.62774	150	26.63	1.358	0.079
21FLSJWMDTL	10/28/2002	-	150	25.52	1.347	0.079
21FLSJWMSAVDRLKI	11/4/2002	8.38914	150	22.1	1.345	0.07
21FLSJWMSAVDRLKO	11/4/2002	22.82583	150	22.21	1.332	0.065

Station	Sample Date	CHLAC (μg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLSJWMSAVDRLKI	11/18/2002	15.47799	150	16.1	1.268	0.057
21FLSJWMSAVDRLKO	11/18/2002	21.43476	150	16.97	1.381	0.075
21FLSJWMDTL	11/20/2002	22.56417	150	16.95	1.43	0.081
21FLSJWMDTL	11/26/2002	18.9837	150	16.38	1.48	0.085
21FLSJWMSAVDRLKI	12/2/2002	9.9057	150	14.39	1.207	0.047
21FLSJWMSAVDRLKO	12/2/2002	35.5911	150	14.58	1.3175	0.059
21FLSJWMDTL	12/10/2002	15.84378	150	14.45	1.442	0.08
21FLSJWMSAVDRLKI	12/16/2002	3.26007	150	11.55	1.435	0.068
21FLSJWMSAVDRLKO	12/16/2002	7.88985	150	12.45	1.401	0.066
21FLSJWMSAVDRLKI	1/2/2003	6.17571	150	14.35	1.415	0.065
21FLSJWMSAVDRLKO	1/2/2003	23.90451	150	14.66	1.495	0.07
21FLSJWMDTL	1/7/2003	23.4159	150	12.06	1.501	0.076
21FLSJWMSAVDRLKI	1/21/2003	43.65183	150	10.3	1.745	0.094
21FLSJWMSAVDRLKO	1/21/2003	44.20452	150	10.35	1.357	0.061
21FLSJWMDTL	1/27/2003	53.70972	150	9.13	1.407	0.072
21FLSJWMSAVDRLKI	2/3/2003	13.85463	150	12.91	1.274	0.053
21FLSJWMSAVDRLKO	2/3/2003	20.07306	150	13.07	1.309	0.056
21FLSJWMDTL	2/12/2003	6.69903	150	14.05	1.336	0.064
21FLSJWMSAVDRLKI	2/17/2003	7.06482	150	16.14	1.468	0.085
21FLSJWMSAVDRLKO	2/17/2003	7.92456	150	15.84	1.445	0.07
21FLSJWMSAVDRLKI	3/3/2003	8.09811	150	18.15	1.382	0.077
21FLSJWMSAVDRLKO	3/3/2003	15.81975	150	18.48	1.453	0.086
21FLSJWMDTL	3/10/2003	20.80464	150	20.12	1.285	0.082
21FLSJWMDTL	3/12/2003	17.97711	150	19.4625	1.345	0.082
21FLSJWMSAVDRLKI	3/19/2003	32.06136	150	22.51	1.278	0.095
21FLSJWMSAVDRLKO	3/19/2003	38.29314	150	22.53	1.221	0.086
21FLSJWMSAVDRLKI	4/7/2003	36.38409	100	21.88	1.196	0.121
21FLSJWMSAVDRLKO	4/7/2003	42.85617	150	22.21	1.208	0.121
21FLSJWMDTL	4/15/2003	23.07681	150	21.95	1.162	0.1
21FLSJWMDTL	4/16/2003	28.83867	150	23.34	1.172	0.101
21FLSJWMSAVDRLKI	4/21/2003	27.8214	150	25.34	1.254	0.096
21FLSJWMSAVDRLKO	4/21/2003	28.39812	150	25.21	1.28	0.116
21FLSJWMSAVDRLKI	5/5/2003	-	150	26.14	1.255	0.111
21FLSJWMSAVDRLKO	5/5/2003	-	150	26.32	1.259	0.108
21FLSJWMDTL	5/13/2003	34.23207	200	29.12	1.346	0.13
21FLSJWMDTL	5/15/2003	26.17935	150	28.41	1.305	0.134
21FLSJWMSAVDRLKI	5/20/2003	29.16975	150	27.86	1.301	0.138
21FLSJWMSAVDRLKO	5/20/2003	31.52736	150	27.99	1.281	0.137
21FLSJWMSAVDRLKI	6/3/2003	29.99478	150	27.32	1.198	0.1
21FLSJWMSAVDRLKO	6/3/2003	30.30984	150	27.92	1.126	0.091
21FLSJWMDTL	6/10/2003	-	150	30.01	1.405	0.094
21FLSJWMDTL	6/12/2003	34.58915	150	30.24	1.312	0.095
21FLSJWMSAVDRLKI	6/16/2003	39.1956	100	30.53	1.424	0.085
21FLSJWMSAVDRLKO	6/16/2003	49.54719	100	30.86	1.454	0.075
21FLSJWMSAVDRLKI	7/8/2003	42.186	100	29.79	1.579	0.088
21FLSJWMSAVDRLKO	7/8/2003	38.55925	100	30.94	1.5	0.074

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLSJWMDTL	7/14/2003	65.64462	100	29.47	-	0.118
21FLSJWMDTL	7/16/2003	66.49902	100	28.31	1.707	0.097
21FLSJWMSAVDRLKI	7/22/2003	120.2924	80	29.76	2.271	0.138
21FLSJWMSAVDRLKO	7/22/2003	121.3849	80	29.75	2.141	0.116
21FLSJWMSAVDRLKI	8/4/2003	78.06546	70	28.24	2.135	0.128
21FLSJWMSAVDRLKO	8/4/2003	107.3474	70	28.57	2.089	0.113
21FLSJWMDTL	8/13/2003	44.14993	60	28.4675	1.999	0.108
21FLSJWMDTL	8/14/2003	52.12908	60	28.73	-	0.107
21FLSJWMSAVDRLKI	8/18/2003	50.78785	60	30.56	1.708	0.094
21FLSJWMSAVDRLKO	8/18/2003	49.33779	60	30.54	1.718	0.089
21FLSJWMSAVDRLKI	9/2/2003	29.29753	70	30.41	1.418	0.109
21FLSJWMSAVDRLKO	9/2/2003	34.82197	60	30.06	1.405	0.106
21FLSJWMDTL	9/9/2003	38.07747	60	27.875	1.348	0.096
21FLSJWMDTL	9/11/2003	35.91818	30	26.78	1.423	0.098
21FLSJWMSAVDRLKI	9/16/2003	56.38706	60	29.2	1.752	0.083
21FLSJWMSAVDRLKO	9/16/2003	55.68953	70	29.96	1.661	0.088
21FLSJWMSAVDRLKI	10/1/2003	34.80612	100	23.56	1.45388	0.08277
21FLSJWMSAVDRLKO	10/1/2003	32.92407	100	23.62	1.42248	0.0834
21FLSJWMDTL	10/6/2003	28.22448	80	25.41	1.20985	0.0694
21FLSJWMDTL	10/8/2003	31.66761	60	25.57	1.31456	0.07913
21FLSJWMSAVDRLKI	10/13/2003	28.09782	50	24.28	1.31172	0.06948
21FLSJWMSAVDRLKO	10/13/2003	32.72738	60	24.37	1.37566	0.07234
21FLSJWMSAVDRLKI	11/3/2003	27.11621	100	23.43	1.23682	0.07767
21FLSJWMSAVDRLKO	11/3/2003	31.32332	100	23.64	1.20726	0.0829
21FLSJWMDTL	11/10/2003	38.94195	70	22.185	1.41209	0.08616
21FLSJWMDTL	11/13/2003	29.15481	80	21.93	1.26997	0.08306
21FLSJWMSAVDRLKI	11/17/2003	22.6505	100	19.57	1.27079	0.07165
21FLSJWMSAVDRLKO	11/17/2003	19.28185	100	20.22	1.2234	0.06207
21FLSJWMSAVDRLKI	12/1/2003	23.66591	100	14.61	1.24798	0.07018
21FLSJWMSAVDRLKO	12/1/2003	25.97602	100	15.92	1.25912	0.07392
21FLSJWMDTL	12/10/2003	24.5936	100	14.315	1.447375	0.099885
21FLSJWMSAVDRLKI	12/17/2003	32.06225	70	15.11	2.00085	0.14699
21FLSJWMSAVDRLKO	12/17/2003	24.51362	70	14.52	1.42427	0.08115
21FLSJWMSAVDRLKI	1/5/2004	17.2397	70	17.16	1.23136	0.06128
21FLSJWMSAVDRLKO	1/5/2004	18.20134	70	16.55	1.20866	0.06077
21FLSJWMDTL	1/12/2004	19.38801	100	11.075	1.42764	0.07349
21FLSJWMDTL	1/15/2004	17.99095	100	11.88	1.33912	0.07189
21FLSJWMSAVDRLKI	1/21/2004	22.43563	80	11.91	1.27579	0.05113
21FLSJWMSAVDRLKO	1/21/2004	27.12364	100	13.16	1.33374	0.05899
21FLSJWMSAVDRLKI	2/4/2004	9.55593	100	13.63	1.14925	0.05159
21FLSJWMSAVDRLKO	2/4/2004	23.01273	100	13.68	1.23154	0.06156
21FLSJWMDTL	2/9/2004	21.70066	100	14.215	1.27381	0.06222
21FLSJWMDTL	2/11/2004	17.82023	100	14.22	1.14384	0.04853
21FLSJWMSAVDRLKI	2/16/2004	23.45661	100	13.37	1.16444	0.05341
21FLSJWMSAVDRLKO	2/16/2004	27.08715	100	14.14	1.21612	0.05543
21FLKWATCLA-DOCTORS-1	3/1/2004	-	-	-	0.84	0.046

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLKWATCLA-DOCTORS-2	3/1/2004	-	-	-	0.96	0.057
21FLKWATCLA-DOCTORS-3	3/1/2004	-	-	-	0.78	0.048
21FLSJWMSAVDRLKI	3/1/2004	15.6462	100	14.25	0.99926	0.04404
21FLSJWMSAVDRLKO	3/1/2004	19.15458	100	14.1	1.0637	0.0492
21FLSJWMDTL	3/8/2004	25.70193	100	19.775	1.26522	0.08126
21FLSJWMDTL	3/9/2004	19.17327	80	18.93	1.06512	0.05874
21FLSJWMSAVDRLKI	3/16/2004	11.036	100	19.14	1.25005	0.09706
21FLSJWMSAVDRLKO	3/16/2004	12.64512	80	19.59	1.02707	0.03747
21FLSJWMSAVDRLKI	4/5/2004	19.12733	80	17.35	1.28388	0.06
21FLSJWMSAVDRLKO	4/5/2004	25.91448	80	18.28	1.2947	0.06147
21FLKWATCLA-DOCTORS-1	4/10/2004	-	-	-	0.98	0.049
21FLKWATCLA-DOCTORS-2	4/10/2004	-	-	-	0.95	0.048
21FLKWATCLA-DOCTORS-3	4/10/2004	-	-	-	1.07	0.051
21FLSJWMDTL	4/15/2004	25.43175	70	18.13	1.5936	0.07743
21FLSJWMDTL	4/19/2004	18.81565	80	21.39	1.27464	0.07231
21FLSJWMSAVDRLKI	4/20/2004	15.38301	70	22.83	1.16126	0.04991
21FLSJWMSAVDRLKO	4/20/2004	16.03335	70	23.18	1.13369	0.04306
21FLSJWMSAVDRLKI	5/4/2004	12.61575	70	22.67	1.18849	0.0497
21FLSJWMSAVDRLKO	5/4/2004	29.55847	70	23.67	1.20633	0.05135
21FLKWATCLA-DOCTORS-1	5/11/2004	-	-	-	0.96	0.046
21FLKWATCLA-DOCTORS-2	5/11/2004	-	-	-	0.89	0.045
21FLKWATCLA-DOCTORS-3	5/11/2004	-	-	-	0.99	0.054
21FLSJWMDTL	5/11/2004	23.33046	60	25.7	1.1145	0.04562
21FLSJWMDTL	5/12/2004	25.05567	70	25.7075	1.28687	0.06137
21FLSJWMSAVDRLKI	5/19/2004	15.23305	70	27.18	1.07592	0.04842
21FLSJWMSAVDRLKO	5/19/2004	17.22757	70	27.37	1.05501	0.04751
21FLSJWMSAVDRLKI	6/3/2004	62.72759	50	28.17	1.66912	0.07554
21FLSJWMSAVDRLKO	6/3/2004	50.5253	50	28.7	1.64884	0.07164
21FLSJWMDTL	6/8/2004	46.31665	60	28.9	1.43305	0.06448
21FLSJWMDTL	6/9/2004	41.99942	70	29.11	1.40471	0.06675
21FLSJWMSAVDRLKI	6/14/2004	62.41867	60	29.28	1.55477	0.07548
21FLSJWMSAVDRLKO	6/14/2004	61.37859	60	30.2	1.48724	0.06732
21FLKWATCLA-DOCTORS-1	6/24/2004	-	-	-	0	0
21FLKWATCLA-DOCTORS-2	6/24/2004	-	-	-	0.71	0.04
21FLKWATCLA-DOCTORS-3	6/24/2004	-	-	-	0.65	0.048
21FLSJWMIB224A	7/6/2004	-	60	-	0.77963	0.06124
21FLSJWMSAVDRLKI	7/6/2004	44.76255	60	31.1	1.19505	0.06555
21FLSJWMSAVDRLKO	7/6/2004	32.3782	60	31.5	1.21378	0.05395
21FLSJWMSAVDRLKO	7/7/2004	-	-	-	-	-
21FLSJWMDTL	7/12/2004	21.76431	50	30.06	1.15524	0.07861
21FLSJWMSAVDRLKI	7/19/2004	29.24067	50	27.67	1.13939	0.03919
21FLSJWMSAVDRLKO	7/19/2004	21.01761	50	27.81	1.13146	0.05813
21FLSJWMSAVDRLKI	8/3/2004	12.10511	50	29.62	1.06781	0.05588
21FLSJWMSAVDRLKO	8/3/2004	15.32199	50	29.96	1.04241	0.0586
21FLSJWMDTL	8/10/2004	24.60169	50	27.225	1.06792	0.07348
21FLSJWMSAVDRLKI	8/16/2004	27.23678	60	26.75	1.18246	0.07193

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLSJWMSAVDRLKO	8/16/2004	35.58517	50	27.18	1.14154	0.06818
21FLKWATCLA-DOCTORS-1	8/21/2004	-	-	-	0.65	0.057
21FLKWATCLA-DOCTORS-2	8/21/2004	-	-	-	0.57	0.065
21FLKWATCLA-DOCTORS-3	8/21/2004	-	-	-	0.61	0.062
21FLSJWMSAVDRLKI	9/9/2004	42.17679	200	28.01	2.02966	0.17442
21FLSJWMSAVDRLKO	9/9/2004	9.97817	250	26.93	1.64725	0.11808
21FLSJWMDTL	9/13/2004	32.42143	80	27.6675	1.14213	0.07492
21FLSJWMSAVDRLKI	9/23/2004	27.31289	150	25	1.30818	0.0824
21FLSJWMSAVDRLKO	9/23/2004	32.98451	150	25.04	1.34634	0.08567
21FLSJWMDTL	10/11/2004	7.82844	250	25.4175	1.4579	0.10179
21FLSJWMSAVDRLKI	10/11/2004	12.79197	150	25.42	1.36139	0.09433
21FLSJWMDTL	10/25/2004	10.35159	300	24.0825	1.53522	0.09519
21FLSJWMSAVDRLKI	10/25/2004	26.41698	250	24.26	1.48331	0.09939
21FLSJWMDTL	11/8/2004	20.27598	300	21.915	1.76314	0.10741
21FLSJWMSAVDRLKI	11/8/2004	34.09323	300	22.57	-	0.10912
21FLSJWMDTL	11/22/2004	6.33858	300	19.575	1.72005	0.10689
21FLSJWMSAVDRLKI	11/22/2004	34.57917	300	21.37	1.7523	0.12025
21FLSJWMDTL	12/8/2004	9.9057	300	19.405	1.73495	0.10885
21FLSJWMSAVDRLKI	12/8/2004	7.87094	300	20	1.81088	0.12434
21FLSJWMDTL	12/9/2004	-	-	19.405	-	-
21FLSJWMDTL	12/27/2004	5.70712	300	10.285	1.71871	0.11647
21FLSJWMSAVDRLKI	12/27/2004	3.3375	300	9.29	1.63369	0.11481
21FLSJWMDTL	1/10/2005	6.942	300	17.815	1.67684	0.11122
21FLSJWMSAVDRLKI	1/10/2005	8.6508	300	19.68	1.65735	0.10919
21FLSJWMDTL	1/24/2005	5.90738	300	11.595	1.72886	0.11081
21FLSJWMSAVDRLKI	1/24/2005	7.19886	300	11.38	1.76205	0.10967
21FLSJWMDTL	2/7/2005	7.6362	150	12.5125	1.66145	0.10832
21FLSJWMSAVDRLKI	2/7/2005	7.4493	150	12.83	1.66395	0.10683
21FLSJWMDTL	2/17/2005	9.1581	250	16.35	1.60894	0.11187
21FLSJWMSAVDRLKI	2/17/2005	8.544	250	17.21	1.62505	0.1021
21FLSJWMDTL	3/14/2005	30.93385	150	17.15	-	0.08649
21FLSJWMSAVDRLKI	3/14/2005	40.2903	150	17.86	1.26676	0.07308
21FLSJWMDTL	3/29/2005	14.9787	150	19.96	1.24273	0.08116
21FLSJWMSAVDRLKI	3/29/2005	19.8648	150	20.32	1.14938	0.07537
21FLSJWMDTL	3/30/2005	-	-	19.96	-	-
21FLSJWMDTL	4/11/2005	17.4885	150	21.1775	1.09672	0.06069
21FLSJWMSAVDRLKI	4/11/2005	11.4009	150	21.47	1.04388	0.05098
21FLSJWMDTL	4/25/2005	10.90484	100	20.6175	0.9431	0.0424
21FLSJWMSAVDRLKI	4/25/2005	8.8911	100	20.44	0.89512	0.03933
21FLKWATCLA-DOCTORS-1	5/8/2005	-	-	-	0.93	0.049
21FLKWATCLA-DOCTORS-2	5/8/2005	-	-	-	0.97	0.048
21FLKWATCLA-DOCTORS-3	5/8/2005	-	-	-	0.97	0.045
21FLSJWMDTL	5/9/2005	9.3717	150	23.54	0.92969	0.05787
21FLSJWMSAVDRLKI	5/9/2005	9.4251	100	23.5	0.90274	0.0565
21FLSJWMDTL	5/23/2005	14.36994	100	26.2125	0.98325	0.07878
21FLSJWMSAVDRLKI	5/23/2005	24.1101	100	26.43	1.05873	0.07752

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLSJWMDTL	6/14/2005	51.29069	80	29.105	1.41915	0.11125
21FLSJWMSAVDRLKI	6/14/2005	40.31701	80	29.42	1.33322	0.08982
21FLSJWMDTL	6/30/2005	67.77351	80	28.9525	1.48028	0.13494
21FLSJWMSAVDRLKI	6/30/2005	63.0506	100	28.83	1.54205	0.11467
21FLSJWMDTL	7/12/2005	40.68	80	29.33	1.62176	0.13477
21FLSJWMSAVDRLKI	7/12/2005	67.26	80	29.16	1.39041	0.11437
21FLKWATCLA-DOCTORS-1	7/20/2005	-	-	-	1.81	0.092
21FLKWATCLA-DOCTORS-2	7/20/2005	-	-	-	1.7	0.11
21FLKWATCLA-DOCTORS-3	7/20/2005	-	-	-	1.67	0.103
21FLSJWMDTL	7/21/2005	38.2344	100	31.23	1.53594	0.14692
21FLSJWMSAVDRLKI	7/21/2005	71.06911	100	32.17	2.21512	0.16129
21FLSJWMDTL	7/25/2005	-	-	31.23	-	-
21FLSJWMDTL	8/8/2005	41.919	100	31.97	1.41626	0.15301
21FLSJWMSAVDRLKI	8/8/2005	69.65421	80	32.4	1.81688	0.13755
21FLSJWMDTL	8/22/2005	58.46259	100	31.7725	1.82151	0.1627
21FLSJWMSAVDRLKI	8/22/2005	102.7165	80	31.7	2.1488	0.14424
21FLSJWMDTL	9/12/2005	52.83789	100	26.8625	1.64106	0.11576
21FLSJWMSAVDRLKI	9/12/2005	75.65001	150	27.6	1.87055	0.14153
21FLSJWMDTL	9/26/2005	43.1739	100	28.4975	1.54879	0.11546
21FLSJWMSAVDRLKI	9/26/2005	38.68163	100	28.44	1.43767	0.09956
21FLSJWMDTL	10/11/2005	27.1895	100	26.76	1.4341	0.11944
21FLSJWMSAVDRLKI	10/11/2005	65.1925	150	27.64	1.53399	0.13205
21FLSJWMDTL	10/25/2005	20.5857	150	21.065	1.34997	0.10504
21FLSJWMSAVDRLKI	10/25/2005	20.39212	150	20	1.47356	0.12075
21FLSJWMDTL	11/7/2005	16.6875	80	20.645	0.97871	0.07457
21FLSJWMSAVDRLKI	11/7/2005	24.99787	80	22.2	1.19856	0.09202
21FLSJWMDTL	11/21/2005	29.637	80	19.205	1.59157	0.11082
21FLSJWMSAVDRLKI	11/21/2005	24.831	80	19.3	1.2819	0.07981
21FLSJWMDTL	12/12/2005	16.0734	100	14.235	1.021	0.0463
21FLSJWMSAVDRLKI	12/12/2005	19.15725	80	14.04	1.1372	0.04
21FLSJWMDTL	12/27/2005	21.29325	70	11.685	1.16254	0.09449
21FLSJWMSAVDRLKI	12/27/2005	19.6245	60	11.46	0.9984	0.0724
21FLSJWMDTL	1/10/2006	20.9595	60	13.78	1.11068	0.07811
21FLSJWMSAVDRLKI	1/10/2006	20.47	50	12.9	1.08151	0.07728
21FLSJWMDTL	1/23/2006	29.904	100	15.6625	1.09307	0.04
21FLSJWMSAVDRLKI	1/23/2006	22.46614	80	16.56	0.98049	0.04
21FLSJWMDTL	2/6/2006	20.6124	100	14.505	1.05487	0.08846
21FLSJWMSAVDRLKI	2/6/2006	31.506	100	15.53	1.02404	0.08725
21FLSJWMDTL	2/21/2006	28.76925	100	15.35	1.18964	0.05773
21FLSJWMSAVDRLKI	2/21/2006	25.86562	100	16.57	1.093	0.05625
21FLSJWMDTL	3/7/2006	21.894	100	18.17	1.28682	0.08718
21FLSJWMSAVDRLKI	3/7/2006	18.8235	100	18.01	1.28039	0.087
21FLSJWMDTL	3/21/2006	19.32412	100	20.855	1.12234	0.07937
21FLSJWMSAVDRLKI	3/21/2006	17.622	80	20.89	1.0976	0.07883
21FLSJWMDTL	4/10/2006	19.02375	80	21.495	1.06908	0.08584
21FLSJWMSAVDRLKI	4/10/2006	22.2945	70	21.46	1.18565	0.09577

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLSJWMDTL	4/28/2006	28.836	80	24.81	1.05233	0.09404
21FLSJWMSAVDRLKI	4/28/2006	25.81	60	25.39	1.1736	0.08779
21FLSJWMDTL	5/11/2006	53.2665	60	25.565	1.34391	0.08252
21FLSJWMSAVDRLKI	5/11/2006	56.2035	60	25.33	1.50169	0.09838
21FLSJWMDTL	5/24/2006	45.657	50	26.835	1.32696	0.08231
21FLSJWMSAVDRLKI	5/24/2006	52.79925	50	29.36	1.48427	0.09825
21FLSJWMDTL	6/16/2006	76.362	50	27.72	1.86017	0.14128
21FLSJWMSAVDRLKI	6/16/2006	76.7625	50	28.64	1.96887	0.12713
21FLSJWMDTL	6/27/2006	40.53949	40	29.525	1.81066	0.13867
21FLSJWMSAVDRLKI	6/27/2006	44.12175	40	29.77	1.85711	0.11669
21FLSJWMDTL	7/11/2006	40.0945	40	28.885	2.58841	0.23141
21FLSJWMSAVDRLKI	7/11/2006	28.2575	40	30.5	1.43968	0.08823
21FLSJWMDTL	7/25/2006	44.589	50	30.2	1.40498	0.14221
21FLSJWMSAVDRLKI	7/25/2006	33.019	50	31.06	1.22008	0.10801
21FLSJWMDTL	8/7/2006	40.762	50	31.055	1.35188	0.11931
21FLSJWMSAVDRLKI	8/7/2006	31.57275	50	31.12	1.34242	0.10869
21FLSJWMDTL	8/21/2006	39.31575	50	30.765	6.68278	0.47695
21FLSJWMSAVDRLKI	8/21/2006	45.85726	50	30.37	1.35869	0.08441
21FLSJWMDTL	9/5/2006	49.92899	50	30.24	1.38681	0.11208
21FLSJWMSAVDRLKI	9/5/2006	42.987	50	30.92	1.21378	0.0782
21FLSJWMDTL	9/20/2006	29.014	40	27.975	1.26562	0.10607
21FLSJWMSAVDRLKI	9/20/2006	19.491	40	27.88	1.44984	0.09118
21FLSJWMDTL	10/2/2006	21.8495	50	27.125	1.24819	0.12494
21FLSJWMSAVDRLKI	10/2/2006	26.522	50	27.81	1.21036	0.10154
21FLSJWMDTL	10/17/2006	25.0535	30	22.665	1.23697	0.10587
21FLSJWMSAVDRLKI	10/17/2006	4.4055	30	22.88	1.11131	0.07328
21FLSJWMDTL	11/2/2006	26.2105	30	21.725	1.10123	0.10543
21FLSJWMSAVDRLKI	11/2/2006	15.7085	30	22.32	1.16073	0.10363
21FLSJWMDTL	11/14/2006	26.789	30	19.84	1.14751	0.07464
21FLSJWMSAVDRLKI	11/14/2006	23.4515	30	18.88	1.13344	0.07064
21FLSJWMDTL	12/4/2006	16.1535	30	18.595	1.13753	0.09567
21FLSJWMSAVDRLKI	12/4/2006	5.696	30	18.76	1.10101	0.08427
21FLSJWMDTL	12/18/2006	19.9805	50	17.29	0.98012	0.08543
21FLSJWMSAVDRLKI	12/18/2006	15.486	40	17.79	0.8959	0.07387
21FLSJWMDTL	1/8/2007	37.469	50	20.365	0.87931	0.11232
21FLSJWMSAVDRLKI	1/8/2007	38.4925	50	20.39	0.84384	0.1037
21FLSJWMDTL	1/22/2007	30.082	40	15.85	1.0835	0.10497
21FLSJWMSAVDRLKI	1/22/2007	19.313	40	16.06	0.99011	0.08444
21FLSJWMDTL	2/5/2007	33.5085	50	13.155	-	-
21FLSJWMSAVDRLKI	2/5/2007	3.13725	50	12.8	-	-
21FLSJWMDTL	2/19/2007	27.501	50	11.55	1.08332	0.10449
21FLSJWMSAVDRLKI	2/19/2007	14.5515	50	11.6	0.96197	0.07307
21FLSJWMDTL	3/12/2007	27.0115	50	19.51	1.09471	0.0893
21FLSJWMSAVDRLKI	3/12/2007	20.8705	50	20.14	1.0274	0.07289
21FLSJWMDTL	3/27/2007	21.69375	50	22.83	0.99063	0.09646
21FLSJWMSAVDRLKI	3/27/2007	15.486	40	23.88	0.90892	0.07592

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLSJWMDTL	4/10/2007	19.6245	40	18.04	0.292	0.0692
21FLSJWMSAVDRLKI	4/10/2007	17.8445	40	17.96	0.3087	0.0579
21FLSJWMDTL	4/23/2007	15.11887	30	20.79	0.89287	0.07365
21FLSJWMSAVDRLKI	4/23/2007	14.48475	30	20.66	0.93967	0.06579
21FLSJWMDTL	5/9/2007	20.559	30	22.35	1.01645	0.08988
21FLSJWMSAVDRLKI	5/9/2007	19.58	30	21.49	1.27057	0.1355
21FLSJWMDTL	5/21/2007	20.025	30	24.94	1.07624	0.10637
21FLSJWMSAVDRLKI	5/21/2007	17.9335	30	26.03	1.18747	0.12622
21FLSJWMDTL	6/11/2007	23.318	30	29.39	1.16105	0.13172
21FLSJWMSAVDRLKI	6/11/2007	8.4105	30	31.5	1.10121	0.09419
21FLSJWMDTL	6/25/2007	12.371	40	29.99	1.00311	0.15466
21FLSJWMSAVDRLKI	6/25/2007	22.0275	50	30.71	1.05325	0.16849
21FLSJWMDTL	7/9/2007	24.5195	50	29.75	1.15778	0.20612
21FLSJWMSAVDRLKI	7/9/2007	28.8805	50	30.25	1.14631	0.18025
21FLSJWMDTL	7/23/2007	34.265	50	28.335	1.28974	0.22893
21FLSJWMSAVDRLKI	7/23/2007	36.757	50	28.97	1.5688	0.30534
21FLSJWMDTL	8/7/2007	34.0425	50	30.79	1.31277	0.21378
21FLSJWMSAVDRLKI	8/7/2007	37.98075	50	32	1.39599	0.24225
21FLSJWMDTL	8/22/2007	38.359	50	31.18	1.28857	0.23284
21FLSJWMSAVDRLKI	8/22/2007	61.8105	50	32.17	1.63132	0.24514
21FLSJWMDTL	9/4/2007	58.94024	50	28.945	1.83095	0.21324
21FLSJWMSAVDRLKI	9/4/2007	61.54351	50	29.38	1.92155	0.22094
21FLSJWMDTL	9/18/2007	34.10925	50	27.23	1.62394	0.22673
21FLSJWMSAVDRLKI	9/18/2007	44.055	50	26.89	1.69446	0.22377
21FLBRA 2389-A	4/18/2008	-	-	21.56	-	-
21FLBRA 2389-B	4/22/2008	-	-	20.57	-	-
21FLBRA 2389-A	5/1/2008	-	-	24.01	-	-
21FLBRA 2389-B	5/1/2008	-	-	24.72	-	-
21FLBRA 2389-A	5/6/2008	-	-	29.09	-	-
21FLBRA 2389-A	5/15/2008	-	-	24.21	-	-
21FLBRA 2389-B	5/15/2008	-	-	22.3	-	-
21FLBRA 2389-A	5/23/2008	-	-	25.62	-	-
21FLBRA 2389-B	5/23/2008	-	-	24.17	-	-
21FLBRA 2389-C	5/23/2008	-	-	25.03	-	-
21FLSJWMDTL	5/28/2008	44.7225	60	26.37	1.5072	0.1136
21FLSJWMSAVDRLKI	5/28/2008	47.32575	60	26.45	1.5344	0.1156
21FLBRA 2389-A	5/29/2008	-	-	25.87	-	-
21FLBRA 2389-B	5/29/2008	-	-	24.56	-	-
21FLBRA 2389-C	5/29/2008	-	-	27.09	-	-
21FLSJWMDTL	6/9/2008	47.9265	60	29.58	1.4797	0.1502
21FLSJWMSAVDRLKI	6/9/2008	25.16475	60	31.87	1.5136	0.131
21FLBRA 2389-A	6/13/2008	-	-	29.37	-	-
21FLBRA 2389-B	6/13/2008	-	-	28.92	-	-
21FLBRA 2389-C	6/13/2008	-	-	29.3	-	-
21FLBRA 2389-A	6/17/2008	-	-	31.55	-	-
21FLBRA 2389-B	6/17/2008	-	-	30.19	-	-

Station	Sample Date	CHLAC (µg/L)	COLOR (PCUs)	TEMP (º C)	TN (mg/L)	TP (mg/L)
21FLBRA 2389-C	6/17/2008	-	-	29.36	-	-
21FLBRA 2389-A	6/23/2008	-	-	29.55	-	-
21FLSJWMDTL	6/23/2008	36.9795	50	28.51	1.37	0.1663
21FLSJWMSAVDRLKI	6/23/2008	47.32575	50	28.63	1.6255	0.1624
21FLSJWMDTL	7/8/2008	43.9215	50	29.48	1.5499	0.1585
21FLSJWMSAVDRLKI	7/8/2008	68.21851	60	28.78	1.8686	0.1668
21FLSJWMDTL	7/21/2008	62.67825	60	30.225	1.5694	0.1432
21FLSJWMSAVDRLKI	7/21/2008	80.56725	60	30.36	1.8612	0.1465
21FLSJWMDTL	8/11/2008	46.92525	70	29.905	1.3799	0.1253
21FLSJWMSAVDRLKI	8/11/2008	76.42875	60	30.59	1.8479	0.1301
21FLSJWMDTL	8/25/2008	37.60251	100	26.365	1.2104	0.086
21FLSJWMSAVDRLKI	8/25/2008	15.3525	100	25.8	1.4692	0.1472
21FLA 20030183	9/10/2008	50	200	29.6	1.704	0.1
21FLSJWMDTL	9/22/2008	15.95325	150	27.04	1.3688	0.0991
21FLSJWMSAVDRLKI	9/22/2008	30.37125	150	26.94	1.3738	0.1146

Appendix C: Kruskal–Wallis Analysis of DO, DOSAT, CHLAC, TN, TP, and BOD5 Observations versus Season in Swimming Pen Creek (WBID 2410)

Kruskal-Wallis One-Way Analysis of Variance for 180 cases
Dependent variable is DO
Grouping variable is SEASON$

Group	Count	Rank Sum
FALL	38	2792.500
SPRING	58	5718.500
SUMMER	45	3109.500
WINTER	39	4669.500

Kruskal-Wallis Test Statistic = 25.316
Probability is 0.000 assuming Chi-square distribution with 3 df

Kruskal-Wallis One-Way Analysis of Variance for 181 cases
Dependent variable is DOSAT
Grouping variable is SEASON$

Group	Count	Rank Sum
FALL	38	2459.000
SPRING	59	6439.000
SUMMER	45	3887.000
WINTER	39	3686.000

Kruskal-Wallis Test Statistic = 17.161
Probability is 0.001 assuming Chi-square distribution with 3 df

Kruskal-Wallis One-Way Analysis of Variance for 168 cases
Dependent variable is CHLAC
Grouping variable is SEASON$

Group	Count	Rank Sum
FALL	39	2092.500
SPRING	43	4306.000
SUMMER	46	5177.500
WINTER	40	2620.000

Kruskal-Wallis Test Statistic = 41.534
Probability is 0.000 assuming Chi-square distribution with 3 df

Kruskal-Wallis One-Way Analysis of Variance for 166 cases
Dependent variable is TN
Grouping variable is SEASON$

Group	Count	Rank Sum
FALL	36	2654.500
SPRING	44	3982.000
SUMMER	46	4441.500
WINTER	40	2783.000

Kruskal-Wallis Test Statistic = 9.170
Probability is 0.027 assuming Chi-square distribution with 3 df

Kruskal-Wallis One-Way Analysis of Variance for 177 cases
Dependent variable is TP
Grouping variable is SEASON$

Group	Count	Rank Sum
FALL	39	3251.500
SPRING	46	4204.500
SUMMER	50	5536.000
WINTER	42	2761.000

Kruskal-Wallis Test Statistic = 18.214
Probability is 0.000 assuming Chi-square distribution with 3 df

Kruskal-Wallis One-Way Analysis of Variance for 118 cases
Dependent variable is BOD
Grouping variable is SEASON$

Group	Count	Rank Sum
FALL	27	1016.500
SPRING	31	2419.000
SUMMER	31	2367.000
WINTER	29	1218.500

Kruskal-Wallis Test Statistic = 35.335
Probability is 0.000 assuming Chi-square distribution with 3 df

Appendix D: Kruskal–Wallis Analysis of DO, DOSAT, CHLAC, TN, TP, and BOD5 Observations versus Month in Swimming Pen Creek (WBID 2410)

Kruskal-Wallis One-Way Analysis of Variance for 180 cases
Dependent variable is DO
Grouping variable is MONTH

Group	Count	Rank Sum
1	13	1716.000
2	14	1580.000
3	12	1373.500
4	18	2004.500
5	21	2218.000
6	19	1496.000
7	14	1350.000
8	15	893.500
9	16	866.000
10	13	651.000
11	14	1156.500
12	11	985.000

Kruskal-Wallis Test Statistic = 40.398
Probability is 0.000 assuming Chi-square distribution with 11 df

Kruskal-Wallis One-Way Analysis of Variance for 181 cases
Dependent variable is DOSAT
Grouping variable is MONTH

Group	Count	Rank Sum
1	13	1219.000
2	14	1220.000
3	12	1247.000
4	18	2064.000
5	21	2480.000
6	20	1895.000
7	14	1651.000
8	15	1142.000
9	16	1094.000
10	13	726.000
11	14	1019.000
12	11	714.000

Kruskal-Wallis Test Statistic = 28.394
Probability is 0.003 assuming Chi-square distribution with 11 df

Kruskal-Wallis One-Way Analysis of Variance for 168 cases
Dependent variable is CHLAC
Grouping variable is MONTH

Group	Count	Rank Sum
1	13	885.000
2	14	900.500
3	13	834.500
4	14	932.000
5	14	1343.500
6	15	2030.500
7	15	1926.000
8	15	1691.500
9	16	1560.000
10	13	875.500
11	14	687.500
12	12	529.500

Kruskal-Wallis Test Statistic = 60.964
Probability is 0.000 assuming Chi-square distribution with 11 df

Kruskal-Wallis One-Way Analysis of Variance for 166 cases
Dependent variable is TN
Grouping variable is MONTH

Group	Count	Rank Sum
1	12	875.500
2	14	937.500
3	14	970.000
4	14	818.500
5	14	1301.500
6	16	1862.000
7	14	1184.500
8	16	1760.000
9	16	1497.000
10	13	882.000
11	11	817.000
12	12	955.500

Kruskal-Wallis Test Statistic = 22.721
Probability is 0.019 assuming Chi-square distribution with 11 df

Kruskal-Wallis One-Way Analysis of Variance for 177 cases
Dependent variable is TP
Grouping variable is MONTH

Group	Count	Rank Sum
1	12	843.500
2	15	764.000
3	15	1153.500
4	14	890.500
5	15	1356.000
6	17	1958.000
7	16	1612.500
8	17	2005.000
9	17	1918.500
10	13	1285.500
11	14	1022.500
12	12	943.500

Kruskal-Wallis Test Statistic = 30.893
Probability is 0.001 assuming Chi-square distribution with 11 df

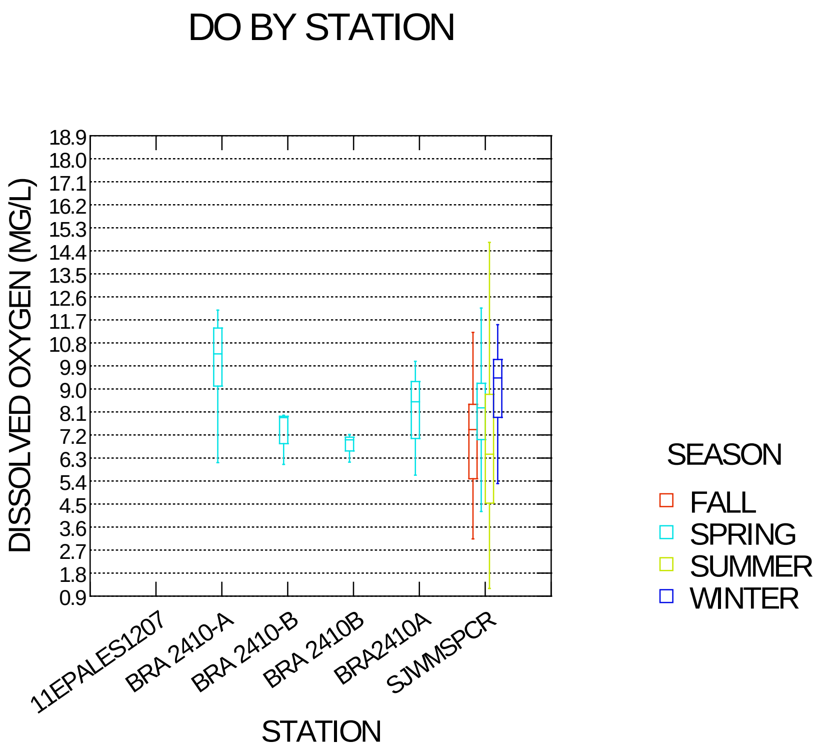
Kruskal-Wallis One-Way Analysis of Variance for 118 cases
Dependent variable is BOD
Grouping variable is MONTH

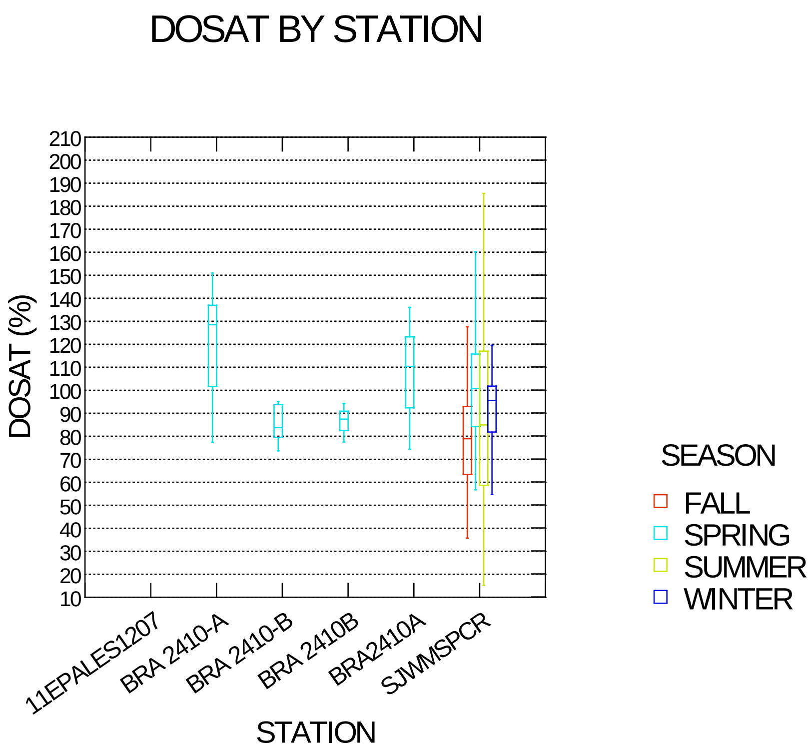
Group	Count	Rank Sum
1	9	385.500
2	9	311.000
3	11	522.000
4	9	470.000
5	10	827.500
6	12	1121.500
7	10	846.000
8	11	887.500
9	10	633.500
10	11	479.000
11	8	217.000
12	8	320.500

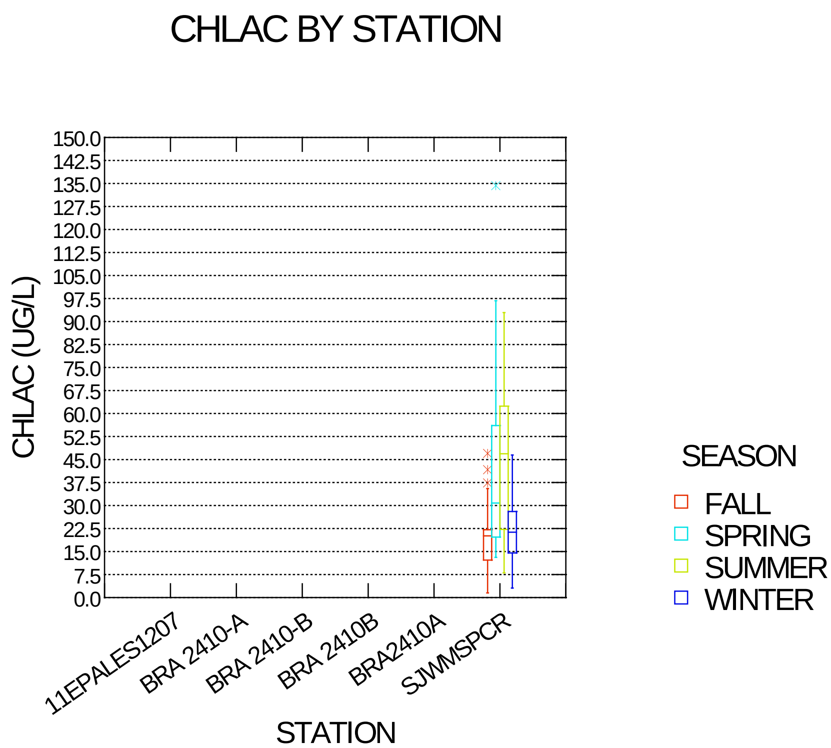
Kruskal-Wallis Test Statistic = 47.166
Probability is 0.000 assuming Chi-square distribution with 11 df

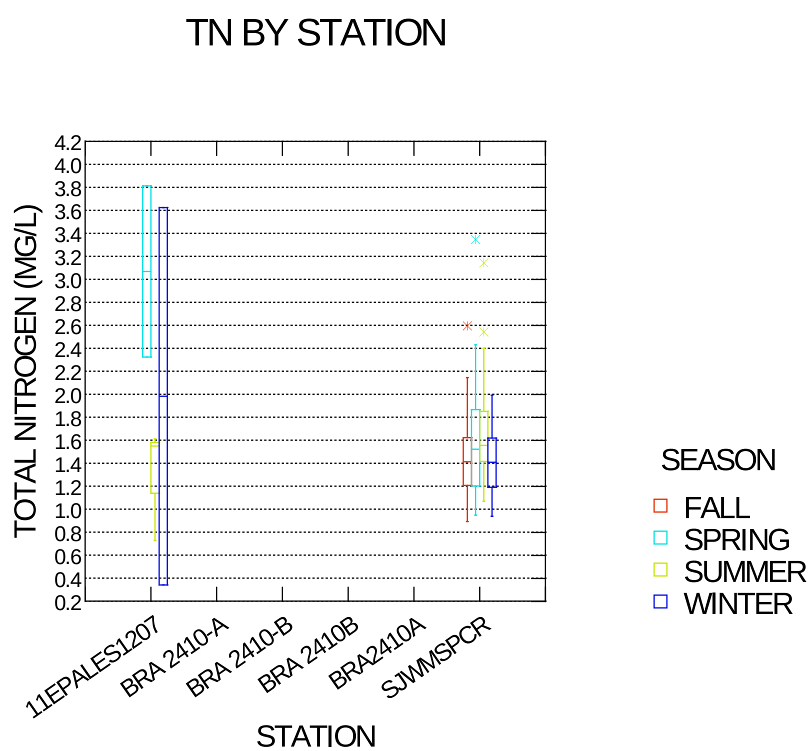
Appendix E: Chart of DO, DOSAT, CHLAC, TN, and TP Observations by Season, Station, and Year in Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389)

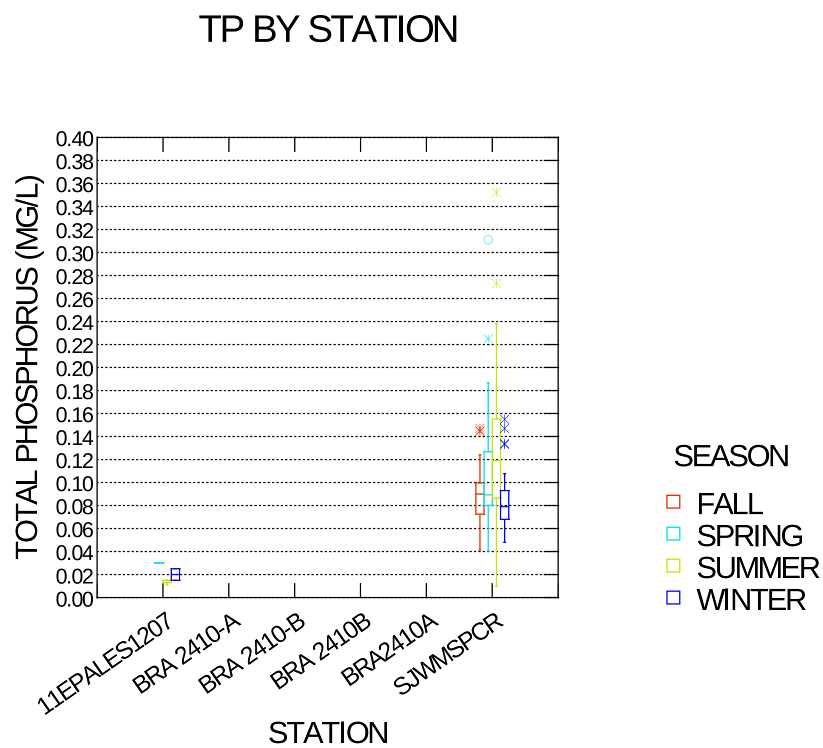
Swimming Pen Creek

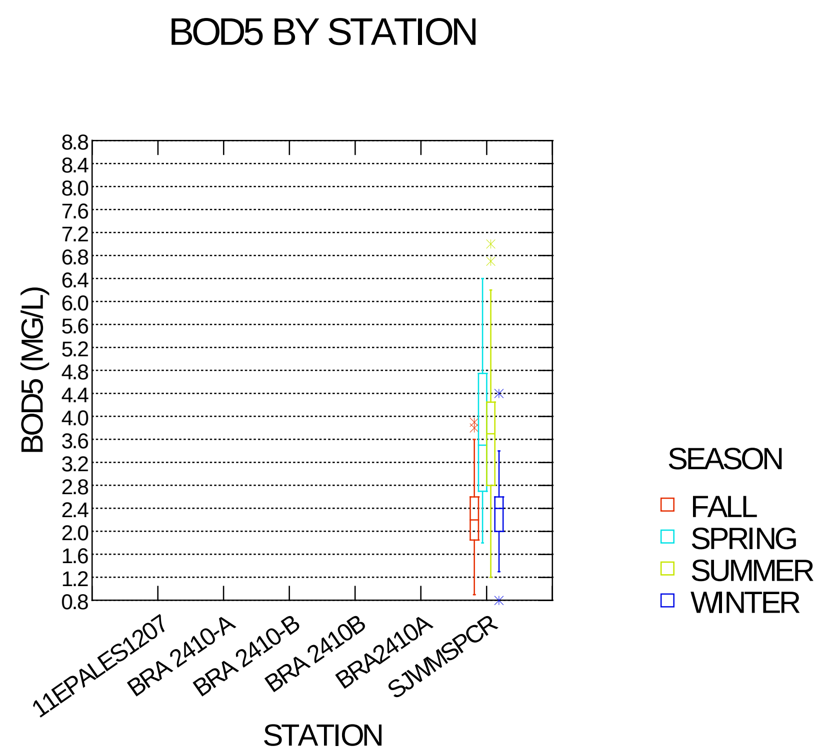


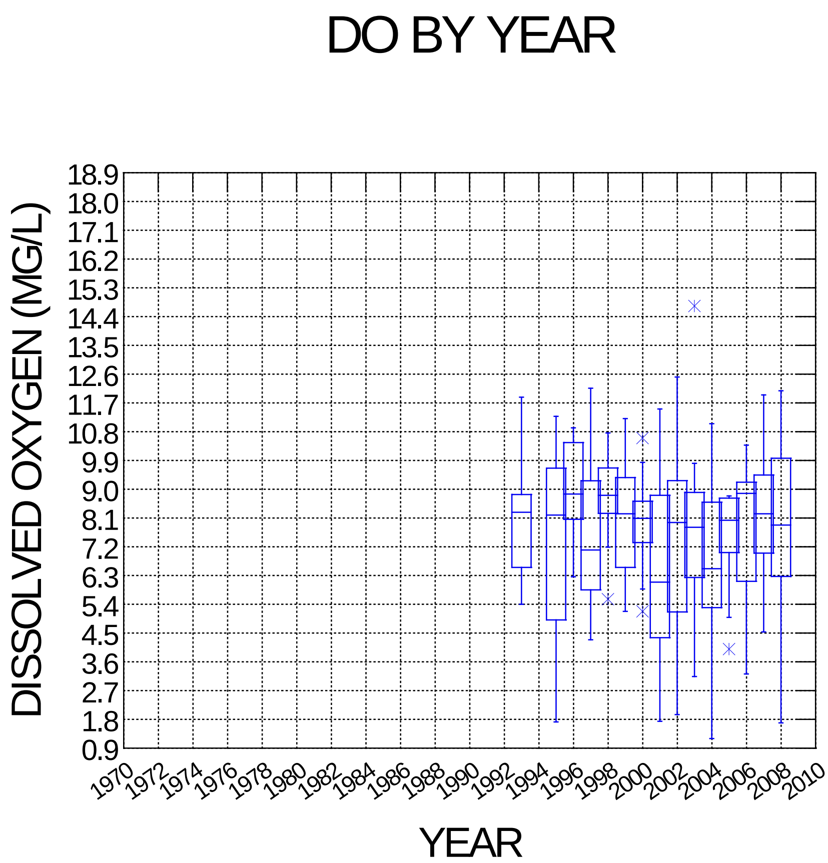

DOSAT BY STATION
DOSAT (%)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
11EPALES1207
BRA 2410-A
BRA 2410-B
BRA 2410B
BRA2410A
SJWMSPCR
STATION
SEASON
FALL
SPRING
SUMMER
WINTER

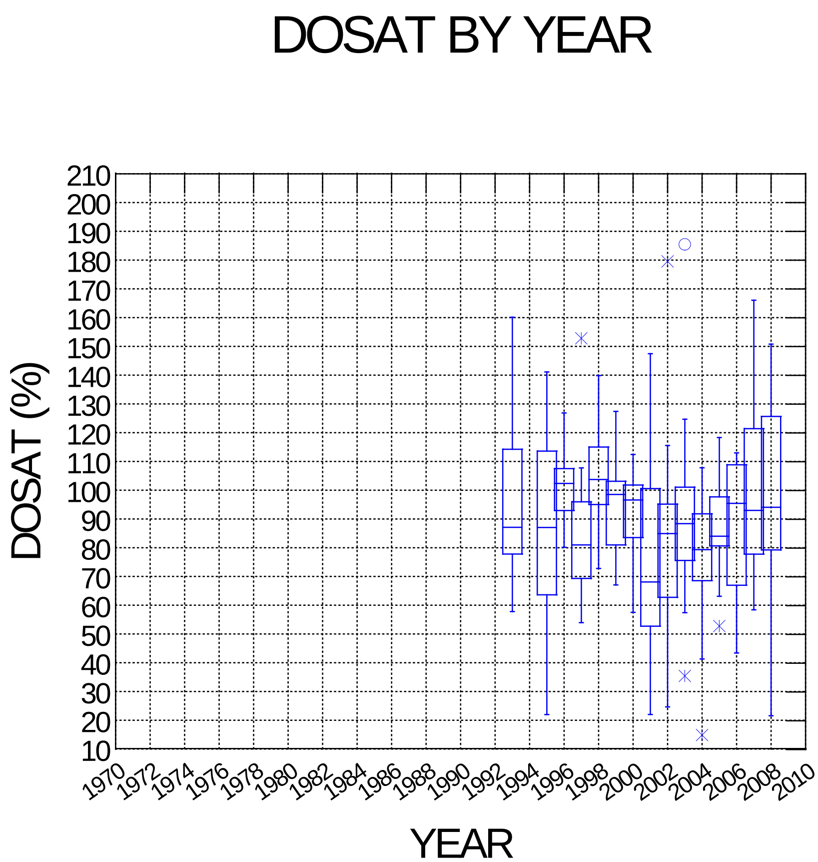

CHLAC BY STATION
CHLAC (UG/L)
150.0
142.5
135.0
127.5
120.0
112.5
105.0
97.5
90.0
82.5
75.0
67.5
60.0
52.5
45.0
37.5
30.0
22.5
15.0
7.5
0.0
11EPALES1207
BRA 2410-A
BRA 2410-B
BRA 2410B
BRA2410A
SJWMSPCR
STATION
SEASON
FALL
SPRING
SUMMER
WINTER

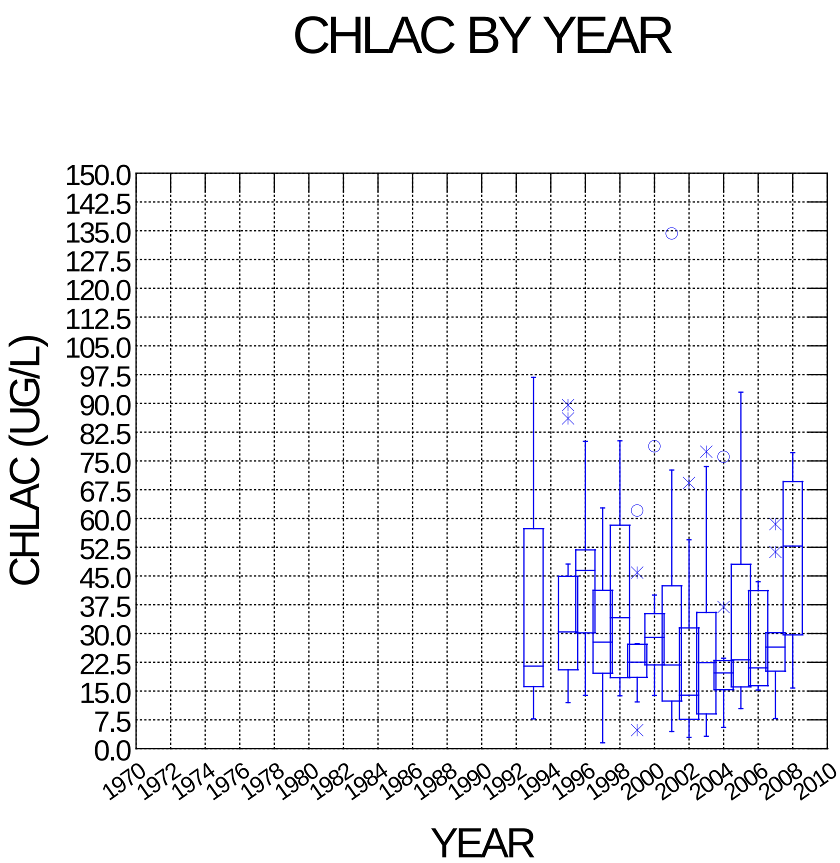

TN BY STATION
TOTAL NITROGEN (MG/L)
4.2
4.0
3.8
3.6
3.4
3.2
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
11EPALES1207
BRA 2410-A
BRA 2410-B
BRA 2410B
BRA2410A
SJWMSPCR
STATION
SEASON
FALL
SPRING
SUMMER
WINTER


TP BY STATION
TOTAL PHOSPHORUS (MG/L)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
0.22
0.24
0.26
0.28
0.30
0.32
0.34
0.36
0.38
0.40
11EPALES1207
BRA 2410-A
BRA 2410-B
BRA 2410B
BRA2410A
SJWMSPCR
STATION
SEASON
FALL
SPRING
SUMMER
WINTER

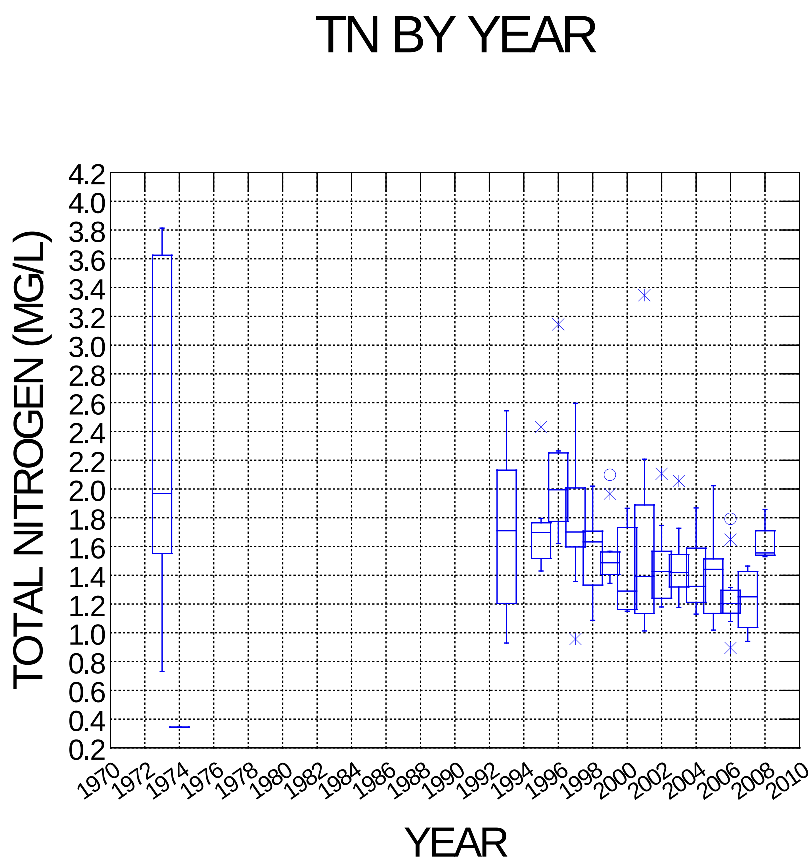

BOD5 BY STATION
BOD5 (MG/L)
0.8
1.2
1.6
2.0
2.4
2.8
3.2
3.6
4.0
4.4
4.8
5.2
5.6
6.0
6.4
6.8
7.2
7.6
8.0
8.4
8.8
11EPALES1207
BRA 2410-A
BRA 2410-B
BRA 2410B
BRA2410A
SJWMSPCR
STATION
SEASON
FALL
SPRING
SUMMER
WINTER

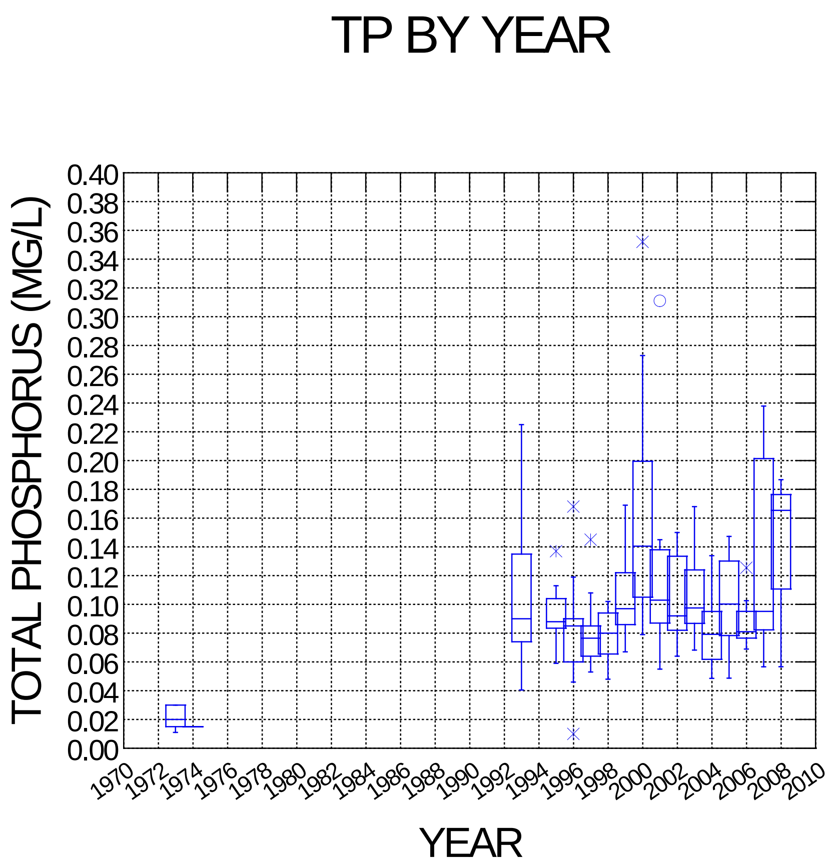

DO BY YEAR
DISSOLVED OXYGEN (MG/L)
18.9
18.0
17.1
16.2
15.3
14.4
13.5
12.6
11.7
10.8
9.9
9.0
8.1
7.2
6.3
5.4
4.5
3.6
2.7
1.8
0.9
1970 1972 1974 1976 1978 1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010
YEAR

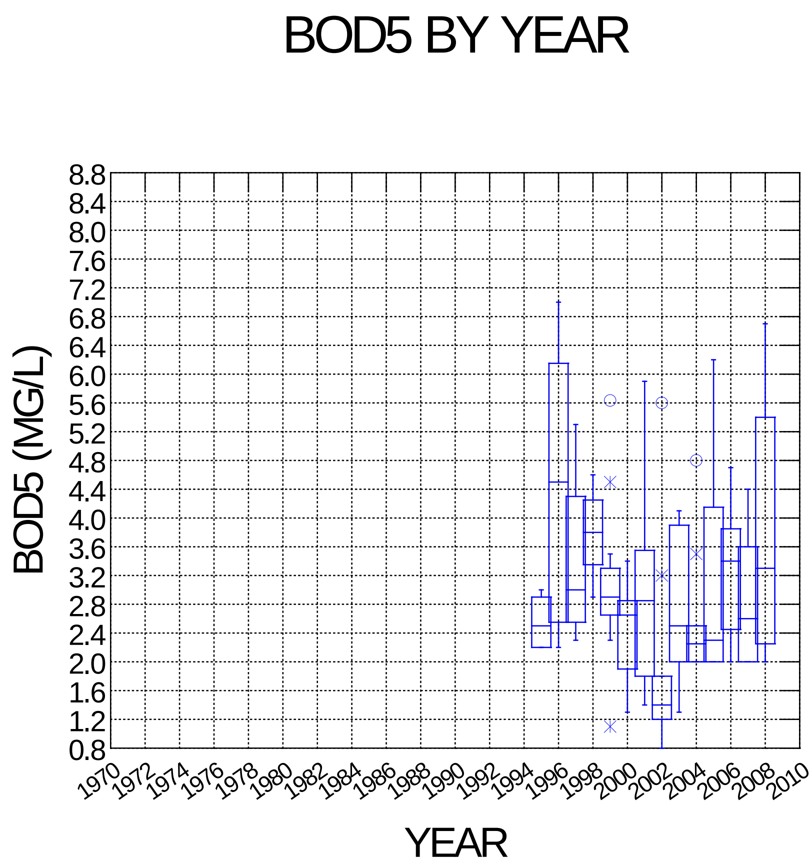

DOSAT BY YEAR
DOSAT (%)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
YEAR

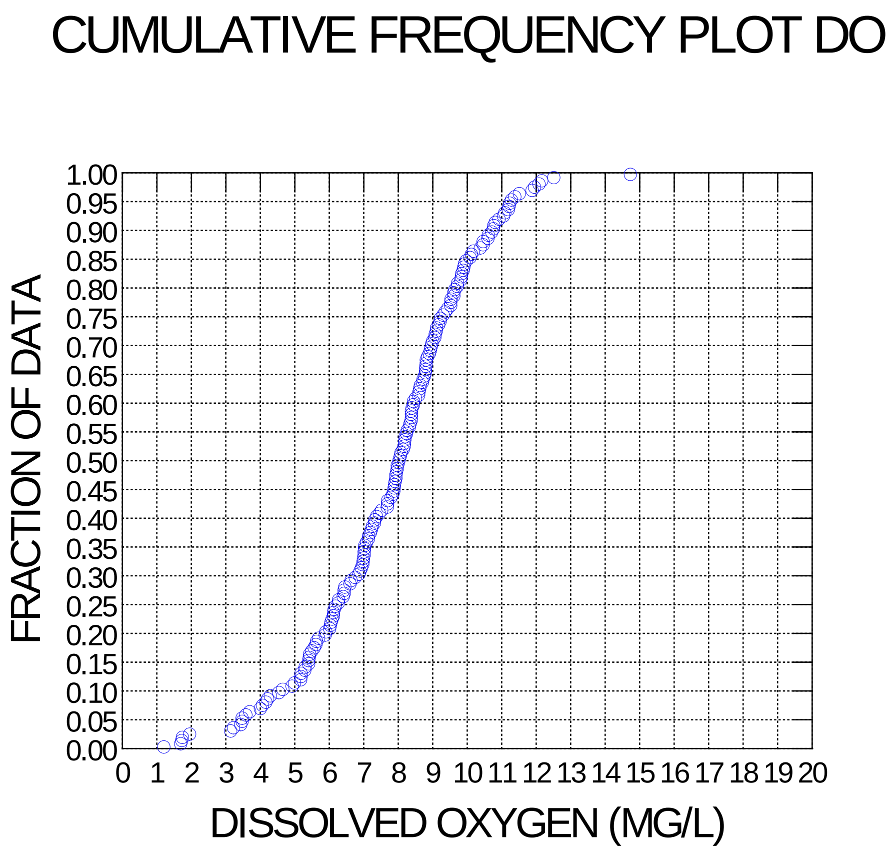


CHLAC BY YEAR
CHLAC (UG/L)
150.0
142.5
135.0
127.5
120.0
112.5
105.0
97.5
90.0
82.5
75.0
67.5
60.0
52.5
45.0
37.5
30.0
22.5
15.0
7.5
0.0
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
YEAR

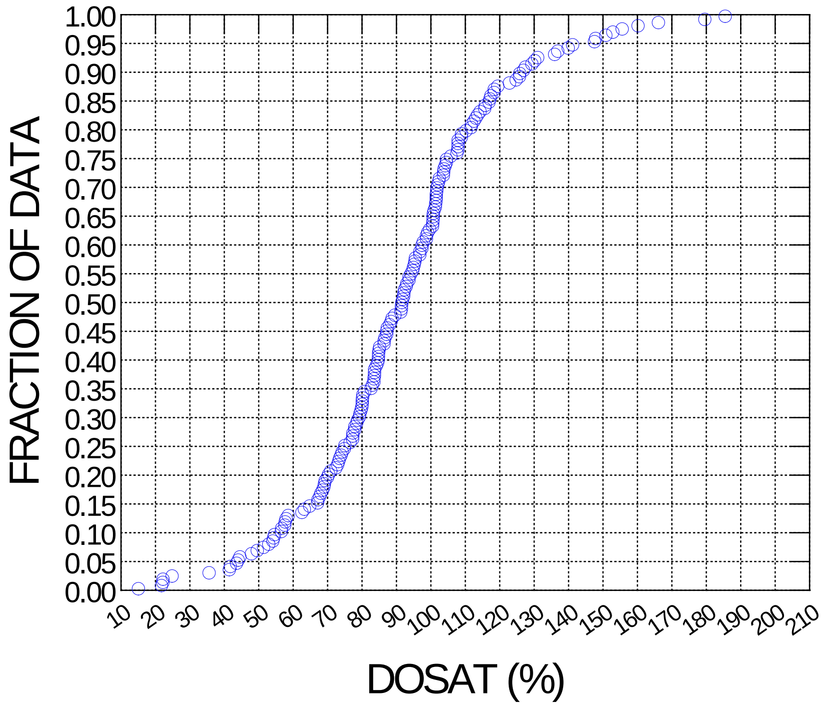

TN BY YEAR
TOTAL NITROGEN (MG/L)
4.2
4.0
3.8
3.6
3.4
3.2
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
YEAR

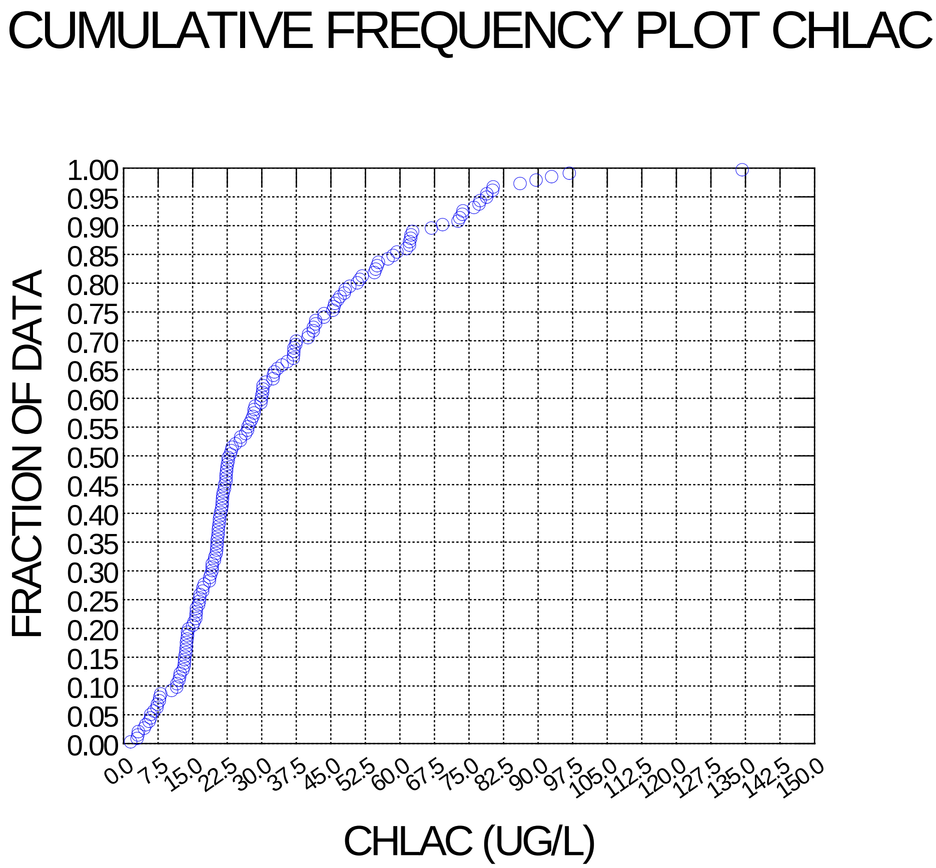

TP BY YEAR
TOTAL PHOSPHORUS (MG/L)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
0.22
0.24
0.26
0.28
0.30
0.32
0.34
0.36
0.38
0.40
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
YEAR

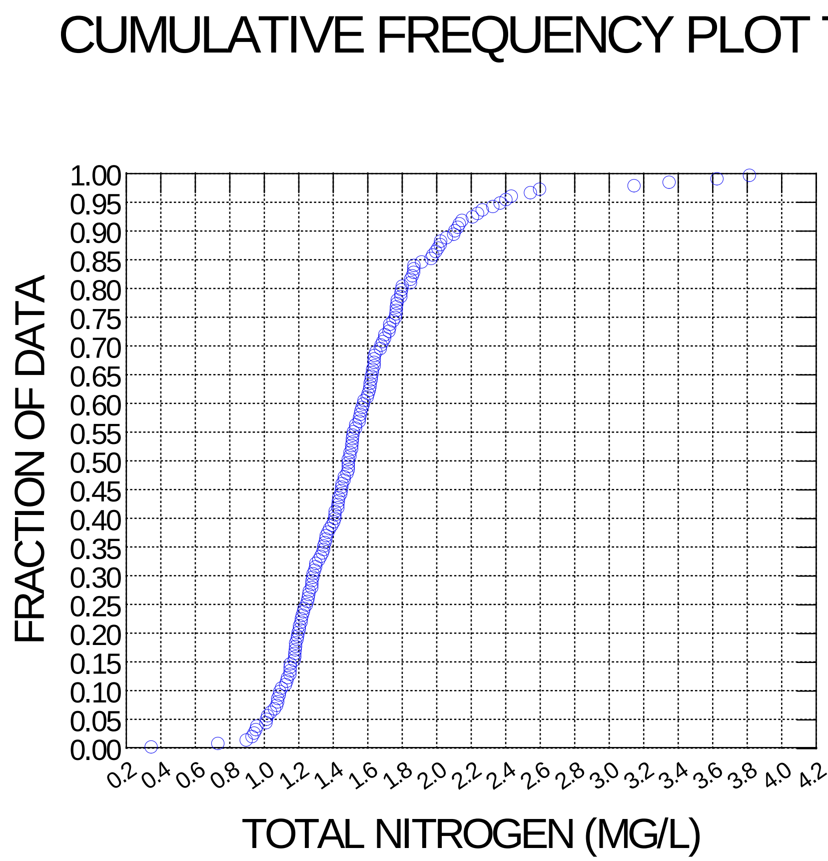

BOD5 BY YEAR
BOD5 (MG/L)
8.8
8.4
8.0
7.6
7.2
6.8
6.4
6.0
5.6
5.2
4.8
4.4
4.0
3.6
3.2
2.8
2.4
2.0
1.6
1.2
0.8
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
YEAR

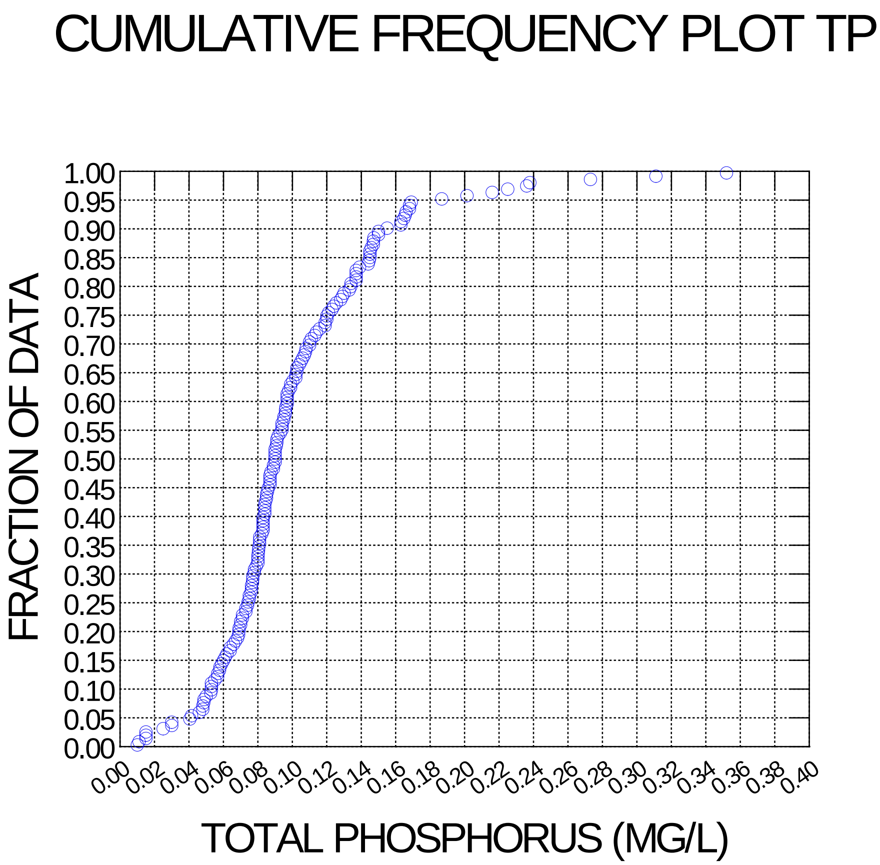

CUMULATIVE FREQUENCY PLOT DO
FRACTION OF DATA
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
DISSOLVED OXYGEN (MG/L)

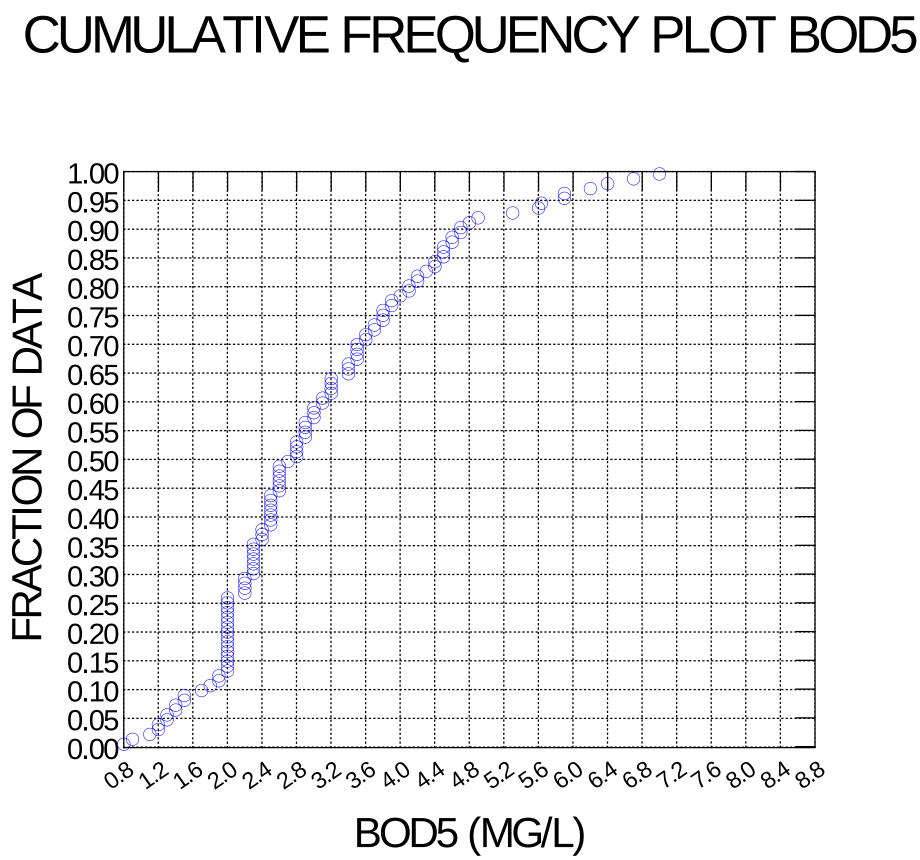
CUMULATIVE FREQUENCY PLOT DOSAT



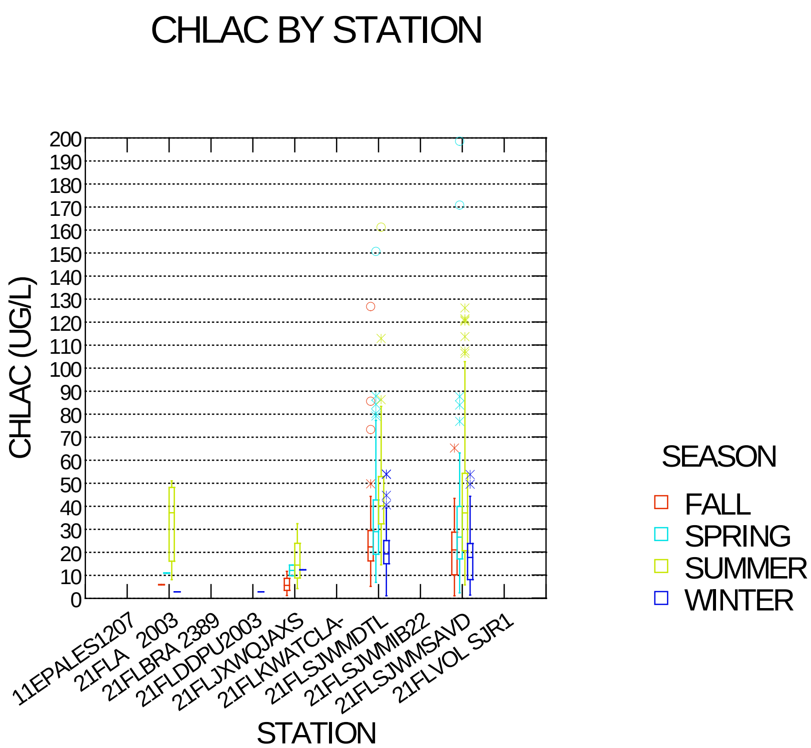

CUMULATIVE FREQUENCY PLOT CHLAC
FRACTION OF DATA
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0
7.5
15.0
22.5
30.0
37.5
45.0
52.5
60.0
67.5
75.0
82.5
90.0
97.5
105.0
112.5
120.0
127.5
135.0
142.5
150.0
CHLAC (UG/L)


CUMULATIVE FREQUENCY PLOT TN
FRACTION OF DATA
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4 2.6 2.8 3.0 3.2 3.4 3.6 3.8 4.0 4.2
TOTAL NITROGEN (MG/L)

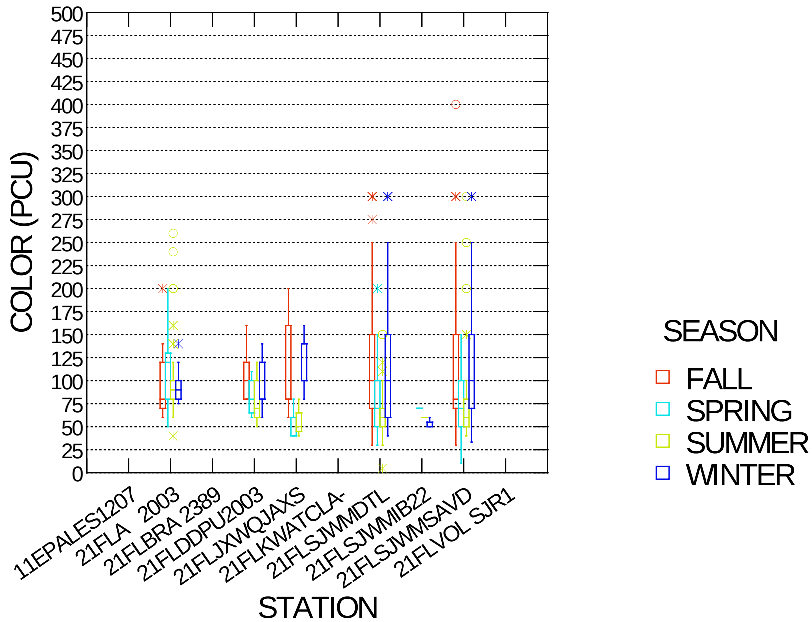

CUMULATIVE FREQUENCY PLOT TP
FRACTION OF DATA
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
0.22
0.24
0.26
0.28
0.30
0.32
0.34
0.36
0.38
0.40
TOTAL PHOSPHORUS (MG/L)


CUMULATIVE FREQUENCY PLOT BOD5
FRACTION OF DATA
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.8
1.2
1.6
2.0
2.4
2.8
3.2
3.6
4.0
4.4
4.8
5.2
5.6
6.0
6.4
6.8
7.2
7.6
8.0
8.4
8.8
BOD5 (MG/L)

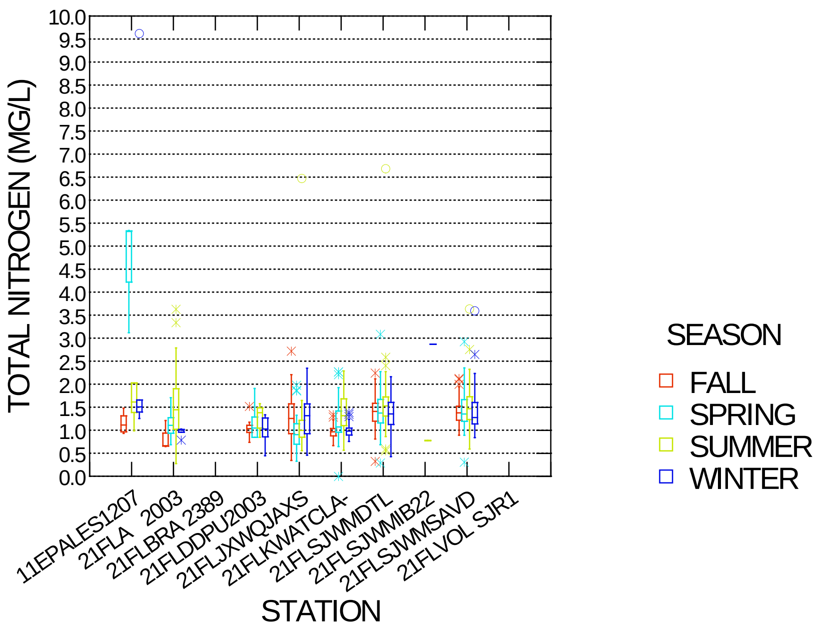
Doctors Lake

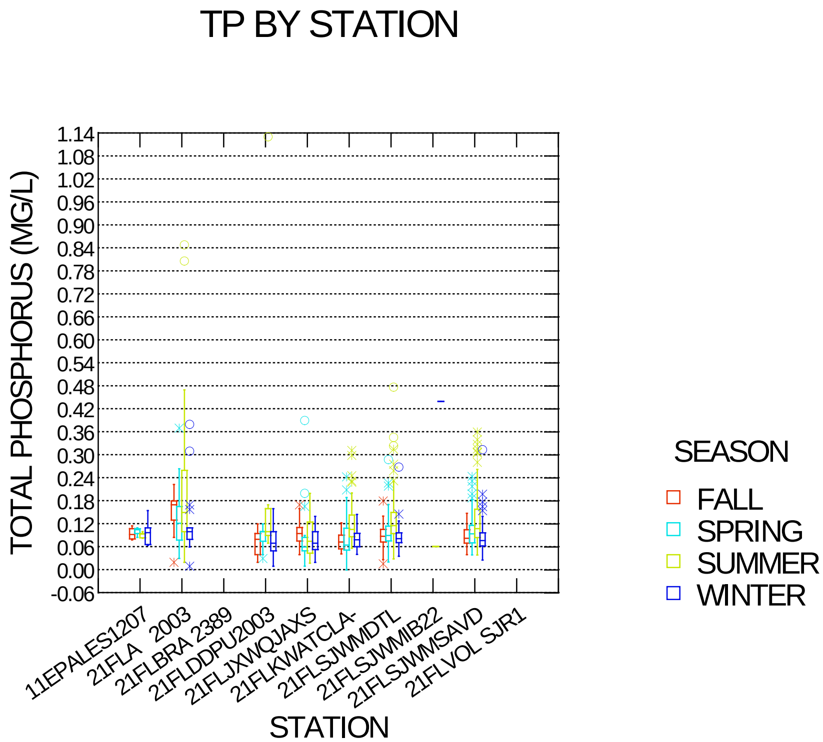


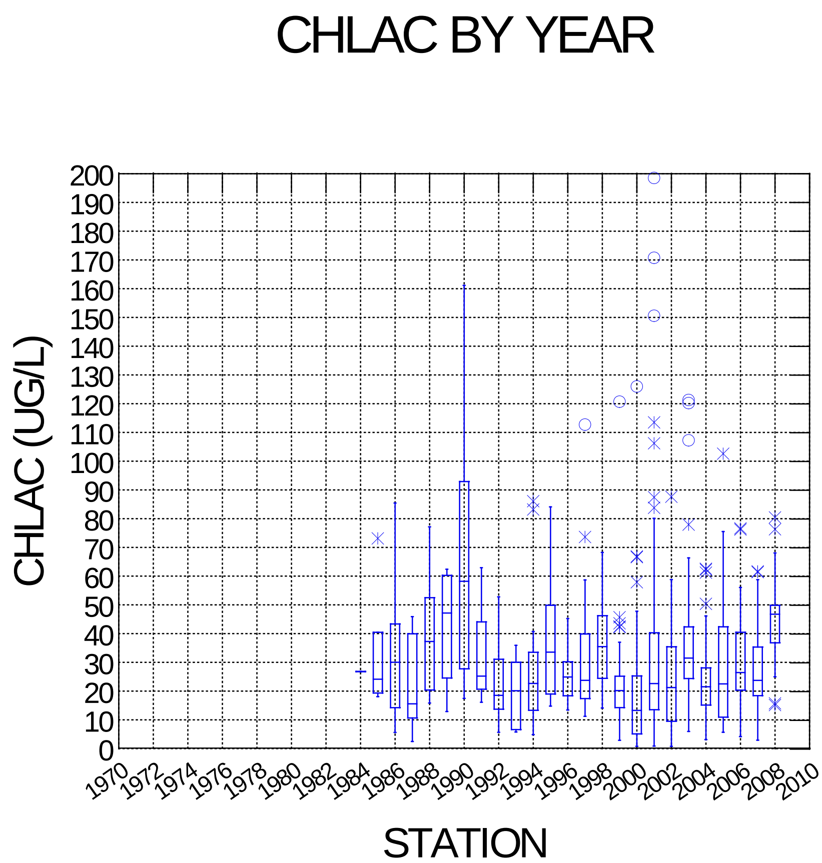
COLOR BY STATION

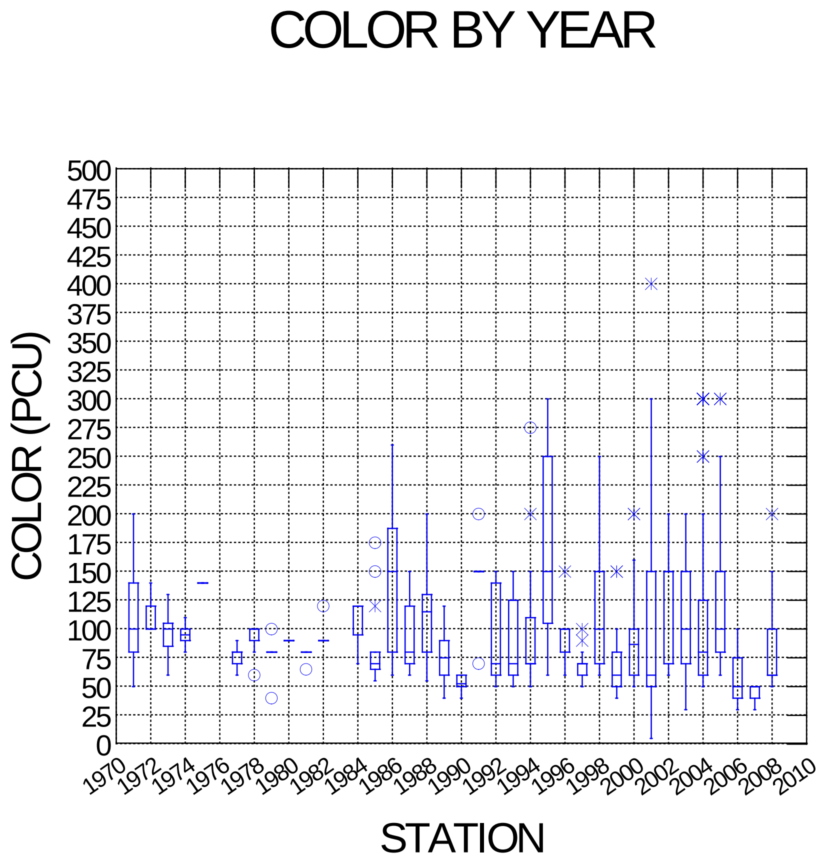


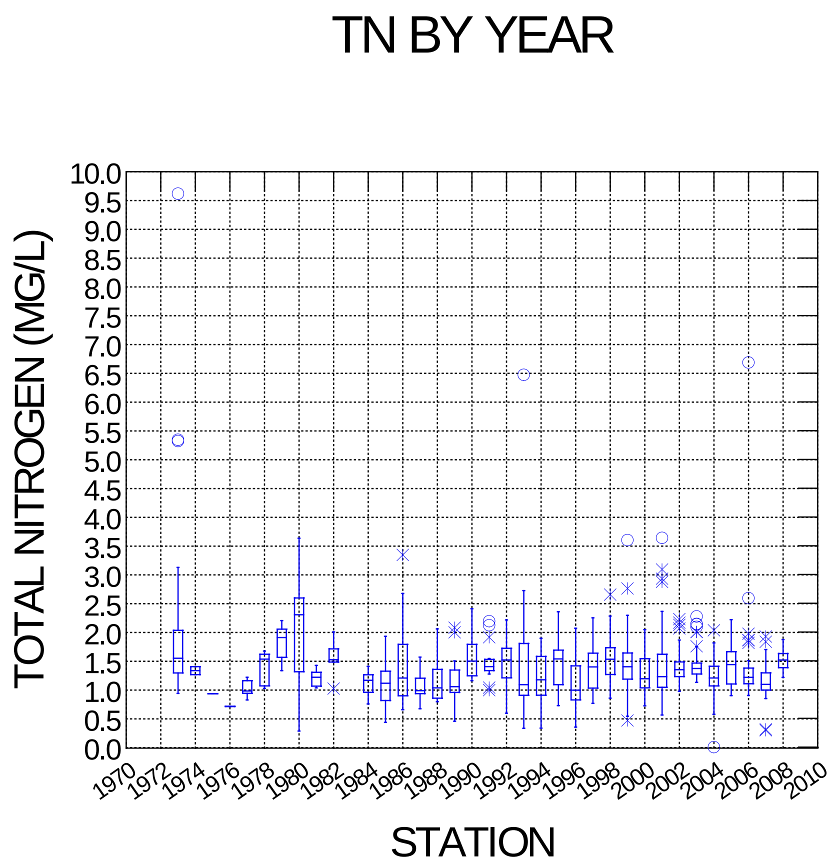
TN BY STATION

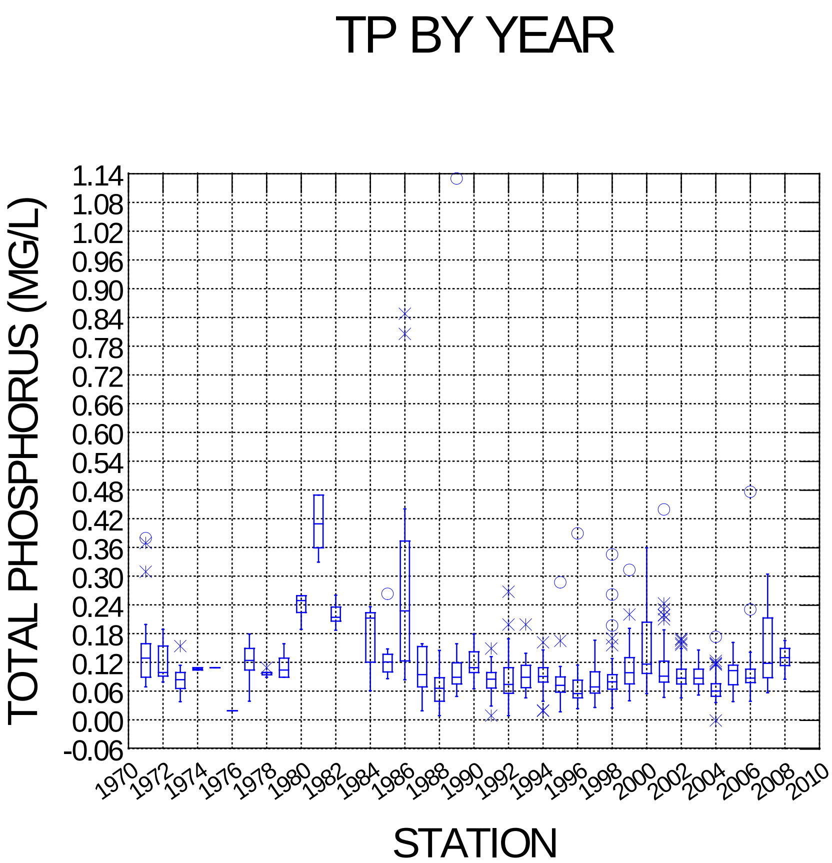



TP BY STATION
TOTAL PHOSPHORUS (MG/L)
1.14
1.08
1.02
0.96
0.90
0.84
0.78
0.72
0.66
0.60
0.54
0.48
0.42
0.36
0.30
0.24
0.18
0.12
0.06
0.00
-0.06
11EPALES1207
21FLA 2003
21FLBRA 2389
21FLDDPU2003
21FLJXWQJAXS
21FLKWATCLA-
21FLSJWMDTL
21FLSJWMIB22
21FLSJWMSAVD
21FLVOL SJR1
STATION
SEASON
FALL
SPRING
SUMMER
WINTER

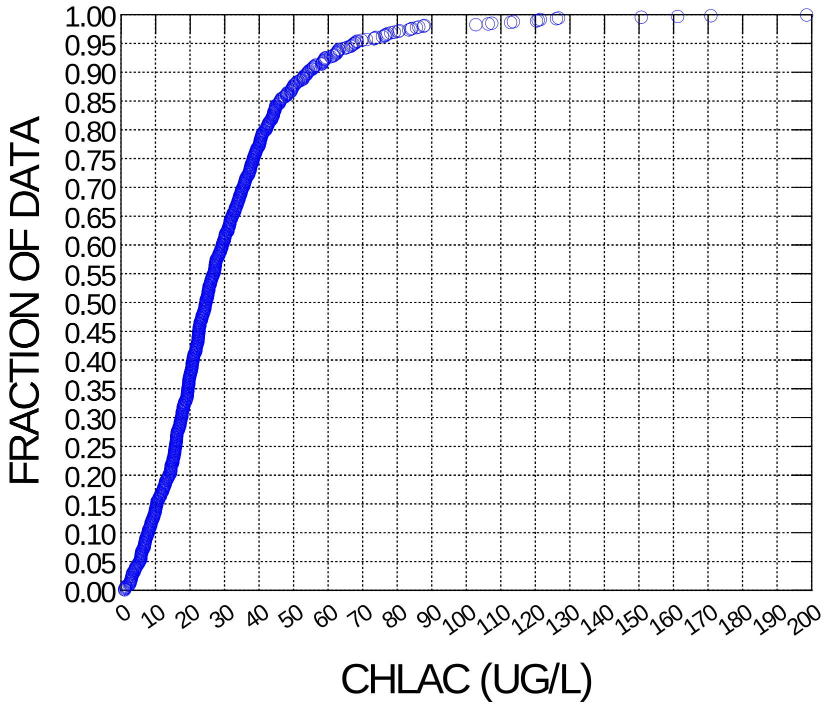

CHLAC BY YEAR
CHLAC (UG/L)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
STATION

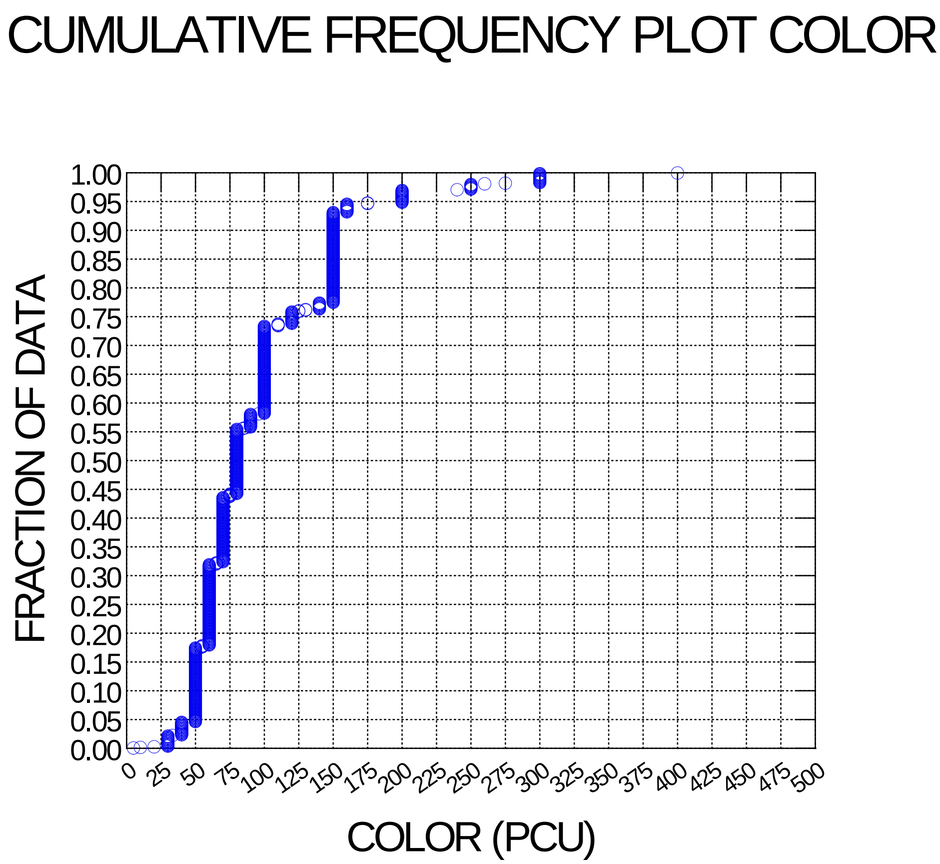

COLOR BY YEAR
COLOR (PCU)
500
475
450
425
400
375
350
325
300
275
250
225
200
175
150
125
100
75
50
25
0
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
STATION

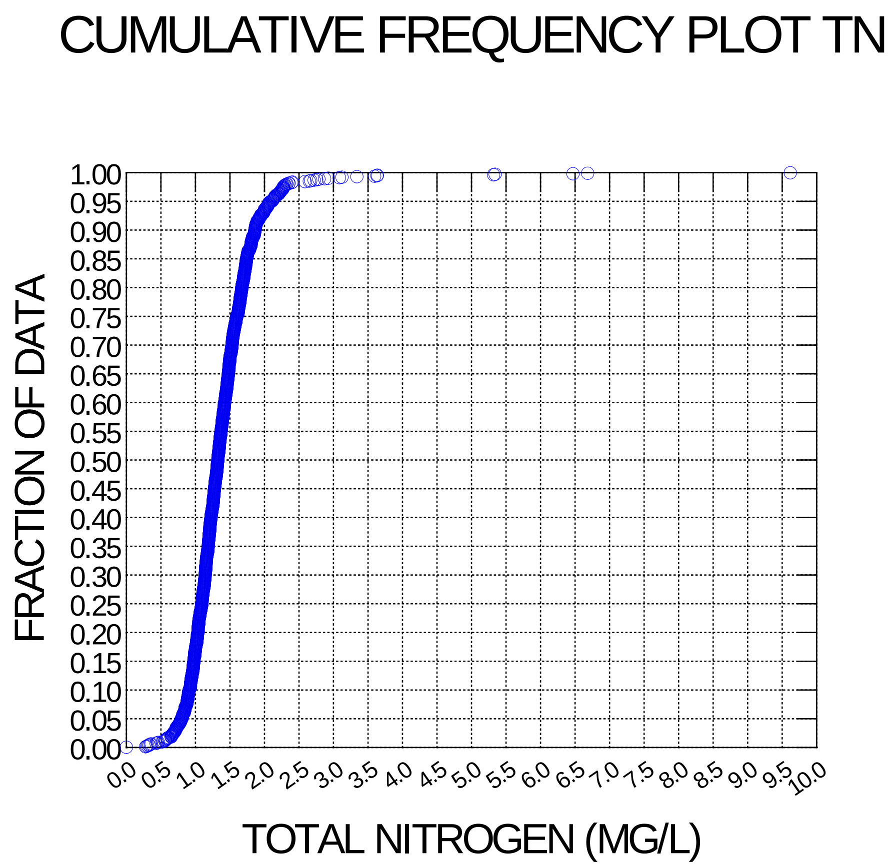

TN BY YEAR
TOTAL NITROGEN (MG/L)
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1970 1972 1974 1976 1978 1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010
STATION

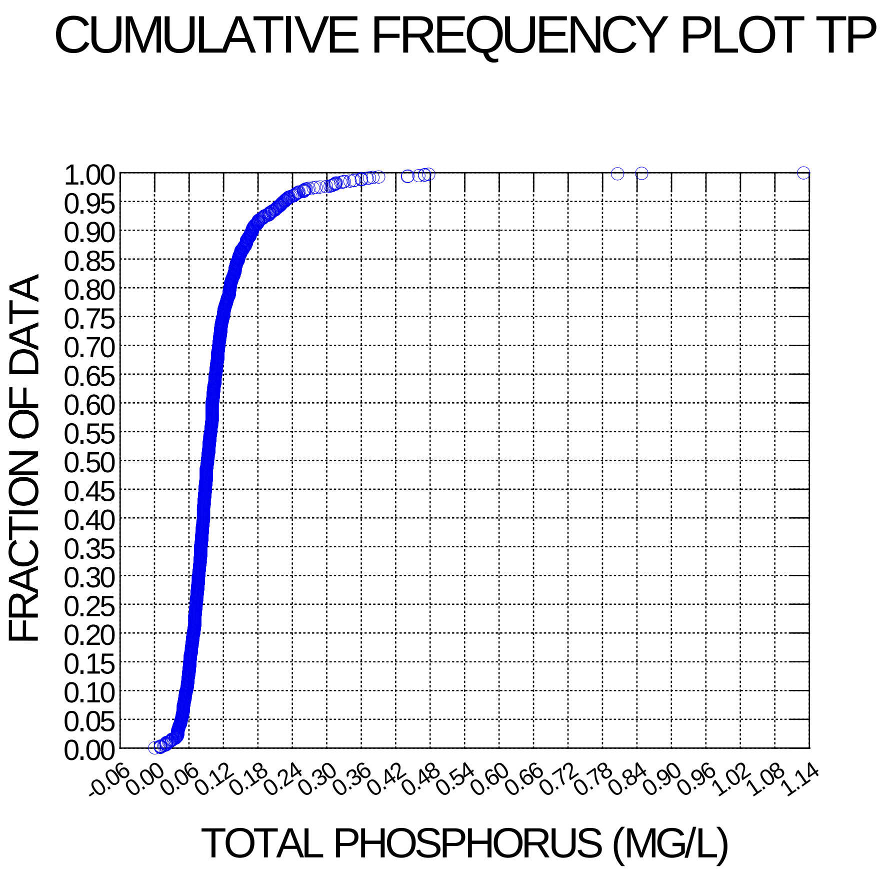

TP BY YEAR
TOTAL PHOSPHORUS (MG/L)
1.14
1.08
1.02
0.96
0.90
0.84
0.78
0.72
0.66
0.60
0.54
0.48
0.42
0.36
0.30
0.24
0.18
0.12
0.06
0.00
-0.06
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
STATION

CUMULATIVE FREQUENCY PLOT CHLAC

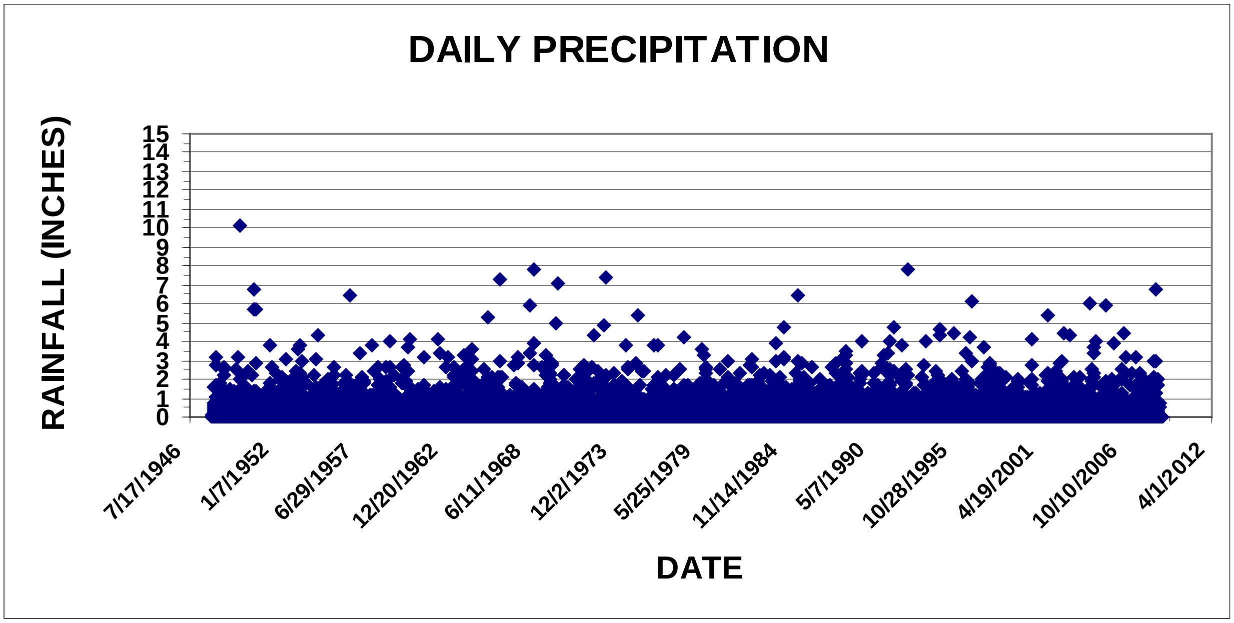



CUMULATIVE FREQUENCY PLOT COLOR
FRACTION OF DATA
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
25
50
75
100
125
150
175
200
225
250
275
300
325
350
375
400
425
450
475
500
COLOR (PCU)


CUMULATIVE FREQUENCY PLOT TN
FRACTION OF DATA
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0
TOTAL NITROGEN (MG/L)


CUMULATIVE FREQUENCY PLOT TP
FRACTION OF DATA
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
-0.06
0.00
0.06
0.12
0.18
0.24
0.30
0.36
0.42
0.48
0.54
0.60
0.66
0.72
0.78
0.84
0.90
0.96
1.02
1.08
1.14
TOTAL PHOSPHORUS (MG/L)

Appendix F: Chart of Rainfall for JIA, 1948–2008



Appendix G: Spearman Correlation Matrix Analysis for Water Quality Parameters in Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389)

Swimming Pen Creek

Spearman correlation matrix

- = Empty cell/no data

PARM	JULIANDATE	BOD	CHLAC	CHLOR	COLOR
JULIANDATE	1	-	-	-	-
BOD	-0.125	1	-	-	-
CHLAC	-0.114	0.788	1	-	-
CHLOR	0.141	0.193	0.24	1	-
COLOR	-0.134	-0.377	-0.304	-0.6	1
COND	0.123	0.221	0.242	0.937	-0.591
DO	-0.087	0.253	0.219	-0.106	-0.221
NH4	0.117	-0.342	-0.381	0.078	0.176
NO3O2	0.067	-0.417	-0.406	-0.306	0.449
PH	0.32	0.39	0.424	0.112	-0.357
SALIN	0	0.254	0.285	0.954	-0.512
SO4	0.137	0.209	0.255	0.984	-0.659
TEMP	0.087	0.609	0.537	0.462	-0.269
TKN	-0.341	0.566	0.529	-0.024	0.066
TN	-0.377	0.515	0.394	-0.095	0.151
TOC	-0.102	-0.28	-0.283	-0.42	0.738
TP	0.215	0.193	0.293	0.256	0.024
TSS	-0.085	0.499	0.567	0.273	-0.399
TURB	-0.023	0.494	0.572	-0.01	-0.206

PARM	COND	DO	NH4	NO3O2	PH
COND	1	-	-	-	-
DO	0.008	1	-	-	-
NH4	0.052	-0.367	1	-	-
NO3O2	-0.288	-0.048	0.544	1	-
PH	0.148	0.544	-0.272	-0.198	1
SALIN	0.99	0.116	0.054	-0.231	0.18
SO4	0.927	-0.045	0.045	-0.319	0.152
TEMP	0.398	-0.213	-0.143	-0.43	0.09
TKN	-0.044	0.032	-0.012	-0.137	0.133
TN	-0.117	0.002	0.1	0.036	0.064
TOC	-0.438	-0.352	0.155	0.209	-0.37
TP	0.226	-0.178	0.153	0.033	-0.026
TSS	0.222	0.11	-0.235	-0.352	0.331
TURB	-0.051	0.213	-0.3	-0.285	0.424

Spearman correlation matrix cont.

PARM	SALIN	SO4	TEMP	TKN	TN
SALIN	1	-	-	-	-
SO4	0.948	1	-	-	-
TEMP	0.357	0.444	1	--	-
TKN	0.07	-0.059	0.387	1	-
TN	0.035	-0.134	0.252	0.947	1
TOC	-0.457	-0.469	-0.132	0.066	0.138
TP	0.162	0.222	0.429	0.322	0.289
TSS	0.182	0.302	0.395	0.357	0.255
TURB	-0.063	0.015	0.31	0.41	0.366

PARM	TOC	TP	TSS	TURB	-
TOC	1	-	-	-	-
TP	-0.042	1	-	-	-
TSS	-0.318	0.211	1	-	-
TURB	-0.181	0.208	0.635	1	-

Pair-wise frequency table

PARM	JULIANDATE	BOD	CHLAC	CHLOR	COLOR
JULIANDATE	196	-	-	-	-
BOD	118	118	-	-	-
CHLAC	168	116	168	-	-
CHLOR	171	118	168	171	-
COLOR	170	117	167	170	170
COND	186	117	166	169	168
DO	180	113	160	163	162
NH4	171	113	160	163	162
NO3O2	166	112	155	158	157
PH	182	113	163	165	164
SALIN	109	80	90	92	91
SO4	170	116	166	169	168
TEMP	186	116	165	168	167
TKN	179	118	168	171	170
TN	166	112	155	158	157
TOC	170	118	166	169	168
TP	177	118	167	170	169
TSS	171	117	167	170	169
TURB	171	118	168	171	170

PARM	COND	DO	NH4	NO3O2	PH
COND	186	-	-	-	-
DO	180	180	-	-	-
NH4	161	155	171	-	-
NO3O2	156	150	160	166	-
PH	182	178	157	152	182
SALIN	109	107	91	91	108
SO4	167	161	162	157	163
TEMP	185	180	161	156	182
TKN	169	163	171	166	165
TN	156	150	160	166	152
TOC	167	161	162	158	163
TP	168	162	169	164	164
TSS	168	162	163	158	164
TURB	169	163	163	158	165

Pair-wise frequency table cont.

PARM	SALIN	SO4	TEMP	TKN	TN
SALIN	109	-	-	-	-
SO4	90	170	-	-	-
TEMP	109	167	186	-	-
TKN	92	170	169	179	-
TN	91	157	156	166	166
TOC	92	168	167	170	158
TP	91	168	167	177	164
TSS	91	170	168	171	158
TURB	92	169	168	171	158

PARM	TOC	TP	TSS	TURB	-
TOC	170	-	-	-	-
TP	168	177	-	-	-
TSS	169	169	171	-	-
TURB	169	170	170	171	-

Doctors Lake

Spearman correlation matrix

- = Empty cell/no data

PARM	JULIADATE	BOD	CHLAC	CHLOR	COD
JULIADATE	1	-	-	-	-
BOD	-0.25	1	-	-	-
CHLAC	0.032	0.698	1	-	-
CHLOR	0.028	0.326	0.114	1	-
COD	-0.215	0.468	-	0.65	1
COLOR	-0.148	-0.061	-0.245	-0.598	0.406
COND	0.114	0.287	0.106	0.944	-0.389
DO	-0.032	0.158	0.028	-0.106	0.181
DOSAT	-0.135	0.474	0.385	0.215	0.33
NH4	-0.06	-0.018	-0.38	0.028	-0.384
NO3O2	-0.041	-0.492	-0.458	-0.299	-
PH	0.038	0.632	0.55	0.172	0.35
SALIN	0.096	0.289	0.064	0.96	-
SD	-0.116	-0.268	-0.431	0.283	-0.062
SO4	0.228	0.308	0.199	0.949	-
TEMP	-0.052	0.446	0.482	0.439	0.372
TKN	-0.025	0.43	0.514	0.02	0.438
TN	-0.022	0.315	0.336	-0.032	0.438
TOC	-0.079	-0.214	-0.077	-0.455	-
TORTH	-0.041	0.019	-0.152	0.016	0.045
TP	-0.019	0.314	0.23	0.357	-0.214
TSS	-0.163	0.389	0.491	0.222	0.304
TURB	0.099	0.436	0.635	0.004	-0.35

PARM	COLOR	COND	DO	DOSAT	NH4
COLOR	1	-	-	-	-
COND	-0.627	1	-	-	-
DO	-0.001	-0.128	1	-	-
DOSAT	-0.157	0.195	0.858	1	-
NH4	0.212	0.021	-0.286	-0.298	1
NO3O2	0.475	-0.24	-0.123	-0.329	0.519
PH	-0.17	0.128	0.439	0.559	-0.31
SALIN	-0.636	0.967	-0.159	0.178	0.042
SD	-0.223	0.241	-0.088	-0.105	0.133
SO4	-0.691	0.933	-0.127	0.304	-0.018
TEMP	-0.278	0.416	-0.379	0.036	-0.091
TKN	-0.038	-0.005	-0.025	0.138	-0.056
TN	0.079	-0.083	-0.026	0.056	0.055
TOC	0.66	-0.473	0.147	0.003	0.004
TORTH	0.104	-0.032	-0.12	-0.076	0.265
TP	-0.1	0.364	-0.223	-0.018	0.227
TSS	-0.198	0.215	0.001	0.207	-0.098
TURB	-0.141	0.023	0.016	0.211	-0.164

Spearman correlation matrix cont.

PARM	NO3O2	PH	SALIN	SD	SO4
NO3O2	1	-	-	-	-
PH	-0.435	1	-	-	-
SALIN	-0.211	0.044	1	-	-
SD	-0.003	-0.278	0.3	1	-
SO4	-0.296	0.25	0.97	0.285	1
TEMP	-0.405	0.265	0.415	-0.024	0.453
TKN	-0.247	0.249	0.021	-0.376	-0.006
TN	-0.028	0.151	-0.064	-0.373	-0.064
TOC	0.165	-0.007	-0.499	-0.331	-0.48
TORTH	0.443	-0.228	-0.007	0.039	-0.063
TP	0.053	0.075	0.363	-0.135	0.361
TSS	-0.27	0.327	0.171	-0.328	0.198
TURB	-0.215	0.415	-0.014	-0.53	0.046

PARM	TEMP	TKN	TN	TOC	TORTH
TEMP	1	-	-	-	-
TKN	0.295	1	-	-	-
TN	0.169	0.951	1	-	-
TOC	-0.091	0.182	0.277	1	-
TORTH	-0.072	-0.126	0.059	0.002	1
TP	0.395	0.293	0.367	-0.091	0.36
TSS	0.332	0.377	0.298	-0.172	-0.041
TURB	0.241	0.403	0.304	-0.065	-0.032
-	-	-	-	-	-
-	TP	TSS	TURB	-	-
TP	1	-	-	-	-
TSS	0.353	1	-	-	-
TURB	0.284	0.588	1	-	-

Pair-wise frequency table

- = Empty cell/no data

PARM	JULIADATE	BOD	CHLAC	CHLOR	COD
JULIADATE	1392	-	-	-	-
BOD	467	467	-	-	-
CHLAC	772	212	772	-	-
CHLOR	999	431	752	999	-
COD	78	71	0	72	78
COLOR	961	378	761	909	78
COND	1101	418	751	934	36
DO	1149	450	736	961	78
DOSAT	437	317	143	363	78
NH4	1053	379	750	907	12
NO3O2	980	357	737	869	0
PH	1135	450	738	954	77
SALIN	880	276	615	744	0
SD	1166	317	709	827	12
SO4	435	221	400	428	0
TEMP	1190	459	767	993	78
TKN	1075	393	759	925	12
TN	1173	379	734	893	12
TOC	513	176	402	407	0
TORTH	403	249	149	305	65
TP	1266	409	747	940	66
TSS	1035	451	768	982	74
TURB	925	345	767	877	12

PARM	COLOR	COND	DO	DOSAT	NH4
COLOR	961	-	-	-	-
COND	892	1101	-	-	-
DO	919	1076	1149	-	-
DOSAT	313	364	433	437	-
NH4	858	1012	994	313	1053
NO3O2	822	938	921	282	966
PH	915	1058	1106	423	982
SALIN	673	845	852	184	821
SD	792	948	952	287	922
SO4	433	426	418	150	416
TEMP	950	1100	1148	437	1032
TKN	873	1032	1015	333	1049
TN	843	964	946	308	983
TOC	422	501	487	96	491
TORTH	252	346	384	229	331
TP	906	1012	1037	356	1014
TSS	945	962	990	389	938
TURB	860	896	881	278	893

Pair-wise frequency table cont.

PARM	NO3O2	PH	SALIN	SD	SO4
NO3O2	980	-	-	-	-
PH	914	1135	-	-	-
SALIN	777	844	880	-	-
SD	851	942	782	1166	-
SO4	396	420	271	373	435
TEMP	957	1133	880	989	431
TKN	973	1004	825	940	433
TN	973	939	775	1048	408
TOC	443	480	375	449	376
TORTH	294	373	257	310	128
TP	938	1028	791	1078	431
TSS	903	987	754	852	432
TURB	859	879	706	845	433

PARM	TEMP	TKN	TN	TOC	TORTH
TEMP	1190	-	-	-	-
TKN	1053	1075	-	-	-
TN	982	1002	1173	-	-
TOC	505	506	446	513	-
TORTH	394	339	304	194	403
TP	1073	1037	1137	505	354
TSS	1023	956	921	417	322
TURB	914	910	881	419	256
-	-	-	-	-	-
-	TP	TSS	TURB	-	-
TP	1266	-	-	-	-
TSS	975	1035	-	-	-
TURB	876	917	925	-	-

Appendix H: Linear Regression Analysis of DO and CHLAC Observations versus Nutrients and BOD in Swimming Pen Creek (WBID 2410) and Doctors Lake (WBID 2389)

Swimming Pen Creek

16 case(s) deleted due to missing data.

Dep Var: DO N: 180 Multiple R: 0.228 Squared multiple R: 0.052

Adjusted squared multiple R: 0.047 Standard error of estimate: 2.304

Effect	Coefficient	Std Error	Std Coef	Tolerance	t	P(2 Tail)
CONSTANT	9.922	0.710	0.000	.	13.970	0.000
TEMP	-0.091	0.029	-0.228	1.000	-3.126	0.002

Analysis of Variance

Source	Sum-of-Squares	df	Mean-Square	F-ratio	P
Regression	51.889	1	51.889	9.773	0.002
Residual	945.038	178	5.309		

Durbin-Watson D Statistic 1.752
First Order Autocorrelation 0.123

Dep Var: DO N: 149 Multiple R: 0.580 Squared multiple R: 0.337

Adjusted squared multiple R: 0.309 Standard error of estimate: 2.011

Effect	Coefficient	Std Error	Std Coef	Tolerance	t	P(2 Tail)
CONSTANT	12.851	4.011	0.000	.	3.204	0.002
TEMP	-0.170	0.138	-0.432	0.038	-1.234	0.219
COLOR	-0.001	0.013	-0.032	0.018	-0.063	0.950
TN	-1.396	2.977	-0.233	0.019	-0.469	0.640
TEMP*COLOR	-0.001	0.000	-0.605	0.036	-1.682	0.095
COLOR*TN	0.002	0.006	0.161	0.030	0.407	0.685
TEMP*TN	0.068	0.100	0.435	0.011	0.678	0.499

Analysis of Variance

Source	Sum-of-Squares	df	Mean-Square	F-ratio	P
Regression	291.589	6	48.598	12.015	0.000
Residual	574.360	142	4.045		

*** WARNING ***
Case 79 has large leverage (Leverage = 0.193)
Case 126 has large leverage (Leverage = 0.677)
Case 128 has large leverage (Leverage = 0.199)
Case 144 has large leverage (Leverage = 0.282)
Case 165 has large leverage (Leverage = 0.272)
Case 188 has large leverage (Leverage = 0.620)

Durbin-Watson D Statistic 1.999
First Order Autocorrelation -0.001

Dep Var: DO N: 112 Multiple R: 0.710 Squared multiple R: 0.503

Adjusted squared multiple R: 0.475 Standard error of estimate: 1.706

Effect	Coefficient	Std Error	Std Coef	Tolerance	t	P(2 Tail)
CONSTANT	11.744	2.594	0.000	.	4.528	0.000
TEMP	-0.157	0.105	-0.394	0.068	-1.496	0.138
COLOR	-0.004	0.010	-0.175	0.028	-0.424	0.672
BOD	-0.121	0.787	-0.067	0.025	-0.154	0.878
TEMP*COLOR	-0.001	0.000	-0.804	0.024	-1.806	0.074
TEMP*BOD	0.010	0.028	0.193	0.017	0.366	0.715
BOD*COLOR	0.006	0.002	0.592	0.092	2.613	0.010

Analysis of Variance

Source	Sum-of-Squares	df	Mean-Square	F-ratio	P
Regression	309.908	6	51.651	17.742	0.000
Residual	305.688	105	2.911		

*** WARNING ***
Case 2 has large leverage (Leverage = 0.271)
Case 8 has large leverage (Leverage = 0.234)
Case 9 has large leverage (Leverage = 0.220)
Case 123 has large leverage (Leverage = 0.225)
Case 134 has large leverage (Leverage = 0.395)
Case 144 has large leverage (Leverage = 0.284)
Case 152 is an outlier (Studentized Residual = 4.475)

Durbin-Watson D Statistic 1.956
First Order Autocorrelation 0.021

Dep Var: BOD N: 108 Multiple R: 0.845 Squared multiple R: 0.714

Adjusted squared multiple R: 0.697 Standard error of estimate: 0.730

Effect	Coefficient	Std Error	Std Coef	Tolerance	t	P(2 Tail)
CONSTANT	1.725	1.565	0.000	.	1.102	0.273
CHLAC	0.086	0.024	1.473	0.016	3.557	0.001
TN	-1.111	1.078	-0.340	0.026	-1.031	0.305
TEMP	-0.074	0.067	-0.332	0.031	-1.103	0.273
CHLAC*TN	-0.013	0.005	-0.595	0.052	-2.560	0.012
CHLAC*TEMP	-0.001	0.001	-0.666	0.015	-1.520	0.132
TN*TEMP	0.103	0.046	1.216	0.010	2.232	0.028

Analysis of Variance

Source	Sum-of-Squares	df	Mean-Square	F-ratio	P
Regression	134.728	6	22.455	42.113	0.000
Residual	53.854	101	0.533		

*** WARNING ***
Case 2 has large leverage (Leverage = 0.283)
Case 7 has large leverage (Leverage = 0.237)
Case 8 has large leverage (Leverage = 0.247)
Case 79 has large leverage (Leverage = 0.854)
Case 128 has large leverage (Leverage = 0.319)
Case 186 has large leverage (Leverage = 0.297)
Case 188 has large leverage (Leverage = 1.319)

Durbin-Watson D Statistic 1.761
First Order Autocorrelation 0.106

Dep Var: CHLAC N: 151 Multiple R: 0.788 Squared multiple R: 0.621

Adjusted squared multiple R: 0.605 Standard error of estimate: 14.092

Effect	Coefficient	Std Error	Std Coef	Tolerance	t	P(2 Tail)
CONSTANT	52.166	24.836	0.000	.	2.100	0.037
TEMP	-2.339	0.875	-0.645	0.045	-2.673	0.008
COLOR	-0.006	0.079	-0.028	0.021	-0.079	0.937
TN	-31.867	19.147	-0.578	0.022	-1.664	0.098
TEMP*COLOR	-0.001	0.003	-0.099	0.033	-0.348	0.728
COLOR*TN	-0.013	0.033	-0.105	0.036	-0.389	0.698
TEMP*TN	2.450	0.657	1.704	0.013	3.730	0.000

Analysis of Variance

Source	Sum-of-Squares	df	Mean-Square	F-ratio	P
Regression	46872.094	6	7812.016	39.340	0.000
Residual	28595.381	144	198.579		

*** WARNING ***
Case 79 has large leverage (Leverage = 0.190)
Case 120 is an outlier (Studentized Residual = 4.519)
Case 126 has large leverage (Leverage = 0.403)
Case 128 has large leverage (Leverage = 0.200)
Case 144 has large leverage (Leverage = 0.195)
Case 165 has large leverage (Leverage = 0.237)
Case 188 has large leverage (Leverage = 0.585)

Durbin-Watson D Statistic 2.111
First Order Autocorrelation -0.065

Doctors Lake

Dep Var: CHLAC N: 721 Multiple R: 0.586 Squared multiple R: 0.343

Adjusted squared multiple R: 0.337 Standard error of estimate: 18.208

Effect	Coefficient	Std Error	Std Coef	Tolerance	t	P(2 Tail)
CONSTANT	-8.756	12.268	0.000	.	-0.714	0.476
COLOR	-0.012	0.068	-0.030	0.032	-0.177	0.860
TN	18.723	9.179	0.347	0.032	2.040	0.042
TEMP	0.222	0.434	0.062	0.062	0.512	0.609
TN*COLOR	-0.076	0.031	-0.328	0.049	-2.405	0.016
TN*TEMP	0.368	0.312	0.249	0.021	.179	0.239
COLOR*TEMP	0.003	0.002	0.144	0.067	1.227	0.220

Analysis of Variance

Source	Sum-of-Squares	df	Mean-Square	F-ratio	P
Regression	123504.798	6	20584.133	62.087	0.000
Residual	236716.341	714	331.535		

*** WARNING ***
Case 127 has large leverage (Leverage = 0.057)
Case 151 has large leverage (Leverage = 0.050)
Case 170 has large leverage (Leverage = 0.353)
Case 171 has large leverage (Leverage = 0.052)
Case 173 has large leverage (Leverage = 0.116)
Case 245 is an outlier (Studentized Residual = 5.810)
Case 247 is an outlier (Studentized Residual = 4.145)
Case 335 has large leverage (Leverage = 0.066)
Case 474 has large leverage (Leverage = 0.087)
Case 606 has large leverage (Leverage = 0.053)
Case 614 has large leverage (Leverage = 0.123)
Case 686 has large leverage (Leverage = 0.055)
Case 840 is an outlier (Studentized Residual = 4.325)
Case 907 has large leverage (Leverage = 0.049)
Case 907 is an outlier (Studentized Residual = 4.532)
Case 908 is an outlier (Studentized Residual = 7.637)
Case 909 is an outlier (Studentized Residual = 6.719)
Case 932 has large leverage (Leverage = 0.059)
Case 938 is an outlier (Studentized Residual = 5.447)
Case 953 has large leverage (Leverage = 0.129)
Case 970 has large leverage (Leverage = 0.054)
Case 1214 has large leverage (Leverage = 0.098)
Case 1215 has large leverage (Leverage = 0.086)
Case 1218 has large leverage (Leverage = 0.072)
Case 1219 has large leverage (Leverage = 0.075)
Case 1302 has large leverage (Leverage = 0.426)
Case 1302 is an outlier (Studentized Residual = -10.747)
Case 1302 has large influence (Cook distance = 10.535)

Durbin-Watson D Statistic 1.036
First Order Autocorrelation 0.481

Dep Var: CHLAC N: 757 Multiple R: 0.419 Squared multiple R: 0.176

Adjusted squared multiple R: 0.173 Standard error of estimate: 20.361

Effect	Coefficient	Std Error	Std Coef	Tolerance	t	P(2 Tail)
CONSTANT	4.049	5.902	0.000	.	0.686	0.493
TEMP	1.311	0.244	0.366	0.236	5.378	0.000
COLOR	-0.050	0.050	-0.124	0.070	-0.993	0.321
COLOR*TEMP	0.000	0.002	0.000	0.074	0.003	0.998

Analysis of Variance

Source	Sum-of-Squares	df	Mean-Square	F-ratio	P
Regression	66661.854	3	22220.618	53.600	0.000
Residual	312167.863	753	414.566		

*** WARNING ***
Case 172 has large leverage (Leverage = 0.039)
Case 173 has large leverage (Leverage = 0.048)
Case 245 is an outlier (Studentized Residual = 6.352)
Case 247 is an outlier (Studentized Residual = 4.633)
Case 335 has large leverage (Leverage = 0.062)
Case 840 is an outlier (Studentized Residual = 4.300)
Case 907 is an outlier (Studentized Residual = 5.971)
Case 908 is an outlier (Studentized Residual = 8.580)
Case 909 is an outlier (Studentized Residual = 7.031)
Case 969 has large leverage (Leverage = 0.043)
Case 1214 has large leverage (Leverage = 0.080)
Case 1215 has large leverage (Leverage = 0.092)
Case 1218 has large leverage (Leverage = 0.066)
Case 1219 has large leverage (Leverage = 0.068)

Durbin-Watson D Statistic 0.886
First Order Autocorrelation 0.557

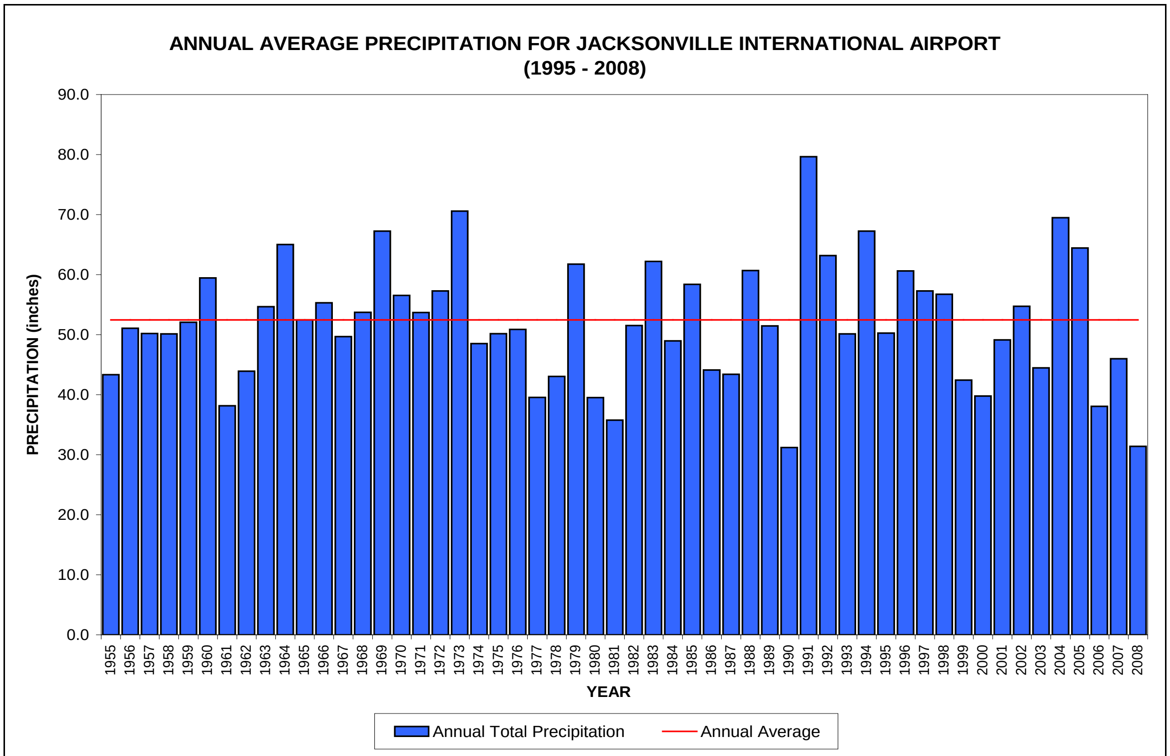
Appendix I: Monthly and Annual Precipitation at JIA, 1955–2008

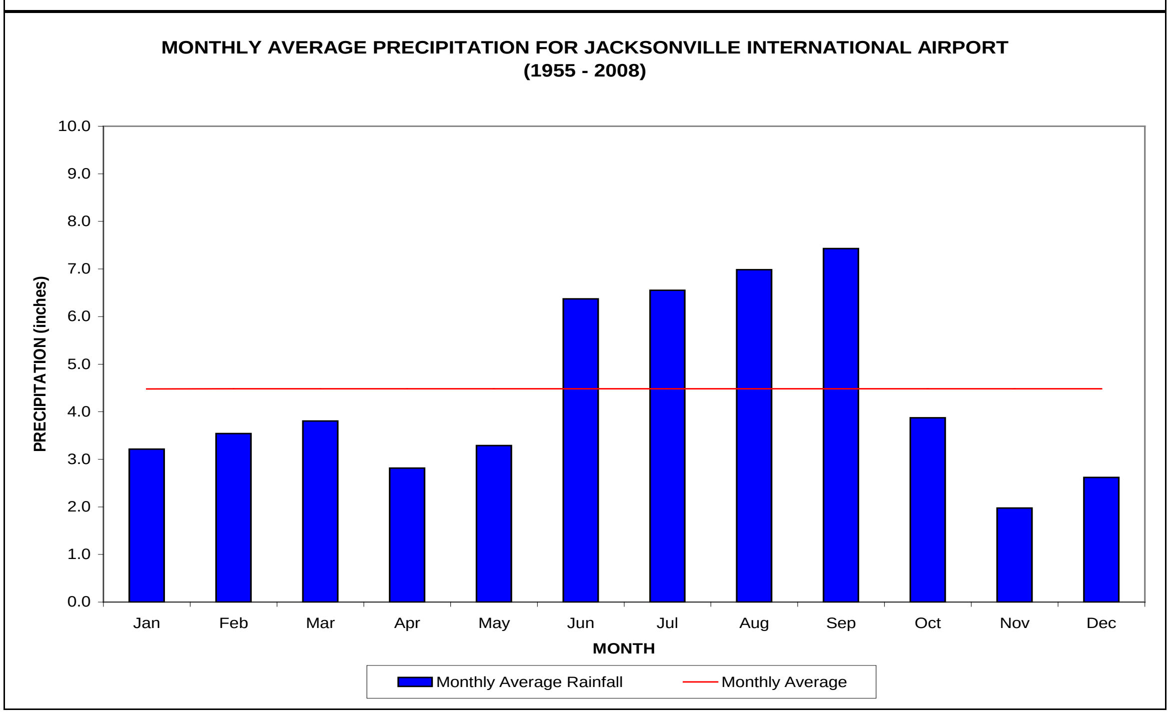
Rainfall is in inches, and represents data from JIA.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
1955	3.1	2.46	1.66	1.5	4.51	2.7	5.53	3.85	10.6	5.36	1.9	0.2	**43.33**
1956	2.9	2.94	0.81	2.33	3.98	7.87	8.25	5.24	2.89	13.4	0.4	0	**51.08**
1957	0.3	1.69	3.87	1.61	5.25	7.1	12.3	3.3	8.33	3.5	1.6	1.3	**50.18**
1958	3.4	3.74	3.38	8.24	3.79	3.96	4.37	4.67	4.75	5.07	2	2.8	**50.14**
1959	3	5.22	9.75	2.65	9.2	2.94	4.51	2.86	5.67	3.12	2.2	1	**52.08**
1960	2.1	5.17	6.94	3.54	1.18	4.7	16.2	6.5	8.57	2.95	0.1	1.5	**59.45**
1961	2.9	4.85	1.17	4.16	3.06	5.27	3.48	10.6	1.02	0.27	0.9	0.5	**38.15**
1962	2.2	0.52	3.1	2.36	1.12	8.22	6.31	10.1	4.37	1.13	2.1	2.5	**43.9**
1963	5.4	6.93	2.23	1.75	1.74	12.5	6.47	4.95	4.88	1.53	2.7	3.6	**54.66**
1964	7.3	6.55	1.76	4.65	4.8	4.67	6.12	5.63	10.3	5.09	3.3	4.8	**65.03**
1965	0.7	5.5	3.91	0.95	0.94	9.79	2.71	9.58	11	1.75	1.9	3.8	**52.47**
1966	4.6	5.97	0.71	2.25	10.4	7.74	11.1	3.88	5.94	1.38	0.2	1.1	**55.3**
1967	3.1	4.35	0.81	2	1.18	12.9	5.22	12.3	1.8	1.13	0.2	4.7	**49.68**
1968	0.8	3.05	1.2	0.99	2.17	12.3	6.84	16.2	2.68	5.09	1.3	1.1	**53.72**
1969	0.8	3.39	4.23	0.34	3.78	5.12	5.89	15.1	10.3	9.81	4.6	3.9	**67.26**
1970	4.2	8.85	9.98	1.77	1.84	2.65	7.6	11	3.2	3.95	0	1.6	**56.55**
1971	2	2.55	2.41	4.07	1.9	5.52	5.07	12.8	4.17	6.46	0.8	5.9	**53.69**
1972	5.8	3.48	4.43	2.98	8.26	6.75	3.15	9.76	2.6	4.46	4.2	1.4	**57.29**
1973	4.6	5.07	10.2	11.6	5.33	4.1	5.45	7.49	7.86	4.08	0.4	4.3	**70.57**
1974	0.3	1.28	3.47	1.53	4.14	5.53	9.83	11.2	8.13	0.34	1	1.7	**48.52**
1975	3.5	2.58	2.46	5.78	7	5.21	6.36	6.23	5.24	3.63	0.4	1.8	**50.15**
1976	2.3	1.05	3.41	0.63	10	4.26	5.41	6.37	8.56	1.63	2.4	4.8	**50.87**
1977	3	3.24	1.03	1.76	3.07	2.65	1.97	7.26	7.45	1.68	3.1	3.4	**39.56**
1978	4.6	4.17	2.83	2.24	9.18	2.62	6.67	2.39	4.4	1.26	0.8	1.8	**43.04**
1979	6.3	3.75	1	4.18	7.54	5.91	4.67	4.78	17.8	0.25	3.6	2	**61.76**
1980	2.6	1.06	6.83	3.91	3.02	4.59	5.29	3.97	3.03	2.69	2.3	0.2	**39.53**
1981	0.9	4.53	5.41	0.32	1.48	3.31	2.46	6.47	1.22	1.35	4.9	3.4	**35.77**
1982	3	1.67	4.26	3.6	3.55	8.06	3.81	6.93	9.32	3.37	1.9	2	**51.52**
1983	7.2	4.27	8.46	4.65	1.38	6.86	6.11	4.63	4.61	4.29	3.3	6.4	**62.19**
1984	2.1	4.67	5.77	3.14	1.46	4.76	6.01	3.78	12.3	1.53	3.3	0.1	**48.96**
1985	1.1	1.45	1.26	2.76	2.08	3.71	6.33	8.93	16.8	8.34	2.1	3.6	**58.39**
1986	4.2	4.72	5.44	0.93	2.13	2.53	3.27	9.6	1.99	1.8	2.9	4.7	**44.1**
1987	4.1	6.47	6.27	0.14	0.75	4.18	4.4	4.48	7.13	0.3	5	0.2	**43.39**
1988	6.4	6.08	2.65	3.44	1.35	3.71	4.5	8.48	16.4	2.35	4.3	1.1	**60.68**
1989	1.7	1.77	2.14	2.79	1.55	3.66	8.98	9.16	14.4	1.39	0.5	3.4	**51.45**
1990	1.8	4.07	1.59	1.34	0.18	1.59	6.53	3.81	2.6	4.54	1.2	1.9	**31.2**
1991	10	1.52	7.33	6.31	9.35	11.7	15.9	3.48	6.2	6.36	0.7	0.6	**79.63**
1992	5.8	2.64	4.09	5.33	5.97	7.04	3.32	10.8	7.33	8.34	1.9	0.7	**63.18**
1993	3.9	2.89	5.98	0.85	1.6	2.52	7.54	2.96	7.6	8.84	3.6	1.9	**50.12**
1994	6.6	0.92	2.14	1.51	3.15	14	8.26	3.29	9.79	10.2	3.5	3.9	**67.26**
1995	1.9	2.07	3.67	1.77	1.77	5.35	9.45	9.93	5.41	3.53	3.2	2.2	**50.25**
1996	1.1	1.11	6.83	2.85	0.72	11.4	4.2	7.83	8.49	11.5	1.4	3.2	**60.63**
1997	2.9	1.28	1.84	4.56	3.43	6.33	7.69	8.24	3.97	4.84	2.4	9.8	**57.27**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
1998	3.5	11.1	2.64	4.71	0.96	2.95	7.29	10.1	7.65	3.01	2.4	0.4	**56.72**
1999	4.6	1.7	0.4	1.92	1.02	7.75	3.56	3.51	13	3.24	0.8	0.9	**42.44**
2000	2.8	1.17	1.79	2.6	1.15	2.43	5.69	7.38	11.6	0.23	1.6	1.4	**39.77**
2001	0.9	0.68	5.48	0.62	2.56	5.59	8.31	3.58	16	0.81	1.4	3.1	**49.14**
2002	4.5	0.82	4.38	2.41	0.47	6.24	7.8	8.14	9.31	2.58	2.7	5.4	**54.72**
2003	0.1	4.66	10.7	2.63	2.54	6.75	7.33	1.83	3.04	2.98	0.7	1.2	**44.47**
2004	1.6	4.47	1.36	2.02	1.24	17.2	8.6	9.85	16.3	1.32	2.9	2.7	**69.47**
2005	1.9	3.56	3.67	4.53	3.51	14.8	7.37	4.43	5.76	6.49	1.1	7.4	**64.44**
2006	2.30	3.91	0.68	1.22	2.01	7.25	3.97	7.08	4.55	1.81	0.39	2.90	**38.07**
2007	2.29	2.40	2.22	1.02	1.12	6.68	9.48	3.57	5.44	8.85	0.17	2.74	**45.98**
2008	2.63	5.22	3.50	2.34	0.66	8.21	8.73	16.83	5.84	1.62	1.01	0.59	**46.01**
AVG	**3.21**	**3.54**	**3.81**	**2.82**	**3.29**	**6.37**	**6.55**	**6.99**	**7.43**	**3.87**	**1.98**	**2.62**	**52.32**

Appendix J: Annual and Monthly Average Precipitation at JIA





Appendix K: Response to Comments

August 7, 2009

Patrick R. Victor, P.E., BCEE
Principal Engineer
Camp Dresser & McKee, Inc.
8381 Dix Ellis Trail, Suite 400
Jacksonville, FL 32256

Subject: Draft Total Maximum Daily Loads for Doctors Lake (WBID 2389)

Dear Mr. Victor:

The Department appreciates the time and effort you and your staff put into reviewing this draft TMDL. We have made edits to the draft report as a result of your comments and because of your efforts the final TMDL will be improved. To aid you in your review, we have included your comment, followed by our response (in blue).

Camp, Dresser, and McKee has reviewed the Draft Total Maximum Daily Load Report for Doctors Lake (WBID 2389) presented to stakeholders on July 9, 2009 at the Northeast District of the Florida Department of Environmental Protection on behalf of Clay County.

We would like to offer the following comments with regards to these TMDLs and their relationship to the previously established TMDL for the Mainstem of the Lower St Johns River Basin.

The draft TMDLs for Doctors Lake apply to WBIDs that border the LSJR and are highly tidally influenced marine section of the river. Measured water quality values within these tidally influenced WBIDs are reflective of water quality within the LSJR itself. The reductions needed to protect these WBIDs from impairment will be addressed through the LSJR Mainstem Basin Management Action Plan (BMAP). At this time, Clay County has fulfilled its obligations for nitrogen reductions in the LSJR Mainstem and has completed all projects and pre-BMAP transfers documented in the October 2008 LSJR BMAP.

Department Response: The Department is supportive of the efforts by Clay County to fulfill its obligations for nitrogen reductions to the Lower St. Johns River under the adopted BMAP. The significance of those changes on Doctors Lake will depend upon the water quality improvements in the St. Johns River, as well as the significance of tidal exchange on residence time and flushing characteristics of Doctors Lake. A technical report "Doctors Lake Restoration Alternative Clay County, Florida" was prepared for the St. Johns River Water Management District in September 2001 and included sections on flushing characteristics and nutrient loading. Model simulations confirmed the perception that Doctors Lake is poorly flushed, with residence times ranging from less than 2.5 months at the inlet to more than 4 months at Peoria Point. The report found that major sources of nutrient loading appeared to be tidal exchange with the St. Johns River and

Patrick R. Victor, P.E., BCEE
Principal Engineer
Camp Dresser & McKee, Inc.
August 7, 2009
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stormwater loading. Their application of the Watershed Management Model indicated that nutrient loading due to runoff and septic tank leachate had increased over the period of 1943 to the present and predicted additional loading increases for the future built-out condition in the watershed. Improvements in both water quality of the St. Johns River and reductions in stormwater loading were expected to have beneficial effects on Doctors Lake. Continued monitoring will assist is assessing the effectiveness of various activities implemented under the BMAP.

In closing, we appreciate your continuing active interest in the Total Maximum Daily Load program, and look forward to you and your clients helping us to restore the designated uses in the Doctors Lake watershed.

Please contact me or Dr. Wayne Magley at 850/245-8449 if you have any further questions.

Sincerely,

Jan Mandrup-Poulsen, Administrator
Watershed Evaluation and TMDL Section

ec: Jeff Martin/DEP
Amy Tracy/DEP

August 7, 2009

Mike Kelter, P.E.
Legacy Civil Engineers
630 Myrtle Avenue
Green Cove Springs, FL 32043

RE: WBID 2389: Comments by the Town of Orange Park regarding the Doctors Lake TMDL

Dear Mr. Kelter:

The Department appreciates the time and effort you and your staff put into reviewing this draft TMDL report. We have made edits to the draft report as a result of your comments and because of your efforts, the final TMDL will be improved. To aid you in reviewing our responses, we have included your comments, followed by a response to each (in blue), in the order in which they were presented.

The following public comments were offered by the Town of Orange Park during the July 9, 2009 public meeting regarding the Doctor's Lake TMDL:

"Over the past several years, the Town of Orange Park has demonstrated an outstanding commitment to stewardship of our water resources. The Town participated in the Main Stem TMDL for the LSJRB and is currently spending $9 million on rehabilitating it Ash Street Wastewater treatment plant to achieve our BMAP requirements years in advance of our deadlines.

As part of the BMAP, the Town elected to "aggregate" its storm water TMDL requirements (pre-BMAP swaps) so that the Town taxpayers and wastewater ratepayers could reduce discharges of Total Nitrogen in to the St. Johns River in excess of 56% thru plant improvements and thru good stewardship of water resources by pumping treated effluent to the CCUA reclaimed water system. By doing these pre-BMAP swaps, we were assured by the Department that the Town would not need to expend scarce monetary resources to construct storm water treatment in a built-up area.

The Town is concerned that the TMDL estimates for Doctor's Lake did not model the tidally-driven movement of flows to and from the St. Johns River where the Town's effluent reduction is being made. The Town believes that its reduction of pollution load into the St. Johns River downstream from the Doctor's Lake Inlet will have a positive effect on the nutrient load in Doctor's Lake."

Mike Kelter, P.E.
Legacy Civil Engineers
August 7, 2009
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Department Response: The Department is aware of and very supportive of the commitment that the Town of Orange Park toward improving water quality in the Lower St. Johns River basin. Under the BMAP for the Lower St. Johns River nutrient TMDL, there are a number of projects being implemented to improve water quality in the St. Johns River and we concur that there should be positive effects for waterbodies where there is a tidal exchange with the St. Johns. The significance of those changes on Doctors Lake will depend upon the water quality improvements in the St. Johns River, as well as the significance of tidal exchange on residence time and flushing characteristics of Doctors Lake. A technical report “Doctors Lake Restoration Alternative Clay County, Florida” was prepared for the St. Johns River Water Management District in September 2001 and included sections on flushing characteristics and nutrient loading. Model simulations confirmed the perception that Doctors Lake is poorly flushed with residence times ranging from less than 2.5 months at the inlet to more than 4 months at Peoria Point. The report found that major sources of nutrient loading appeared to be tidal exchange with the St. Johns River and stormwater loading. Their application of the Watershed Management Model indicated that nutrient loading due to runoff and septic tank leachate had increased over the period of 1943 to the present and predicted additional loading increases for the future built-out condition in the watershed. Improvements in both water quality of the St. Johns River and reductions in stormwater loading were expected to have beneficial effects on Doctors Lake.

The Town has been presented data, years ago, that would indicate FDEP’s knowledge of nutrient migration upstream from the Buckman WWTP outfall into Doctor’s Lake. Since the Town’s Ash Street WWTP lies between the Buckman WWTP outfall and Doctor’s Lake, it is reasonable to conclude that nutrient migration from the Town’s Loring Street outfall would also occur, and that major reductions to nutrient discharges from Ash Street would reduce nutrient loads in Doctor’s Lake. The cooperative efforts between the Town and Clay County Utility Authority, which discharges wastewater at the Campbell Street outfall, will further reduce nutrient loads to the St. Johns River that migrate to Doctors Lake.

Department Response: The Department is aware of the model simulations based upon a dye study conducted on the Buckman WWTP facility that indicated a small fraction of the Buckman discharge could reach Doctors Lake under certain hydrologic conditions. We concur that improvements to WWTP discharges such as the Ash Street and other facilities closer to Doctors Lake as well as other activities to improve water quality in the St. Johns River will benefit Doctors Lake.

The Town asks that the Department include statements in the TMDL study that recognize these site-specific conditions so that the Town’s efforts to reduce nutrient pollution to the St. Johns River will be recognized as a significant benefit to Doctor’s Lake.

Department Response: The Department will include statements in Chapter 7 of the document recognizing efforts by the Town of Orange Park and other entities to reduce nutrient pollution to the St. Johns River under the Lower St. Johns River BMAP and that these efforts will benefit water quality in Doctors Lake.

Mike Kelter, P.E.
Legacy Civil Engineers
August 7, 2009
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In closing, we appreciate your continuing active interest in the Total Maximum Daily Load program, and look forward to you and your clients helping us to restore the designated uses in the Doctors Lake watershed.

Please contact me or Dr. Wayne Magley at 850/245-8449 if you have any further questions.

Sincerely,

Jan Mandrup-Poulsen, Administrator
Watershed Evaluation and TMDL Section
Florida Department of Environmental Protection

ec: Jeff Martin/DEP
Amy Tracy/DEP

LEGACY CIVIL ENGINEERS, INC

Civil Engineering ✦ Utility Management Consulting ✦ Public Works Assistance

TO: **Melissa Long, FDEP Water Resources Division Director**

FROM: **Mike Kelter, P.E.**

DATE: **July 13, 2009**

RE: **Town of Orange Park Advanced Wastewater Treatment Project: Progress Report for July 2009**

The following is a summary of current progress on plant improvements to the Ash Street Wastewater Treatment Plant in the Town of Orange Park for the month of July 2009. The construction process has been underway for eighteen months. You've got to love it when a plan starts coming together. The following sections summarize work completed to date:

CURRENT PLANT OPERATION:

The Ash Street Plant is currently operating with two 1-MGD package treatment plants— Plant #2 and Plant #3. Plant #1, a 0.5-MGD package treatment plant has been shut down for conversion into an extended air treatment system during periods of time when Plant #3 undergoes conversion to a BNR process (Phase 1) and when Plant #2 undergoes conversion in Phase 2. In between phases, and at the end of Phase 2, the outer ring of Plant #1 will become a surge tank.

All influent continues to flow through the influent structure and discharge by gravity to Plants #2 & #3. The chlorination contact chambers of Plants #2 and #3 have been shut down.

All effluent from the clarifiers in Plant #2 & #3 discharge by gravity to the new Nova tertiary filter, and then discharge by gravity to the new, twin 42,300-gallon chlorine contact chambers for disinfection. Disinfected effluent discharges by gravity to the effluent pump station for dechlorination and pump-discharge to the St. Johns River.

At this time, all digestion occurs in the Plant #2 & #3 aerated digester basins.

Facultative bacteria dosing (In-Pipe) continues to occur at 23 locations in the Town sanitary collection system. This dosing allows reduced aeration to the Plant #2 & #3 process basins and digesters.

PLANT TERTIARY FILTER:

In June 2009, one new plant tertiary filter reached substantial completion and was certified for operation by FDEP. The UL 1605 filter **(SEE FIGURE 1),** manufactured by Nova Water Technologies, LLC, Tampa, Florida, was specified to treat 1.25 MGD of average daily flow and up to a maximum of 3.375 MGD at the peak daily flow of 4.5 MGD to meet Class 1 reliability of 75%max flow with a single unit. The filter site is piped, valved and wired for a second, identical filter.

The Nova UL 1605 filter consists of 10 rotating discs with 22 square feet of surface each **(SEE FIGURE 2)**. The filter media is a stainless steel fabric. At the design flow (1.25 MGD) the loading rate of the filter is 3.95 gpm/square foot (SF) of filter. At peak flow, the loading rate is 14.2 gpm/SF.

Figure 1: Nova UL1605 Tertiary Plant

The UL 1605 has proven to be extremely efficient. During start-up trials, the filter reduced TSS from a filter influent concentration of 2.6 mg/L to a filter effluent concentration of 0.4 mg/L at a flow of 1.02 MGD. The reject water rate was impressive. Over a seven day period, the filter rejected 1650 gallons per day at a flow rate of 1.02 MGD—a very frugal 0.162% reject rate.

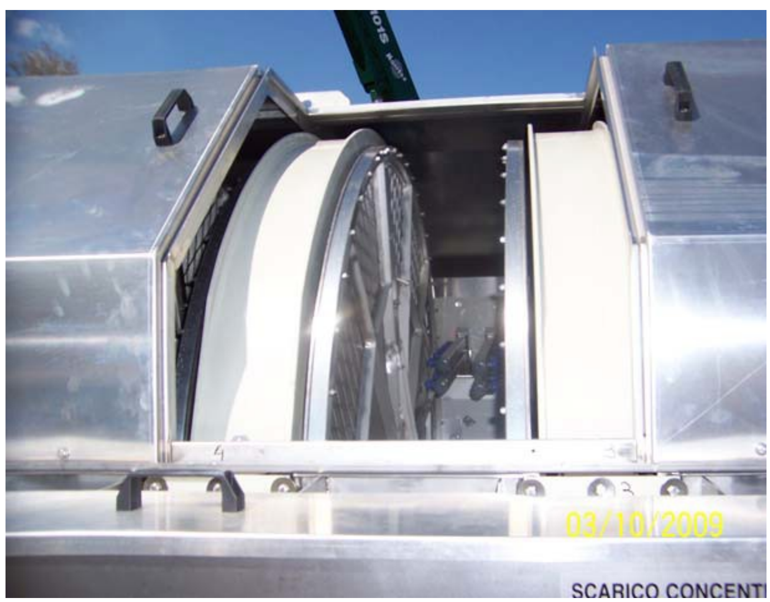


Figure 2: Stainless Steel Filter Disks

During the May 2009 No- Name Northeaster, the Ash Street influent flows reached 2.23 MGD with influent TSS concentrations exceeding 600 mg/L. This storm occurred during the filter start-up trials with only two of the three clarifiers in operation. The single filter was able to control TSS discharge from the plant at 4 mg/L throughout the storm event. Filter backwash water can be obtained either from a filter reservoir or from the Chlorine contact chamber.

CHLORINE CONTACT TANKS:

In June 2009, construction of two (2) 58,700-gallon chlorine contact tanks reached substantial completion and was certified by FDEP to be placed into operation. Each tank consists of five channels 46 feet in length and 5.4 feet in width with a stainless steel diffuser baffle installed at the influent pipe. **(SEE FIGURE 3)** Each tank is dosed independently with sodium hypochlorite from pumps installed in 2003 under a separate permit.

Each tank is designed to provide 33.8 minutes of disinfection contact time at an average daily flow of 2.5 MGD. A adjustable stainless steel rectangular weir is installed at the end of each chamber (**SEE FIGURE 4)**.

The installation of the Nova Filters upstream of the chlorine contact chamber has allowed the Ash Street staff to reduce the sodium hypochlorite by 50%.

Figure 3: Chlorine contact chamber channel with stainless steel diffuser baffle at influent

Figure 4: Overflow weir

DIGESTER #2

In July 2009, the Town submitted a request to FDEP to certify Digester #2 for operation. Digester #2 is a substantial change from the plans submitted to FDEP during the permit process. Initially, Digester #2 was to be located 167 feet east of the constructed location, and was originally planned to be a 368,000-gallon facility. Digester #2 was constructed as a 475,975-gallon aerated tank using existing blowers for air supply. The original plans called for new, local blowers for air supply.

Figure 5: Digester #2

The 475,975-gallon aerated digester **(SEE FIGURE 5)** is constructed of ¼" welded plate steel resting on a pile supported concrete slab and foundation. The tank depth is 18.0 feet. Waste activate sludge will into the digester by 4" Flowserve dry-pit submersible, solids-handling pumps which will be located at Plants #2 & #3. During construction phases when Plant #1 is operating in extended aeration mode, the clarifier at Plant #1 will be wasted through the WAS pump at Plant #2. Clarifier #4 will not be directly wasted to the digesters, but will be indirectly wasted through Plants #2 & #3.

Figure 6: ICBA Coarse Bubble diffuser array in Digester #2

Digester #2 is aerated through 106 I.C.B.A. coarse- bubble diffusers, manufactured by Invent Environmental of Oakland, N.J. **(SEE FIGURE 6)** The

Figure 7: Coarse bubble distribution pattern in Digester #2 during leak testing

coarse-bubble diffuser array is capable of delivering 1905 SCFM of air at the maximum depth of digester fill. The aeration pattern during leak testing is shown in **FIGURE 7.** This is a very nice, uniform aeration pattern.

Decanting is accomplished through an airlift system. The decant draw tube can be manually adjusted for elevation through the entire height of Digester #2. Decanted supernatant is discharged by gravity to a new plant lift station located near the northeast corner of the chlorine contact chamber, which pumps the supernatant to a gravity system which flows to the influent lift station.

MECHANICAL BARSCREEN AND TRASH COMPACTOR:

During the month of June 2009, PBM Constructors, Inc installed the mechanical barscreen on top of the existing splitter box **(SEE FIGURE 8).** The mechanical barscreen assembly consists of a 3/16" Vanguard V2 Mechanically cleaned bar screen; a shafted spiral conveyor and compactor; and a U-shaped stainless steel flow channel with static barscreen, emergency overflow weirs, and supports for the mechanical barscreen. The flow channel is welded to a stainless steel frame which supports the system and walkways on top of the existing splitter box.

Figure 8: Hoisting Mechanical Barscreen channel into place atop the existing splitter box

The Vanguard V2 mechanical barscreen is manufactured by Nova Water Technologies, LLC of Tampa, Florida with components manufactured by PBM Constructors, Inc of Jacksonville, Florida. The barscreen frame is constructed of AISI 316 stainless steel with acetal resin filter elements. The screen is designed to handle a peak flow of 4.5 MGD with an upstream water level of 24" and a head loss of 11.2 inches. The barscreen is activated by a non-mercury type float switch. The barscreen is designed to remove trash larger than 3/16" **(SEE FIGURE 9).**

Figure 9: Installing Vanguard Mechanical barscreen in flow channel

The barscreen is mounted in a AISI 304 stainless steel U-Shaped channel. The mechanical barscreen is mounted on one leg of the U, and the emergency overflow is mounted on the other leg. The emergency overflow is equipped with a static barscreen. All flows out of The channel discharge into the existing splitter box. When the plant is operated with a surge tank, all influent wastewater flows by gravity to Plant #1 and then pumped to the process tanks in Plants #2 & #3. During periods when Plant #2 or #3 are under renovation, influent wastewater discharges by gravity to Plant #1 and Plant #3/Plant #2.

Figure 10: Mechanical barscreen assembly mounted on top of existing splitter box

Trash screened by the mechanical barscreen fall through a AISI 316 stainless steel chute into the CV-200 shafted spiral conveyor and compactor. The CV-200 trash compactor is manufactured by Nova Water Technologies of Tampa, Florida. The trash compactor is constructed of AISI 316 stainless steel and is equipped with an automatic wash system and continuous bagging unit.

AIR SYSTEM:

At the start of the project, all plant air was centrally supplied by two (2) Suterbilt Positive Displacement (PD) blowers, two (2) Dresser-Roots PD blowers, and one Hoffman centrifugal blower. All air was pipe underground through a network of flanged cast-iron pipe.

The original plan of construction was to abandon all PD blowers in favor of new, local centrifugal blowers, and to replace the underground piping with welded carbon steel pipe to support the remaining Hoffman blower.

The plan has been modified. The Roots PD blowers (Blowers #4 & #5) were evaluated and determined to be suitable for supplying air to the digesters and for providing redundant capability for the BNR processes. The 125-HP Hoffman centrifugal blower (Blower #6) failed during construction and was overhauled.

New 50-HP Spencer multistage processes.

The obvious problem with the air delivery system was the badly leaking underground piping **(SEE FIGURE 11).** During periods when the soils were supersaturated, air leakage from the air piping could be detected over 100 feet away from the lay of the underground air piping. At the start of the project, the Town was paying $14,000 per month in electric bills at the plant. With electric rates skyrocketing, the Town and the Contractor made a wise

Figure 11: Air leakage from underground air piping could be detected 100 feet away from the lay of the pipe.

decision to construct overhead air piping using Schedule 10 welded stainless steel pipe. PBM Constructors, Inc has constructed the new elevated air header system to every point of air delivery at the Ash Street Facility and has connected Blower #6 to the system. Before the end of the month, Blowers #4 & #5 will be connected **(SEE FIGURES 12 & 13)**

.

Figure 12: Overhead air header system connection to existing blowers#4, 5, & 6

Figure 13: Connection of overhead air header to existing plant

The new air header system is very energy efficient, since air is no longer being leaked into the ground. The system is also very quiet and vibration free as a result of the installation of the in-line stainless steel muffler **(SEE FIGURE 14).**

Figure 14: Installation of the inline muffler/silencer

The new air header system has the capability to deliver 3800 SCFM to the furthest point of use. At the end of two phases of construction, under maximum loading conditions in Digester #1 and Digester #2, a total of 3135 SCFM of air will be required for the digester functions.

Figure 15: Spencer Multi-stage Blowers for Plant #3

The BNR process air requirements were originally designed to handle influent Carbonaceous Biological Oxygen Demand (CBOD) in excess 325 mg/L at 3.15 MGD. In addition, the permit conditions for the plant at the time of design had much more stringent ammonia removal requirements. Under these maximum conditions, Plant #2 and #3 operating in BNR mode require about 1900 SCFM of air. The plant design calls for installation of three (3) Spencer 50-HP multistage blowers capable of 615 SCFM at each BNR plant. This slight shortage of air capability can be made up with excess air from the existing plant blowers #4, 5, & 6. If the Town continues facultative bacterial dosing of the sanitary collection system, the Ash Street Plant will have more than enough air to meet all requirements.

Currently, the plant operates at an average daily flow of 1.1 MGD and CBOD has fallen to just over 100 mg/L as a result of facultative bacterial dosing in the collection system. The

Town still plans influent CBOD at 325 mg/L and supports this plan by installation of two (2) Spencer 50-HP multistage blowers at each BNR plant until sustained plant flow exceeds 2.0 MGD. At that time, a third blower can be added to each site. Blower pads for the third blower have already been constructed for Plant #3 and electrical conduits have been installed for this future need.

In Phase 1, two Spencer Power Mizer multistage blowers have been installed at the Plant #3 blower site **(SEE FIGURE 15).** The Spencer blowers are manufactured by the Spencer Turbine Company of Windsor, Connecticut. Each blower will be connected to a variable frequency drive (VFD) located in the Motor Control Center in the Operations Building.

DIGESTER #1/CLARIFIER #4

The outer ring of this concentric-ring steel tank is a 368,800-gallon aerobic digester. The inner ring of the steel tank is a 1,288 Square-foot redundant clarifier **(SEE FIGURE 16)**

Tank has been constructed and the walkways/stairs have been installed. Clarifier #4 will receive mixed liquor from Plants #2 and #3 and will return activated sludge back to both plants in the same proportion that mixed liquor was received. Air to digester #1 will be supplied by existing blowers #4, #5, and #6, via new, elevated 12" air header system. 75 ICBA coarse- bubble diffusers have been received. These diffusers will provide 1230 SCFM of air to Digester #1 under maximum operating conditions.

Figure 16: Digester #1/Clarifier #4 under construction

ELECTIC IMPROVEMENTS:

During the month of June, a new 1000 kVA pad-mounted transformer was installed to provide power to the Motor Control Center and the plant distribution circuits. The existing 750 kVA pole-mounted transformers will remain in service until all circuits are connected to the new system.

Over the past five months, five motor control center units have been delivered and installed in the Plant Operations building. **(SEE FIGURES 17, 18, 19).**

Figure 17: Programmable Logic Cards in MCC #5

Figure 18: Variable frequency drives for RAS

Figure 19: Variable frequency drives for Blowers #7 & 8

The Motor Control Center was manufactured by Sunstate Systems of Orange Park, Florida.

An Olympian 1000 kW generator and a 1600 kVA automatic transfer switch have been ordered from Ring Power of St. Augustine, Florida. Ring Power is the distributor of Catepillar Olympian generators.

EFFLUENT PIPELINE TO CCUA MILLER STREET PLANT:

As previously reported, the Town of Orange Park and Clay County Utility Authority (CCUA) have executed an interlocal agreement to allow the Town to pump treated, filtered effluent to the CCUA Miller Street plant for high-level disinfection and use in the CCUA reclaimed water program. As part of the Ash Street AWWTP project the Town constructed 2000 linear feet of 16-inch PVC effluent forcemain between the Ash Street WWTP and the Miller Street WWTP. CCUA has agreed to complete construction of the pipeline by jacking and boring under the CSX Railroad tracks and connecting to the Miller Street disinfection system for high-level chlorination.

The Town has issued right-of-way permits to CCUA to allow construction of the forcemain from the Miller Street plant to the point of reclaimed water use. In May 2009, CCUA began constructing the forcemain. Concurrent with this construction, CCUA has begun modernization of the Miller Street plant, which will provide for forcemain

connections with the Town's Ash Street Plant. According to CCUA officials, the Town's ability to remove treated effluent from the St. Johns River should become a reality within a year.

PLANT #3 IMPROVEMENTS:

Conversion of Plant #3 to a Biological Nutrient Removal (BNR) process will be the last step in the Phase 1 conversion of the Ash Street Plant to advanced wastewater treatment. This step cannot occur until Plants #1 & #2 are converted to an extended aeration process. This should occur by early very early autumn.

Major equipment for Plant #3 are already either on- hand or in production. As mentioned, Blowers #7 & #8 are already being installed **(SEE FIGURE 15).** The RAS/WAS pumping station for Plant #3 has been partially completed **(SEE FIGURE 20).** The RAS System consists of two (2) 6-inch Flowserve drypit submersible solids handling pumps that will be connected to the clarifier well and discharge to the Anaerobic basin located at the head of Plant #3. The RAS pump speed will be controlled by VFD and set to recycle activated sludge at the rate of 1.0 X the influent flow to Plant #3. The RAS flow will be monitored using magnetic flowmeters.

Figure 20: Plant #3 RAS/WAS Pumping station

The WAS system, as mentioned earlier consists of a single 4-inch Flowserve drypit submersible solids handling pump. The amount of waste activated sludge being pumped to the digesters will be recorded at the Operations building through data received by an in- line flow meter at the station.

HOW ARE WE DOING?

The Town is spending $7.5 million on this project in an effort to be good environmental stewards of water resources. Even though this project is only two-thirds complete, we like to know that the ratepayer's money is being well-spent on a successful project. As shown in Figure 21, the Total Nitrogen effluent concentrations have declined throughout most of the construction process. There was a brief, three month spike in TN discharge for the first three months of the year, but the issues causing this spike were addressed and current test results indicate a strong trend of lowering TN to much lower values. The next significant drop in TN will occur when Plant #3 is converted.

FIGURE 21: Ash Street WWTP Total Nitrogen & Ammonia (Effluent)

FIGURE 22: Ash Street WWTP Influent TSS & CBOD

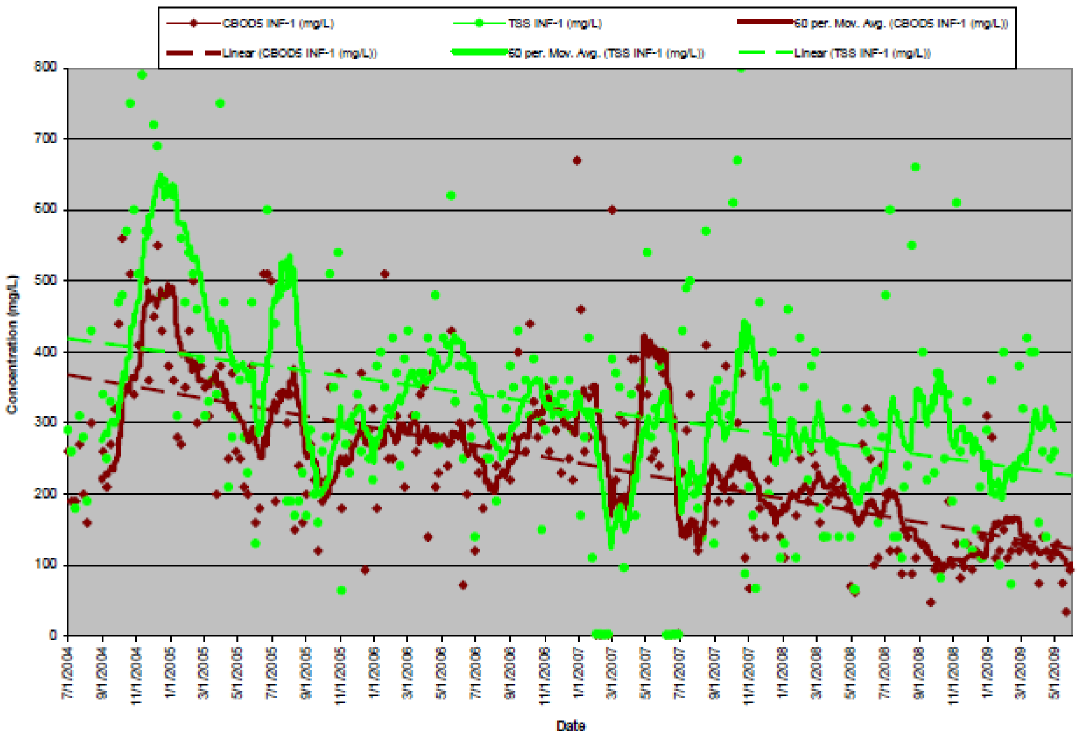


FIGURE 22: Ash Street WWTP Influent TSS & CBOD

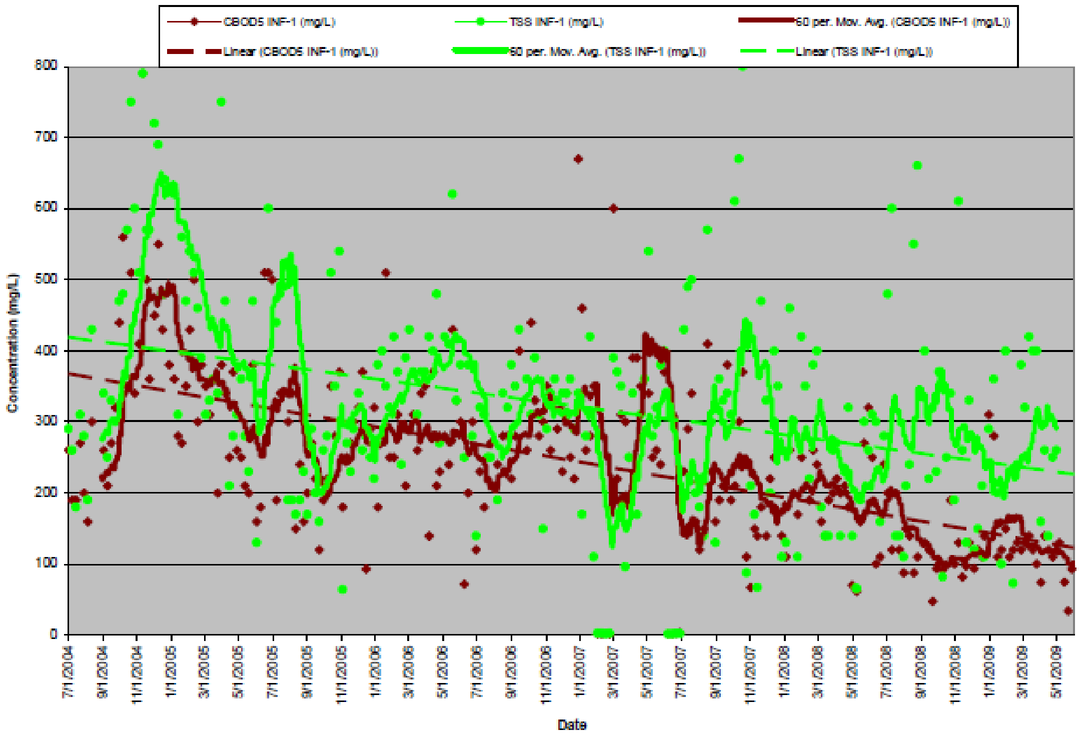
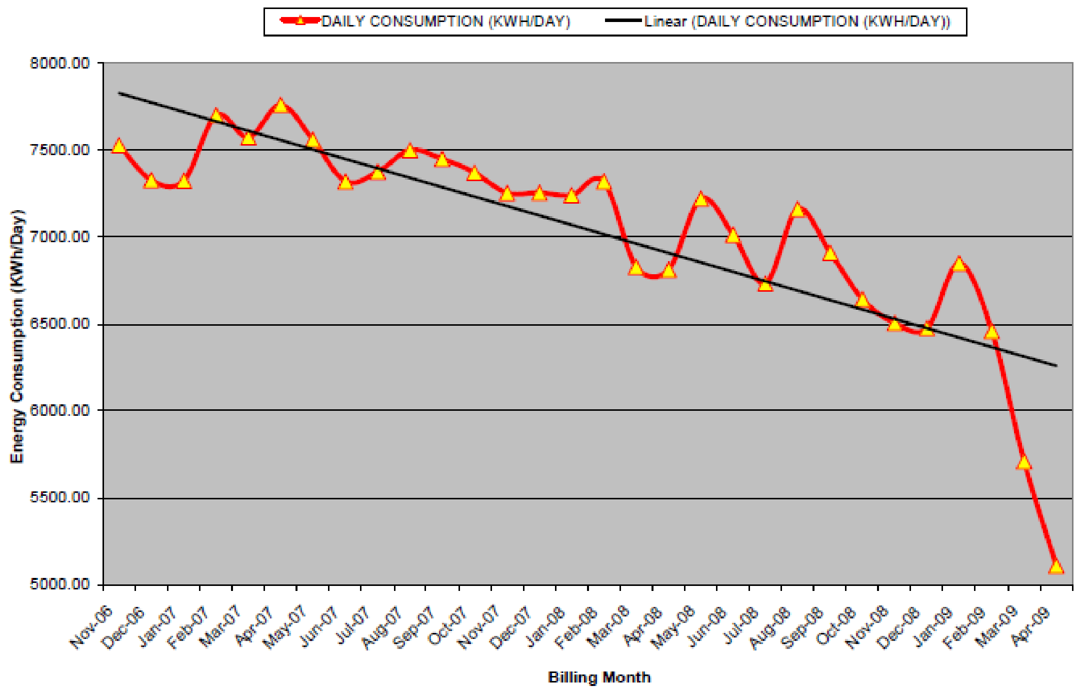


Figure 22 shows significant reduction in CBOD since the start of construction. The majority of this reduction is the result of facultative bacterial dosing of the wastewater collection system. The CBOD reduction has a significant impact on the efficiency of the Plant operations. Reduced CBOD helps to reduce the aeration requirements of the plant. Aeration equipment is energy intensive. Not only does energy consumption affect the rates that are paid for wastewater treatment, but energy consumption has an indirect effect on consumptive uses of water resources. Energy generation consumes lots of water. To the extent that the new Ash Street plant reduces energy consumption, an added benefit accrues to the people of Florida in terms of water conservation. Figure 23 shows the reduced energy consumption that has occurred at the Ash Street plant during the period of construction.

FIGURE 23: ASH STREET ENERGY CONSUMPTION



The Town of Orange Park has come a long ways in the past eighteen months, considering that they are constructing an entirely new process on the footprint of an existing process that continues to serve the Town's wastewater needs. The Town appreciates the Department's positive assistance with this project over the past year and looks forward to continued cooperation and progress as we complete this phase of the project early in 2010.

FOR THE TOWN STAFF:
Mike Kelter, P.E.
Legacy Civil Engineers, Inc (904) 284-8103

cc: The Honorable JB Renninger, Mayor
Honorable Members of the Town Council
John Bowles, Town Manager
Bill White, Public Works Director
Bob Brace, Utility Superintendent
Jeff Martin, FDEP
Derek Busby, LSJRB Program manager

August 10, 2009

Mr. Joshua Boan
Environmental Process/Natural Sciences Manager
Environmental Research Administrator
605 Suwannee Street MS 37
Tallahassee, FL 32399
Ph: 850-414-5266
Email: joshua.boan@dot.state.fl.us

Re: FDOT Comments on Newly Released Draft TMDLs

Dear Mr. Boan,

The Department appreciates the time and effort you and your staff put into reviewing these draft TMDLs. We have made necessary edits to some draft TMDL reports as a result of your comments. Because of your efforts, the final TMDL will be improved. To aid you in reviewing our responses, we have included your comments, followed by a response to each (in blue), in the order in which they were presented. Please contact me at Jan.Mandrup-Poulsen@dep.state.fl.us. if you have any further questions.

Sincerely,

Jan Mandrup-Poulsen, Administrator
Watershed Evaluation and TMDL Section
Florida Department of Environmental Protection

DISTRICT 2 COMMENTS

GENERAL COMMENTS

The following comments relate to multiple TMDLs where specific comments are provided below for each of the TMDL documents.

1. It appears that the nutrient load assessments for the transportation category (Chapter 4) are based upon values presented in Harper (2007) (i.e., 1.64 mg/l TN and 0.22 mg/l TP). Harper's numbers are determined by averaging the average results from eleven different datasets from studies conducted between 1975 and 2005. Each study was given equal weight in the averaging procedure regardless of the number of events sampled and the methodologies used. Between December 2004 and October 2007 roadway runoff water quality data were collected by Johnson Engineering for FDOT District 1 at four locations within District 1. Ten events were sampled for each of the four locations, with samples collected at both the inflows and outflows of existing stormwater treatment ponds. All collection, transfer, and handling procedures were conducted in accordance with FDEP Standard Operating Procedures, and samples were analyzed by certified labs. Average values for TN and TP ***at the pond inflows*** were determined to be 1.17 mg/l and 0.158 mg/l, respectively. [It is perhaps noteworthy to observe that the highest average TN and TP values were measured at the first site sampled (i.e., samples collected between December 2004 and November 2005) which is also the site with the lowest percentage of impervious area.] Given the changes to roadway management practices that FDOT has undertaken over the past several years and the rigorous quality control used in these studies compared

with the older studies, we believe that the numbers presented by Johnson Engineering are more representative than Harper's numbers of present day TN and TP loading conditions. [This comment applies to all nutrient and DO TMDL documents reviewed. This included WBIDs 2410, 2389, 2203, 2213P,2265A, 2460, 2589, 2578.]

Department Response: A copy of the Johnson Engineering Study report was not included with the comments we received. If FDOT could provide the report to Mr. Eric Livingston (Bureau Chief for the Bureau of Watershed Restoration) it will be reviewed for incorporation into the stormwater database and use in estimation of transportation event mean concentrations (EMCs).

1. The load reductions determined for the non-point sources, which include the WLA for the stormwater (under the MS4 permit) and the LA, have not been allocated but simply applied evenly between the WLA for Stormwater and the LA. Sufficient studies have not been completed to determine if an even distribution of the load reductions is justified, therefore some language acknowledging this (within the TMDL and ultimately within the Rule) should be put into both the TMDL documents and ultimately the rules to allow the ability to finalize (and therefore change the assigned reductions) under the BMAP. [This comment applies to all TMDLs reviewed in which there was an WLA-MS4 allocation specified.]

   Department Response: In 2001, the Department submitted to the Governor and Legislature a document outlining the intended process for the allocation of loads under the TMDL Program. One key provision of the proposal was to level the "playing field," such that once stakeholders had the opportunity to meet and discuss what steps needed to be taken and to get appropriate credit for those initiatives already completed, the specific allocations will be set by the agreements reached under the Basin Management Action Plan (BMAP). This process has been successfully used in several adopted BMAPs and has demonstrated the flexibility that remains after setting the initial reductions for stormwater-related allocations (LA and WLA_{sw}) at identical levels.

   The laws of Florida form the underlying basis for the initial equal allocations. In particular, Section 403.067(6)(b) of Florida Statutes, states in part that:

   "Allocations may also be made to individual basins and sources or as a whole to all basins and sources or categories of sources of inflow to the water body or water body segments. An initial allocation of allowable pollutant loads among point and nonpoint sources may be developed as part of the total maximum daily load. However, in such cases, the detailed allocation to specific point sources and specific categories of nonpoint sources shall be established in the basin management action plan…"

   Additionally, each of the draft TMDL reports contains language in the NPDES Stormwater Discharges section in chapter 6 of the reports (repeated below) to address the issue of allocation between the WLA for stormwater and the LA portions of the TMDL.

   "It should be noted that any MS4 permittee is only responsible for reducing the anthropogenic loads associated with stormwater outfalls that it owns or otherwise has responsible control over, and it is not responsible for reducing other nonpoint source loads in its jurisdiction."

SPECIFIC COMMENTS

The following are specific comments referenced to the individual TMDL documents reviewed.

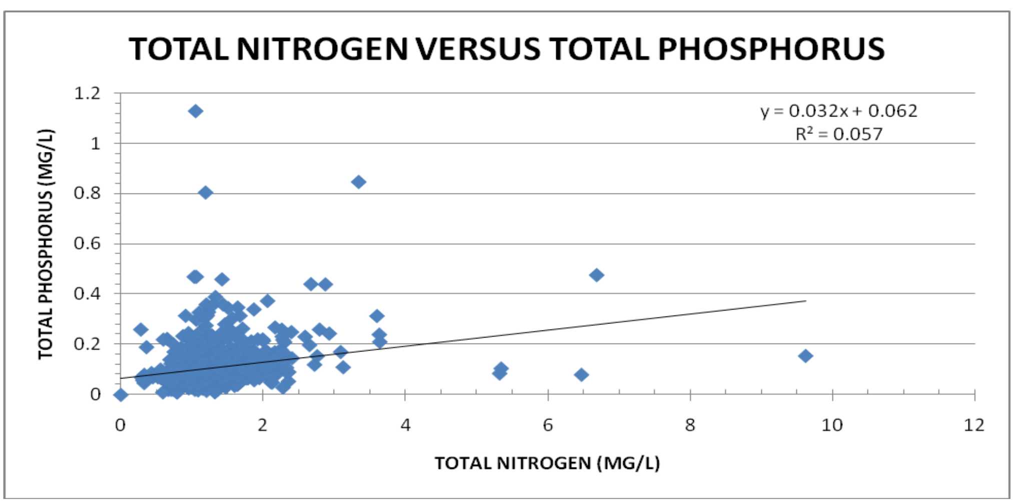
Swimming Pen Creek and Doctors Lake (WBIDs 2410 and 2389): DO and DO/Nutrients

1. The Doctors Lake loading values and target values do not consider inputs from Swimming Pen Creek. Would reductions in TN loads for Swimming Pen Creek influence the required reductions in Doctors Lake in order to achieve acceptable DO values?

   Department Response: The load/concentration estimates described in Chapter 4 were provided to indicate the relative importance of various sources of nutrients in the watershed. Load reductions in Swimming Pen Creek were developed to address the DO and nutrient impairments observed in Swimming Pen Creek; however, as Swimming Pen Creek is part of the contributing watershed of Doctors Lake, reductions achieved in Swimming Pen Creek would benefit Doctors Lake. Just to clarify, Doctors Lake was not listed as impaired for DO.

2. The regression analysis for Chla in Doctors Lake reduces TN while holding TP constant (i.e., TP is not included as a variable in the GLM). The TSI value is then calculated for each historic data point using the calculated Chla, the reduced TN, and the original (unreduced) value of TP. This approach provides an overly conservative estimate of the resulting TSI, because TP will also be reduced as TN is reduced. The TSI values should be recalculated to account for reduced TP values using either a regression analysis between TN and TP or by assuming that the ratio TN/TP remains the same for each historic data point.

   Department Response: The TMDL focused upon TN since the mainstem Lower St. Johns River nutrient TMDL required TN reductions from watersheds in the marine portion of the system. The Department understands that activities to reduce TN are also likely to reduce TP concentrations, however, the reduction in TP may vary depending upon the type of activity or implementation project. There is also likely to be differences among sources in the relative contributions of nitrogen and phosphorus. Total nitrogen versus TP is plotted below. It appears that a few high TN values are influencing the regression line. The regression explained less than 6 percent of the variance in TP.



The regression equation of TN versus TP was applied to obtain predicted TP concentrations based on a 30 percent or 50 percent reduction in TN then substituted into the TSI calculation. The average reduction in TP using the regression equation with a 30 (or 50) percent in TN was 35 (or 4) percent. The following table illustrates predicted annual TSIs with and without predicted changes in the TP concentration.

YEAR	TSIMTN70	TSIMTN70 & TN versus TP	TSIMTN50	TSIMTN50 & TN versus TP
1985	59.31	52.24	55.68	45.14
1986	61.38	59.22	57.72	55.08
1987	53.62	53.63	49.91	47.85
1988	64.38	60.18	61.42	55.96
1989	65.14	61.27	62.03	57.41
1990	68.13	62.17	64.42	58.16
1991	62.57	57.48	58.75	53.42
1992	59.29	58.91	56.47	54.58
1993	54.11	51.17	50.38	45.73
1994	57.49	57.61	53.91	53.97
1995	61.62	57.37	59.22	53.89
1996	60.21	57.95	57.71	53.41
1997	61.84	58.56	58.94	54.61
1998	63.79	60.08	60.99	56.20
1999	59.30	59.56	56.07	55.11
2000	55.70	57.58	52.00	52.90
2001	60.85	58.16	57.51	53.49
2002	58.35	58.03	54.69	53.88
2003	62.64	58.17	59.27	53.79
2004	58.64	56.70	55.81	52.13
2005	60.61	57.08	56.95	52.43
2006	61.19	57.59	57.50	52.48
2007	58.49	56.82	54.87	51.42
2008	65.80	61.30	62.19	57.68

In the second approach, the TN/TP ratio was unchanged and the 30 (or 50) percent reduction in TN was used to predict a new TP concentration. The corresponding TN and predicted TP concentrations were substituted into the TSI equation to calculate TSI and annual averages were determined. The following table compares the predicted annual TSIs. Since the TN/TP ratio remained fixed the 30 (or 50) percent reductions in TN also meant the same percent reductions in TP.

YEAR	TSIMTN70	TSIMTN70 & TN/TP Ratio	TSIMTN50	TSIMTN50 & TN/TP Ratio
1985	59.31	53.14	55.68	45.18
1986	61.38	60.36	57.72	55.17
1987	53.62	54.35	49.91	48.15
1988	64.38	60.39	61.42	54.59
1989	65.14	62.30	62.03	56.62
1990	68.13	63.64	64.42	58.01
1991	62.57	57.49	58.75	52.23
1992	59.29	57.69	56.47	51.77
1993	54.11	51.33	50.38	45.33
1994	57.49	58.17	53.91	52.93
1995	61.62	56.66	59.22	51.83
1996	60.21	58.46	57.71	52.41
1997	61.84	58.04	58.94	52.73
1998	63.79	59.58	60.99	54.21
1999	59.30	60.03	56.07	54.30
2000	55.70	58.64	52.00	52.87
2001	60.85	58.42	57.51	52.68
2002	58.35	58.59	54.69	53.23
2003	62.64	58.37	59.27	52.85
2004	58.64	55.93	55.81	50.47
2005	60.61	58.11	56.95	52.78
2006	61.19	58.31	57.50	52.48
2007	58.49	56.52	54.87	50.12
2008	65.80	62.91	62.19	57.53

3. The graphical comparisons of historical observations of TSI with predicted TSI under reduced TN (Figure 5.16) do not include a graph of the case of zero TN reduction computed using the regression equation, so there is no way to see how well the equation predicts TSI using the historical values as input. The comparison between actual data and predicted values for the zero reduction condition should be included.

   Department Response: Figure 5.16 includes the TSIs calculated under the existing TN, TP, and CHLAC concentrations (diamonds) as well as TSIs calculated after applying a 30 (or 50) percent reduction to existing TN concentrations and substituting predicted CHLAC concentrations under a 30 (or 50) percent reduction in TN based on the CHLAC GLM (squares, triangles).

4. It appears that the required TN reduction of 50 percent in Doctors Lake is driven by one high TSI value in 1990, a year in which only five calculations of TSI can be made, dates of data collection are not distributed seasonally, and the two highest values of TSI are computed from data collected within a one month period. Since reductions are based upon satisfying an average annual value, it would be better to go back in time no farther than to a point where reasonable amounts of seasonably distributed data are available.

Department Response: The following table summarizes annual TSIs shown in Figure 5.16 of the TMDL document. Under a 30 percent reduction in TN, there were multiple years in which the annual TSI was predicted to exceed the listing value of 60. With a 50 percent reduction in TN there were only 2 years after 1990 for which the annual TSI exceeded 60.

YEAR	N of CASES	TSIM	TSIMTN70	TSIMTN50
1985	5	62.90	59.31	55.68
1986	14	65.01	61.38	57.72
1987	8	57.16	53.62	49.91
1988	5	66.76	64.38	61.42
1989	4	68.01	65.14	62.03
1990	6	70.97	68.13	64.42
1991	4	64.34	62.57	58.75
1992	11	61.48	59.29	56.47
1993	6	56.90	54.11	50.38
1994	5	59.73	57.49	53.91
1995	9	63.38	61.62	59.22
1996	7	62.84	60.21	57.71
1997	33	63.83	61.84	58.94
1998	67	65.83	63.79	60.99
1999	63	61.83	59.30	56.07
2000	61	58.89	55.70	52.00
2001	70	63.56	60.85	57.51
2002	68	60.76	58.35	54.69
2003	65	64.93	62.64	59.27
2004	62	60.49	58.64	55.81
2005	47	63.17	60.61	56.95
2006	48	64.06	61.19	57.50
2007	34	62.42	58.49	54.87
2008	17	69.21	65.80	62.19

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