UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

JUN 21 2013

Herschel T. Vinyard
Secretary
Florida Department of Environmental Protection
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Dear Secretary Vinyard:

The U. S. Environmental Protection Agency has completed its review of the site specific alternative criteria (SSAC) for total nitrogen (TN) and total phosphorus (TP) for the Middle St. Johns River (MSJR). The Florida Department of Environmental Protection (FDEP) submitted the revised Chapter 62-302, including the SSAC, to the EPA on June 13, 2012 as new or revised water quality standards with the necessary certification by the FDEP general counsel, pursuant to 40 CFR Part 131. The SSAC were included in the list of site specific numeric interpretations of paragraph 62-302.530(47)(b), Florida Administrative Code (F.A.C.), referenced in paragraph 62-302.531(2)(a), F.A.C. and published at FDEP's website at http://www.dep.state.fl.us/water/wqssp/swq-docs.htm. FDEP submitted the numeric interpretations of the state narrative nutrient criterion for WBIDs 2964A, 2964, 2893F, 2893C, 2893D and 2893E expressed in the MSJR Total Maximum Daily Load report as the SSAC. FDEP intends for these SSAC to serve as numeric nutrient criteria for TN and TP for the MSJR in place of the otherwise applicable TN and TP criteria set out in paragraphs 62-302.531(2)(b)1. and 62-302.531(2)(c), F.A.C.

In accordance with section 303(c) of the CWA, I am hereby approving the SSAC for the MSJR WBIDs 2964A, 2964, 2893F, 2893C, 2893D, and 2893E as the revised water quality standards for TN and TP. Any other criteria applicable to these waterbodies remain in effect, including other applicable criteria at 62-302.531(2)(b)1. and any applicable federal criteria at 40 CFR 131.43(c)(1). The requirements of paragraph 62-302.530(47)(a), F.A.C. also remain applicable. The details of the SSAC are discussed in the enclosed documentation. We would like to commend you and your staff for your continued efforts in environmental protection for the State of Florida.

If you have any questions regarding the EPA's approval, please contact me at (404) 562-9345 or have a member of your staff contact Ms. Annie M. Godfrey, Water Quality Standards Section Chief at (404) 562-9967.

Sincerely,

James D. Giattina
Director
Water Protection Division

Enclosure
cc: Thomas M. Beason, FDEP
Daryll Joyner, FDEP

Decision Document for Hierarchy 1 Site Specific Alternative Criteria for Middle St. Johns River (MSJR)

Summary Information

WBID	Description	Class	Waterbody Type *Impaired Waters Rule (IWR) Run 40*	Listing Parameter
2893C	St. Johns River above Wekiva River	Class III (freshwater)	Stream	Dissolved Oxygen (DO) and Nutrients (Chlorophyll-*a* (chl-*a*))

A nutrient and DO Total Maximum Daily Load (TMDL) for the MSJR WBID 2893C was developed by the Florida Department of Environmental Protection (FDEP) and approved by the Environmental Protection Agency on September 30, 2009 pursuant to section 303(d) of the Clean Water Act (CWA). This TMDL was developed to identify the level of nutrients that would prevent an imbalance of flora and fauna as required by the state's narrative nutrient criterion at paragraph 62-302.530(47)(b), Florida Administrative Code (F.A.C.). FDEP determined that a total nitrogen (TN) load of 1,906 tons/year (yr) and a total phosphorus (TP) load of 144 tons/yr, not to be exceeded as annual loads, would meet its narrative criterion and adopted the loads as TMDL values at subsection 62-304.505(13), F.A.C. FDEP has submitted the TN and TP loads from the TMDL for EPA review as hierarchy 1 site specific alternative nutrient criteria (SSAC) for the MSJR WBID 2893C, pursuant to section 303(c) of the CWA and EPA's implementing regulations at 40 CFR Part 131. This decision document approves the SSAC for TN of 1,906 tons/yr and for TP of 144 tons/yr, not to be exceeded as annual loads, as hierarchy 1 criteria for MSJR WBID 2893C. Any other criteria applicable to this waterbody remain in effect, including the requirements of paragraph 62-302.530(47)(a), F.A.C.

In a letter dated June 13, 2012, from Thomas M. Beason, General Counsel for FDEP, to Gwendolyn Keyes Fleming, Regional Administrator of the EPA's Region 4 Office, FDEP submitted the numeric interpretations of the state narrative nutrient criterion for WBID 2893C as expressed in the MSJR TMDL as the SSAC for the MSJR WBID 2893C. These SSAC serve as the primary site specific interpretations of Florida's narrative water quality criterion for nutrients set out in paragraph 62-302.530(47)(b), F.A.C. in accordance with paragraph 62-302.531(2)(a), F.A.C. Pursuant to section 303(c) of the CWA, these revised water quality standards are subject to review and approval by the EPA since FDEP intends for these SSAC to serve as the numeric nutrient criteria for TN and TP for the MSJR in the place of the otherwise applicable TN and TP criteria set out in paragraph 62-302.531(2)(c), F.A.C. In the June 13, 2012, letter, the FDEP General Counsel certified that the revised water quality standards were duly adopted pursuant to Florida law.

The EPA's decision to approve these criteria is subject to the results of consultation under section 7 of the Endangered Species Act with the U.S. Fish and Wildlife Service. By approving the standards "subject to the results of consultation," the EPA retains its discretion to take appropriate action if the consultation identifies deficiencies in the standards requiring remedial action by the EPA. The EPA will notify FDEP of the results of the section 7 consultation upon completion of the action.

Description of waters for which the SSAC have been proposed

According to the TMDL, the six waterbodies included in the MSJR TMDL are within the portion of the Middle St. Johns River spanning from the inlet of Lake Harney to the confluence with the Wekiva River to the north (see maps on pages 5 – 7). The Middle St. Johns River stretches 33 miles and flows southeast to northwest, eventually draining into the Lake George watershed. The Middle St. Johns River receives drainage from about 771,000 acres in Lake, Volusia, Seminole, Orange, Marion, and Brevard counties through several major tributaries as well as the Upper St. Johns River.

WBID 2893C is a riverine segment downstream of Lake Monroe on the Middle St. Johns River. It is the most downstream waterbody included in the Middle St. Johns Basin TMDL. The majority of flows and nutrient loadings for WBID 2893C are from upstream flows from the Upper St. Johns River and Econlockhatchee River. Direct surface drainage to the impaired WBIDs downstream of Lake Jesup (WBIDs 2893E, 2893D, and 2893C) is received from about 71,380 acres, which is primarily urban and has about 15 percent of the area in agricultural, mining, pasture, and range land uses. WBID 2893C is a Class III waterbody with designated uses of recreation, propagation, and the maintenance of a healthy, well-balanced population of fish and wildlife. Development in the watersheds surrounding the Middle St. Johns River has contributed to deterioration of the area's water quality, particularly in waterbodies downstream of Lake Jesup including WBID 2893C.

Discussion of how the loads were derived

According to the TMDL, WBID 2893C was verified as impaired for both nutrients and DO on the basis of water quality assessments revealing elevated chl-*a* and depressed DO concentrations during the Cycle 2 verified period from January 1, 2001 to June 30, 2007. Consequently, the WBID was added to the verified list of impaired waters for the Middle St. Johns River by Secretarial Order on May 19, 2009. Segments of the Middle St. Johns River located downstream of the Lake Jesup outlet (including WBID 2893C) had significantly higher chl-*a* levels than the waterbodies upstream of Lake Jesup during the 1996 - 2007 period; WBID 2893C had a 75th percentile monthly average chl-*a* concentration of 25.2 µg/L, while WBIDs upstream of Lake Jesup had 75th percentile monthly average chl-*a* concentrations of 10 µg/L or less. The probable cause for the downstream increase in chl-*a* is input from Lake Jesup. Because the two lake waterbodies in this TMDL have longer residence times, making them more susceptible to nutrient pollution, the targets set for Lake Harney and Lake Monroe were presumed by FDEP to be sufficiently protective of the riverine segments as well. WBID 2893C was also verified as impaired for DO based on the observation that concentrations in more than 10 percent of samples from 2001-2007 were below the DO criterion.

To address the impairments in WBID 2893C, FDEP developed a nutrient and DO TMDL dated September 3, 2009, which was approved by the EPA on September 30, 2009. The nutrient and DO TMDL for the Middle St. Johns Basin WBID 2893C adopted at 62-304.505(13) was for TN and TP loadings of 1,906 tons/yr and 144 tons/yr, respectively. The primary targets utilized in this TMDL were TN and TP targets set by selecting the median value of three different approaches. The final TN and TP target concentrations were 1.18 mg/L and 0.07 mg/L,

respectively, which were derived by taking the median values from the three methods described below.

The Trophic State Index (TSI) method set target concentrations that resulted in TN TSI and TP TSI values less than the state target for overall TSI (60 for lakes with color > 40 Platinum Cobalt Units) using the TSI equations from Huber et al. (1982). The TSI is a composite measurement used in evaluating the level of nutrient enrichment in lakes, rivers and estuaries. The paleolimnological method utilized studies that analyzed and interpreted the diverse information contained in the sedimentary records of lakes and other waterbodies. The paleolimnological study identified nutrient accumulation rates in Lake Monroe. A low-impact period (1920s - 1960s) was differentiated from existing conditions (1990s) by identifying a significant increase in silica (indicator for diatom productivity, emergent plants, and attached sponges) in the 1970s, which was supported by changes in diatom taxonomy results. This paleolimnological method compared the ratio of the accumulation rate in the low-impact period to the accumulation rate of the existing conditions period and applied the ratio to the existing conditions annual average TP concentration. The TN target was then correlated to the annual average TP concentrations. The reference lake method utilized data from 1993-1997 from 200 Florida reference lakes that were grouped by biological assemblages and selected a target using the 75^{th} percentile concentrations of the alkaline, colored lake class.

The TN and TP nutrient targets represent the median values from the methods described above and although each had a different approach linking nutrient reductions to biological conditions, all approaches resulted in very similar values. The TN and TP targets were developed for the two lakes (Lake Harney and Lake Monroe) and then applied to the four riverine segments. Because of the longer residence time, FDEP expected the lakes to be more vulnerable to nutrient pollution than the associated river channels. FDEP determined that TN and TP concentrations were not dramatically different in the segments upstream of the Lake Jesup outlet (WBIDs 2964A, 2964, and 2893F) to the segments downstream of the Lake Jesup outlet (WBIDs 2893E, 2893D, and 2893C). However, chl-*a* concentrations were found to be two to three times higher in the downstream segments than the upstream segments. Therefore, FDEP found it reasonable to apply the same TN and TP targets to both the upstream and downstream segments, but with the expectation of achievable chl-*a* concentrations and TSI being relatively higher in the downstream segments than the upstream segments.

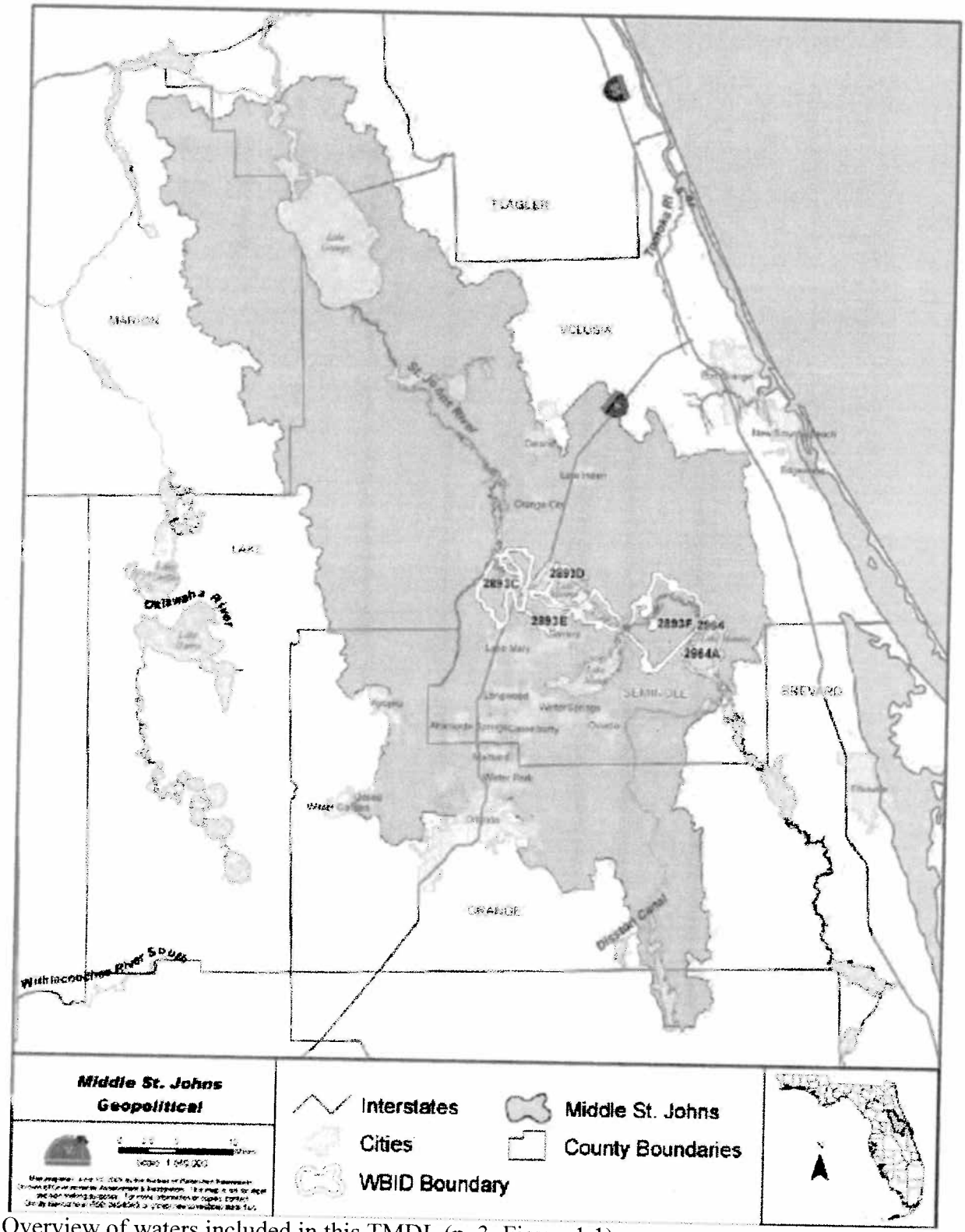
To determine the expression of the TMDL, nutrient loading in the MSJR was simulated using computer models. Modeled TN and TP loads were reduced until the annual average TN and TP concentrations in all of the impaired segments met the identified TN and TP target concentrations of 1.18 mg/L and 0.07 mg/L respectively. Meeting the DO standard was based upon a correlation found between TP and DO such that if monthly average TP was reduced to the TP target, the monthly average DO concentrations were greater than 5.0 mg/L. The TSI of 48 and chl-*a* of 9.1ug/l for this stream segment corresponds to the TN and TP targets. For WBID 2893C, the TMDL was expressed as TN and TP loadings of 1,906 tons/yr and 144 tons/yr which were adopted at subsection 62-304.505(13) F.A.C.

Consideration of TMDL loads as new or revised water quality standards

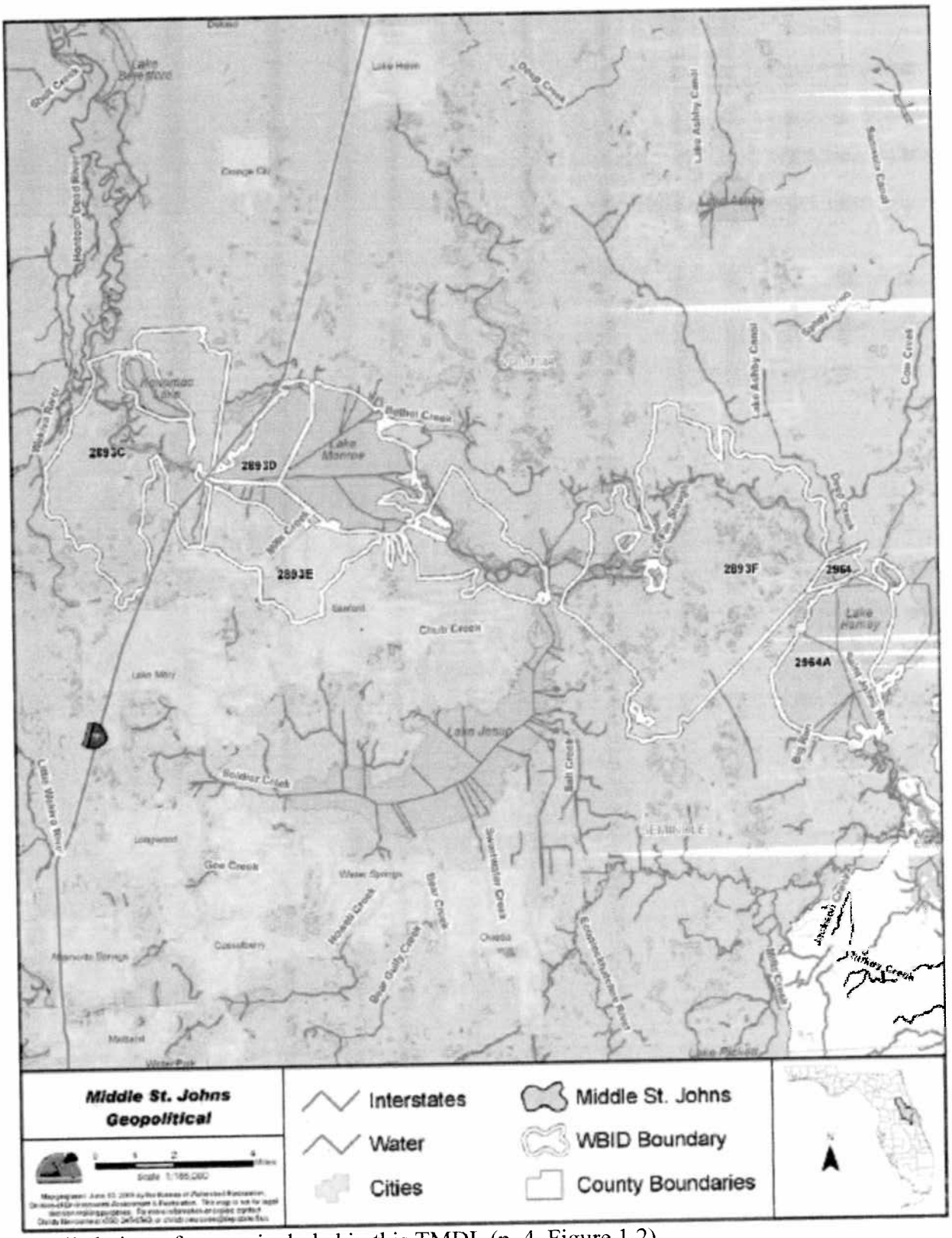
The TN and TP nutrient targets were derived by selecting the median values derived from three approaches including TSI, paleolimnological data, and reference lakes. Modeled loadings were developed to meet the TN and TP targets. The TMDL loads will achieve the TSI and chl-*a* values and will ensure that all Middle St. Johns River and lake segments are kept in a lower mesotrophic status and that healthy and balanced aquatic flora and fauna are maintained in these segments. This TMDL represents the annual TN and TP loadings that the river segment can assimilate and maintain balanced aquatic flora and fauna.

Conclusion

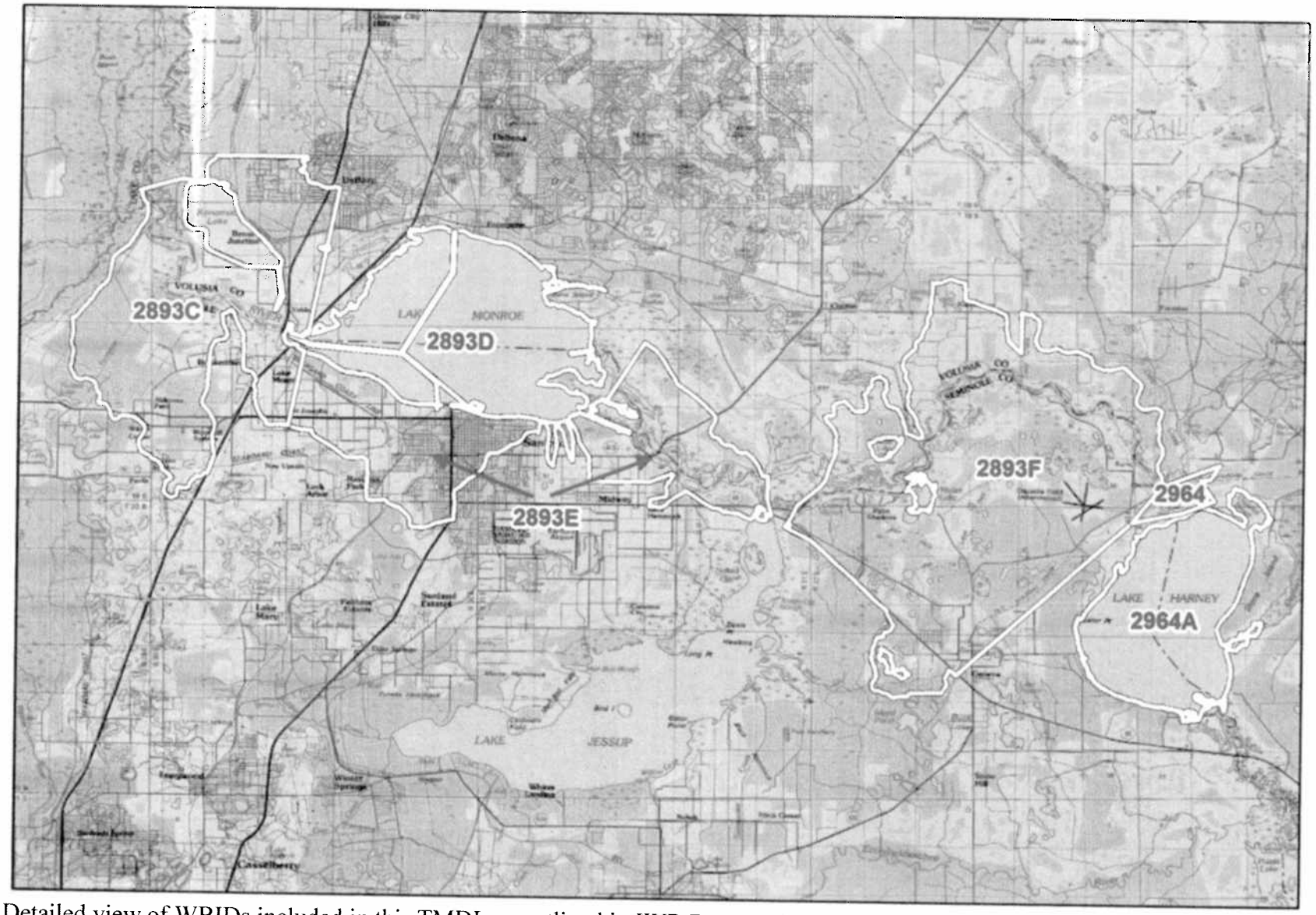
Based on the chemical, physical and biological data presented in the development of the SSAC, the EPA concludes that the SSAC for TN and TP established for the MSJR protect healthy, well-balanced biological communities in the waters to which the SSAC apply and are consistent with the CWA and its implementing regulations. More specifically, the SSAC are consistent with both 40 CFR Part 131.11(b)(1)(ii), and the EPA's 304(a) guidance on nutrient criteria. The TN and TP SSAC for St. Johns River above Wekiva River WBID 2893C which provide for TN and TP loadings of 1,906 tons/yr and 144 tons/yr, respectively, will protect water quality and aquatic life. FDEP did not address downstream protection in this TMDL. Paragraph 62-302.531(4), F.A.C. will apply to this WBID in conjunction with the Hierarchy 1 SSAC to ensure attainment and maintenance of water quality standards of downstream waters, in accordance with 40 Part 131.10. In accordance with section 303(c) of the CWA, the SSAC for St. Johns River above Lake Wekiva WBID 2893C for TN of 1,906 tons/yr and TP of 144 tons/yr, not to be exceeded as annual loads, are hereby approved as consistent with the CWA and 40 CFR Part 131.



Overview of waters included in this TMDL (p. 3, Figure 1.1)



Detailed view of waters included in this TMDL (p. 4, Figure 1.2)



Detailed view of WBIDs included in this TMDL as outlined in IWR Run 44. (This map was created to further illustrate the WBIDs covered by this TMDL but was not included in the TMDL.)

Appendix 1 – Summary of the TMDL Background

Name(s) of Addressed Water(s)	St. Johns River above Wekiva River
Waterbody Type(s)	Stream (IWR Run 40)
WBIDs	2893C
Latitude/Longitude	NA.
Description	The overall TMDL includes mainstem segments of the Middle St. Johns River from the inlet of Lake Harney to the confluence with Wekiva River to the north. The Middle St. Johns River stretches 33 miles and flows southeast to northwest, eventually draining into the Lake George watershed (TMDL p. 1). WBID 2893C is a riverine segment downstream of Lake Monroe on the Middle St. Johns River. It is the most downstream waterbody included in the Middle St. Johns Basin TMDL.
Classification(s)	Class III (freshwater) (TMDL p. 35)
Basin	Middle St. Johns Basin (TMDL p. 1)
Date Placed on Verified List	May 19, 2009 (TMDL p. 1)
Date TMDL was approved by EPA	September 30, 2009 (EPA WATERS database query 6/4/12)
Reference Streams/Lakes	One of three approaches used to establish nutrient targets for these WBIDs was based on using the 75th percentile of 200 reference lakes in Florida from research by Paul and Gerritsen (2002).
Source of Majority of Flow	The majority of flows for WBID 2893C are from upstream flows from the Upper St. Johns River and Econlockhatchee River. Direct surface drainage (excluding the upstream contributions from the watersheds draining the Upper St. Johns River and Econlockhatchee River) to the impaired WBIDs downstream of Lake Jesup (WBIDs 2893E, 2893D, and 2893C) is received from about 71,380 acres, which is primarily urban (43%) and has about 15 percent of the area in agricultural, mining, pasture, and range land uses (TMDL p. 66-67).
Indicators	Three different approaches were used to select nutrient targets: state standard (TSI) for colored lakes, paleolimnological data (i.e., significant increases in diatom productivity and taxonomy changes as an inflection point between low-impact conditions and existing conditions), and the 75th percentile concentrations of reference lakes (TMDL p. 44-48). In addition, algal biomass was observed as a biological indicator that is affected by nutrient composition, low turbidity, low color, and residence time (TMDL p. 39). The TMDL noted that while nutrient loads upstream and downstream of Lake Jesup are similar chl-*a* is higher in downstream segments (WBID 2893C is downstream of Lake Jesup). This was attributed to inputs to the

	downstream segments from Lake Jesup, which has a longer residence time, large surface area, shallow depth, and average annual chl-*a* of 66.5 µg/L (TMDL p. 37-42). Relationships between BOD and nutrients and chl-*a* were examined and a strong relationship between BOD and chl-*a* was found suggesting that BOD concentrations are controlled by algal biomass (TMDL p. 52).
Identification of Causative Pollutants (as determined by measurements of response endpoints or indicators)	WBID 2893C was verified as impaired for nutrients based upon exceedances of the chl-*a* IWR threshold of 20 µg/L. Phytoplankton were considered co-limited by TN and TP based on a median TN/TP ratio of 18 from 2001-2008 (TMDL p. 6). BOD was identified as the causative pollutant for DO impairment in WBID 2893C (median BOD of 2.8 mg/L, above the 2.0 mg/L threshold identified in Table 2.4 (TMDL p. 9-11, 52).
Sources and Concentrations of Nutrient Enrichment	The majority of nutrient loadings are generated from nonpoint sources (including watershed contributions, upstream contributions and direct atmospheric deposition). Point sources account for less than 1 percent of total nutrient loading (TMDL p. 61, 109). Nutrient loading in the MSJR were simulated using Hydrologic Simulation Program□Fortran (HSPF) (TMDL p. 61). As part of this modeling the MSJR was split into the Lake Harney basin (WBIDs 2964, 2964A, and 2893F) and the Lake Monroe basin (WBIDs 2893E, 2893D, and 2893C) (TMDL p. 61-66). Urban land uses in the Lake Monroe basin account for 43 percent of the total area, considerably higher than the Lake Harney basin (6%). Natural land uses (open land, forest, water, and wetlands) account for 41 percent of the total area. Sixteen percent of the Lake Monroe basin was estimated to be covered with impervious cover (TMDL p. 67-68). Approximately 99 percent of TN load and 98 percent of TP load for WBID 2893C were modeled to be contributed from upstream sources, with little input from within the watershed (0.9% TN; 1.4% TP), rainfall (0.1% TN and TP), or point sources (0.5% TN; 0.7% TP) (TMDL p. 97-98). Seven NPDES permitted facilities discharge in the watersheds of the MSJR that discharge to the six WBIDs covered by this TMDL. These seven facilities include five concrete batch plants, a steam electric power plant, and a domestic wastewater treatment facility. The concrete batch plants and the power plant are not considered significant sources of nutrients and no nutrient monitoring is required in these permits (TMDL p. 56-58). All of these facilities are located in the northern (downstream) portion of the WBIDs covered in this TMDL. One concrete batch plant and the aforementioned domestic WWTF discharges within this WBID. The mean loading from the domestic WWTF from 2000-2007 was 38,215 lbs/yr TN and 5,039 lbs/yr TP (TMDL p. 56-59).

	The MSJR contains three Phase I MS4 permit holders affected by this TMDL: Seminole County, City of Lake Mary, and City of Sanford; in addition to eight other Phase II MS4 permit holders (TMDL p. 61).
Nutrient Watershed Region in Proposed 62.302	Peninsular Stream (IWR Run 40)
Proposed Nitrogen SSAC and Frequency	The TMDL for 2893C for TN was 1,906 tons/yr. 4,202,340 lbs/yr (37% reduction) TN annual average in WBID 2893C to reach a target annual average concentration of 1.18 mg/L TN (TMDL p. 49, 108).
Proposed Phosphorus SSAC and Frequency	The TMDL for 2893C for TP was 144 tons/yr. 318,236 lbs/yr (31% reduction) TP annual average in WBID 2893C to reach a target annual average concentration of 0.07 mg/L TP (TMDL p. 49, 108).
Biological Index Score(s) (e.g. SCI, TSI, IBI)	NA.

Decision Document for Hierarchy 1 Site Specific Alternative Criteria for Middle St. Johns River (MSJR)

Summary Information

WBID	Description	Class	Waterbody Type *Impaired Waters Rule (IWR) Run 40*	Listing Parameter
2964	St. Johns River Downstream of Lake Harney	Class III (freshwater)	Stream	Dissolved Oxygen (DO)
2893F	St. Johns River above Lake Jesup	Class III (freshwater)	Stream	DO

A nutrient and DO Total Maximum Daily Load (TMDL) for the MSJR WBIDs 2964 and 2893F was developed by the Florida Department of Environmental Protection (FDEP) and approved by the Environmental Protection Agency on September 30, 2009 pursuant to section 303(d) of the Clean Water Act (CWA). This TMDL was developed to identify the level of nutrients that would prevent an imbalance of flora and fauna as required by the state's narrative nutrient criterion at paragraph 62-302.530(47)(b), Florida Administrative Code (F.A.C.). FDEP determined that a total nitrogen (TN) load of 1,697 tons/year (yr) and a total phosphorus (TP) load of 125 tons/yr, not to be exceeded as annual loads, would meet its narrative criterion and adopted these loads as TMDL values at subsection 62-304.505(14), F.A.C. FDEP has submitted the TN and TP loads from the TMDL for EPA review as hierarchy 1 site specific alternative nutrient criteria (SSAC) for MSJR WBIDs 2964 and 2893F, pursuant to section 303(c) of the CWA and EPA's implementing regulations at 40 CFR Part 131. This decision document approves the SSAC for TN of 1,697 tons/yr and for TP of 125 tons/yr, not to be exceeded as annual loads, as hierarchy 1 criteria for MSJR WBIDs 2964 and 2893F. Any other criteria applicable to this waterbody remain in effect, including the requirements of paragraph 62-302.530(47)(a), F.A.C.

In a letter dated June 13, 2012, from Thomas M. Beason, General Counsel for FDEP, to Gwendolyn Keyes Fleming, Regional Administrator of the EPA's Region 4 Office, FDEP submitted the numeric interpretations of the state narrative nutrient criterion for WBIDs 2964 and 2893F as expressed in the MSJR TMDL as the SSAC for the MSJR WBIDs 2964 and 2893F. These SSAC serve as the primary site specific interpretations of Florida's narrative water quality criterion for nutrients set out in paragraph 62-302.530(47)(b), F.A.C. in accordance with paragraph 62-302.531(2)(a), F.A.C. Pursuant to section 303(c) of the CWA, these revised water quality standards are subject to review and approval by the EPA since FDEP intends for these SSAC to serve as the numeric nutrient criteria for TN and TP for the MSJR in place of the otherwise applicable TN and TP criteria set out in paragraph 62-302.531(2)(c), F.A.C. In the June 13, 2012, letter, FDEP General Counsel certified that the revised water quality standards were duly adopted pursuant to Florida law.

The EPA's decision to approve these criteria is subject to the results of consultation under section 7 of the Endangered Species Act with the U.S. Fish and Wildlife Service. By approving the standards "subject to the results of consultation," the EPA retains its discretion to take appropriate action if the consultation identifies deficiencies in the standards requiring remedial

action by the EPA. The EPA will notify FDEP of the results of the section 7 consultation upon completion of the action.

Description of waters for which the SSAC have been proposed

According to the TMDL, the waterbodies included in the MSJR TMDL document are within the portion of the Middle St. Johns River spanning from the inlet of Lake Harney to the confluence with the Wekiva River to the north (see maps on pages 5 – 7). The Middle St. Johns River stretches 33 miles and flows southeast to northwest, eventually draining into the Lake George watershed. The Middle St. Johns River receives drainage from about 771,000 acres in Lake, Volusia, Seminole, Orange, Marion, and Brevard counties through several major tributaries as well as the Upper St. Johns River.

WBIDs 2964 and 2893F are described as the riverine segments located on the Middle St. Johns River downstream of Lakes Harney and Jesup. The majority of flows and nutrient loading into WBID 2964 are the result of upstream flows from the Upper St. Johns River and Econlockhatchee River. The surface drainage area for the downstream portion of WBID 2893F includes about 145,106 acres, which is primarily (72%) composed of natural land uses (i.e., open land, forest, water, and wetlands). Both WBIDs are Class III waterbodies with designated uses of recreation, propagation, and the maintenance of a healthy, well-balanced population of fish and wildlife. Development in the watersheds surrounding the Middle St. Johns River has contributed to deterioration of the area's water quality, though more so downstream than in these WBIDs.

Discussion of how the loads were derived

According to the TMDL, WBIDs 2964 and 2893F were verified as impaired for DO on the basis of water quality assessments revealing depressed DO concentrations during the Cycle 2 verified period from January 1, 2001 to June 30, 2007. The WBIDs were added to the verified list of impaired waters for the Middle St. Johns River by Secretarial Order on May 19, 2009.
FDEP linked the observed low DO to nutrients because of the functional relationship between nutrients and chlorophyll-*a* (chl-*a*), which then in turn affects DO concentrations. Nutrients, specifically nitrogen, were identified as the causative pollutant for this impairment based on exceeding the TN threshold value. BOD was also identified as a causative pollutant for this impairment based on exceeding the BOD threshold value. Because the two lake waterbodies in the LSJR TMDL have longer residence times, making them more susceptible to nutrient pollution, the targets set for Lake Harney and Lake Monroe were presumed by FDEP to be sufficiently protective of the riverine segments (WBIDs 2964 and 2893F) as well. Nutrients were determined to be the cause of the DO impairment for WBIDs 2964 and 2893F and the nutrient targets in the TMDL were developed to meet the DO criterion.

To address the impairment in WBIDs 2964 and 2893F, FDEP developed a nutrient and DO TMDL dated September 3, 2009, which was approved by EPA on September 30, 2009. The nutrient and DO TMDLs for the Middle St. Johns River Segments WBIDs 2964 and 2893F were adopted at 62-304.505(14) for TN and TP loads of 1,697 tons/yr and 125 tons/yr, respectively. The primary targets utilized in this TMDL were TN and TP targets set by selecting the median value of three different approaches. The final TN and TP target concentrations were 1.18 mg/L and 0.07 mg/L, respectively, which were derived by taking the median values from the three methods described below.

The Trophic State Index (TSI) method set target concentrations that resulted in TN TSI and TP TSI values less than the state target for overall TSI (60 for lakes with color > 40 Platinum Cobalt Units) using the TSI equations from Huber et al. (1982). The TSI is a composite measurement used in evaluating the level of nutrient enrichment in lakes, rivers and estuaries. The paleolimnological method utilized studies that analyzed and interpreted the diverse information contained in the sedimentary records of lakes and other water bodies. The paleolimnological study identified nutrient accumulation rates in Lake Monroe. A low-impact period (1920s - 1960s) was differentiated from existing conditions (1990s) by identifying a significant increase in silica (indicator for diatom productivity, emergent plants, and attached sponges) in the 1970s, which was supported by changes in diatom taxonomy results. This paleolimnological method compared the ratio of the accumulation rate in the low-impact period to the accumulation rate of the existing conditions period and applied the ratio to the existing conditions annual average TP concentration. The TN target was then correlated to the annual average TP concentrations. The reference lake method utilized data from 1993-1997 from 200 Florida reference lakes that were grouped by biological assemblages and selected a target using the 75th percentile concentrations of the alkaline, colored lake class.

The TN and TP nutrient target concentrations represent the median values from the methods described above and although each had a different approach linking nutrient reductions to biological conditions, all approaches resulted in very similar values. The TN and TP targets were developed for the two lakes (Lake Harney and Lake Monroe) and then applied to the four riverine segments. Because of the longer residence time, FDEP expected the lakes to be more vulnerable to nutrient pollution than the associated river channels. FDEP determined that TN and TP concentrations were not dramatically different in the segments upstream of the Lake Jesup outlet (WBIDs 2964A, 2964, and 2893F) to the segments downstream of the Lake Jesup outlet (WBIDs 2893E, 2893D, and 2893C). However, chl-*a* concentrations were found to be two to three times higher in the downstream segments than the upstream segments. Therefore, FDEP found it reasonable to apply the same TN and TP targets to both the upstream and downstream segments, but with the expectation of achievable chl-*a* concentrations and TSI being relatively higher in the downstream segments than the upstream segments.

To determine the expression of the TMDL, nutrient loads were simulated in the MSJR using computer models. Modeled TN and TP loads were reduced until the annual average TN and TP concentrations in all of the impaired segments met the identified TN and TP target concentrations of 1.18 mg/L and 0.07 mg/L respectively. Meeting the DO standard was based upon a correlation found between TP and DO such that if monthly average TP was reduced to the TP target, the monthly average DO concentrations were greater than 5.0 mg/L. The TSI of 42 and chl-*a* of 5.8ug/l for these stream segments correspond to the TN and TP targets. For WBIDs 2964 and 2893F, the TMDL was expressed as TN and TP loads of 1,697 tons/yr and 125 tons/yr, respectively, not to be exceeded as annual loads, and were adopted at 62-304.505(14), F.A.C.

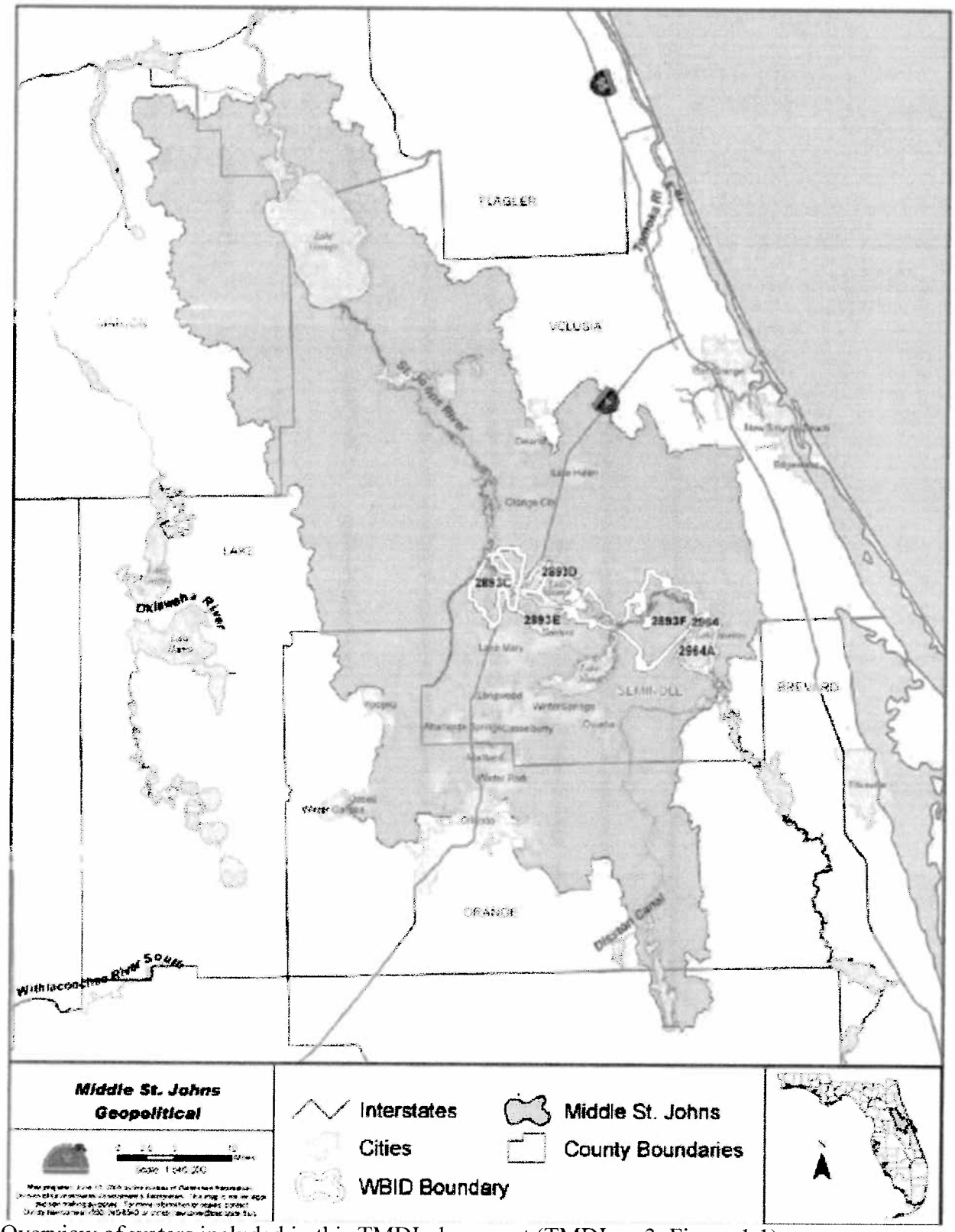
Consideration of TMDL loads as new or revised water quality standards

The TN and TP nutrient targets were derived by selecting the median values derived from three approaches including TSI, paleolimnological data, and reference lakes. The modeled loadings were then developed to meet the TN and TP targets. The TMDL loads will achieve the TSI and

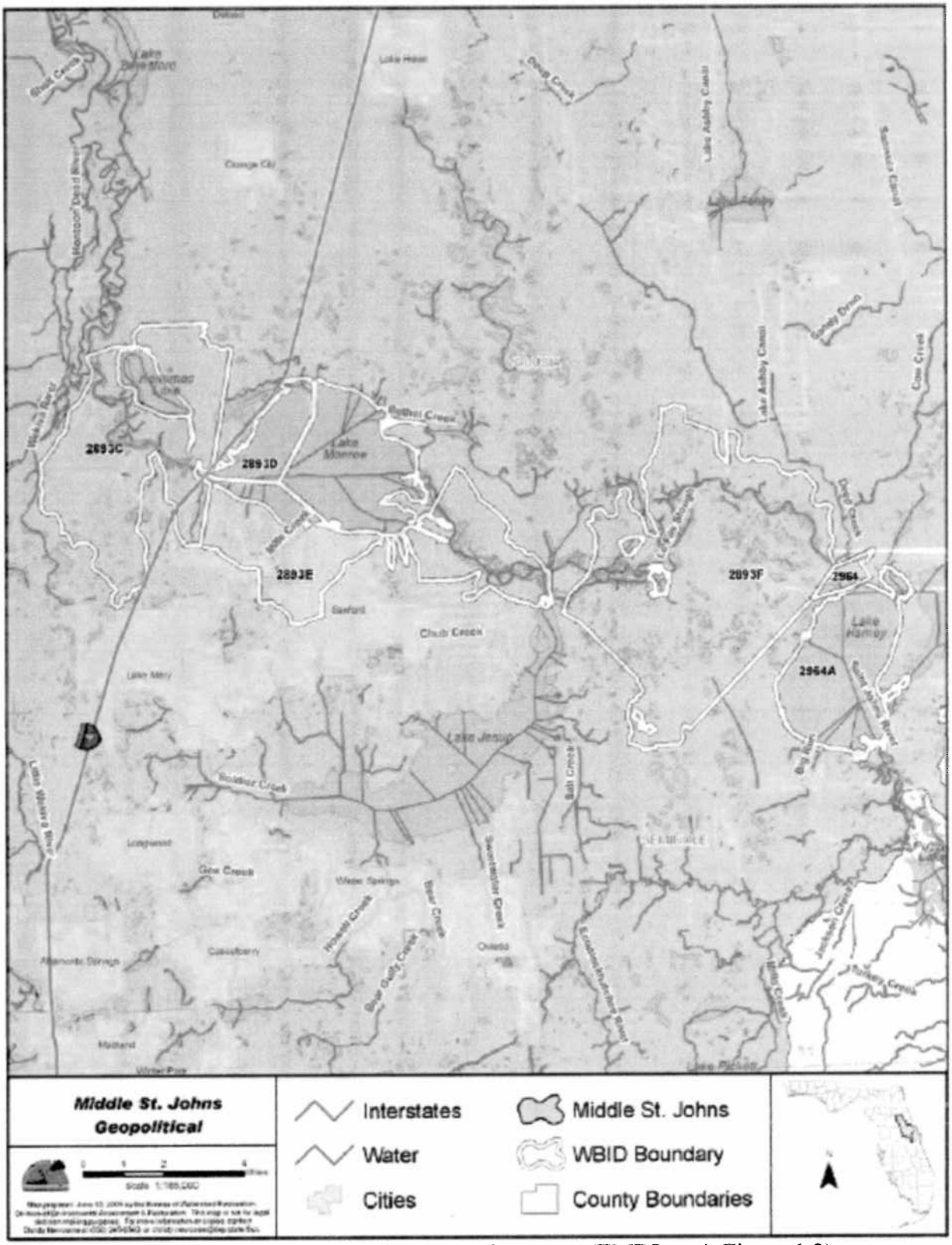
chl-*a* values and will ensure that St. Johns river segments downstream of Lake Harney and upstream of Lake Jesup and the associated MSJR segments are kept in a lower mesotrophic status and that healthy and balanced aquatic flora and fauna are maintained in these segments. This TMDL represents the annual TN and TP loadings that the river segment can assimilate and maintain balanced aquatic flora and fauna.

Conclusion

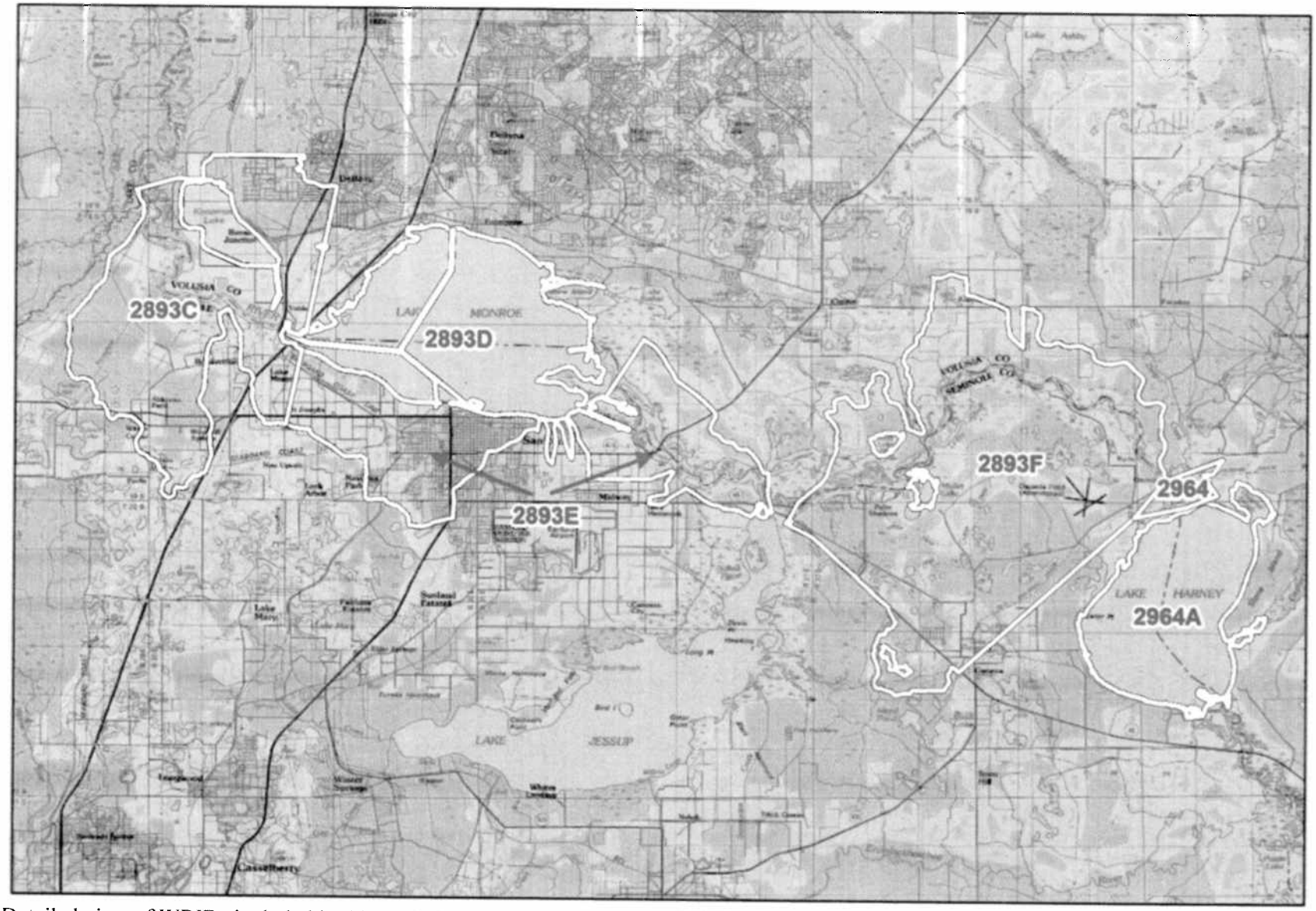
Based on the chemical, physical and biological data presented in the development of the SSAC, the EPA concludes that the SSAC for TN and TP established for the MSJR WBIDs 2964 and 2893F protect healthy, well-balanced biological communities in the waters to which the SSAC apply and are consistent with the CWA and its implementing regulations. More specifically, the SSAC are consistent with both 40 CFR Part 131.11(b)(1)(ii), and the EPA's 304(a) guidance on nutrient criteria. The TN and TP SSAC for St. Johns River Downstream of Lake Harney WBID 2964 and St. Johns River above Lake Jesup WBID 2893F which provide for TN and TP loadings of 1,697 tons/yr and 125 tons/yr, respectively, will protect water quality and aquatic life. FDEP did not address downstream protection in this TMDL. Paragraph 62-302.531(4), F.A.C. will apply to this WBID in conjunction with the Hierarchy 1 SSAC to ensure attainment and maintenance of water quality standards of downstream waters, in accordance with 40 CFR Part 131.10. In accordance with section 303(c) of the CWA, the SSAC for MSJR WBIDs 2893F and 2964 for TN of 1,697 tons/yr and TP of 125 tons/yr, not to be exceeded as annual loads, are hereby approved as consistent with the CWA and 40 CFR Part 131.



Overview of waters included in this TMDL document (TMDL p. 3, Figure 1.1)



Detailed view of waters included in this TMDL document (TMDL p. 4, Figure 1.2)



Detailed view of WBIDs included in this TMDL document as outlined in IWR Run 44 (map not in TMDL, created to illustrate the WBIDs covered by this TMDL)

Appendix 1 – Summary of the TMDL Background

Name(s) of Addressed Water(s)	St. Johns River downstream of Lake Harney and St. Johns River above Lake Jesup
Waterbody Type(s)	Stream (IWR Run 40)
WBIDs	2964 and 2893F
Latitude/Longitude	NA.
Description	The overall TMDL document includes mainstem segments of the Middle St. Johns River from the inlet of Lake Harney to the confluence with Wekiva River to the north. The Middle St. Johns River stretches 33 miles and flows southeast to northwest, eventually draining into the Lake George watershed (TMDL p. 1). WBID 2964 is located at the outlet of Lake Harney on the Middle St. Johns River (TMDL p. 66). WBID 2893F is located upstream of Lake Jesup and downstream of Lake Harney on the Middle St. Johns River.
Classification(s)	Class III (freshwater) (TMDL p. 35)
Basin	Middle St. Johns Basin (TMDL p. 1)
Date Placed on Verified List	May 19, 2009 (TMDL p. 1)
Date TMDL was approved by EPA	September 30, 2009 (EPA WATERS database query 6/4/12)
Reference Streams/Lakes	One of three approaches used to establish nutrient targets for these WBIDs was based on using the 75th percentile of 200 reference lakes in Florida from research by Paul and Gerritsen (2002).
Source of Majority of Flow	The majority of flows for WBID 2964 and 2893F are from upstream flows from the Upper St. Johns River and Econlockhatchee River. Direct surface drainage (excluding upstream contributions from the watersheds draining the Upper St. Johns and Econlockhatchee River) to WBID 2964A and the WBIDs directly downstream (WBIDs 2964 and 2893F) is received from about 145,106 acres, which is primarily (72%) composed of natural land uses (i.e., open land, water, forest, wetlands) (TMDL p. 66).
Indicators	Three different approaches were used to select nutrient targets: state standard (TSI) for colored lakes, paleolimnological data (i.e., significant increases in diatom productivity and taxonomy changes as an inflection point between low-impact conditions and existing conditions), and the 75th percentile concentrations of reference lakes (TMDL p. 44-48). In addition, algal biomass was observed as a biological indicator that is affected by nutrient composition, low turbidity, low color, and residence time (TMDL p. 39). The TMDL noted that while nutrient loads upstream and downstream of Lake Jesup are similar chl-*a* is higher in downstream segments (WBID 2964 and 2893F are upstream of Lake Jesup). This was attributed to inputs to the downstream segments from Lake Jesup, which has a longer residence time, large

	surface area, shallow depth, and average annual chl-*a* of 66.5 µg/L (TMDL p. 37-42). Relationships between BOD and nutrients and chl-*a* were examined and a strong relationship between BOD and chl-*a* was found suggesting that BOD concentrations are controlled by algal biomass (TMDL p. 52).
Identification of Causative Pollutants (as determined by measurements of response endpoints or indicators)	Nitrogen was identified as the causative pollutant for DO impairment in WBID 2964 (TMDL p. 9-11). Although nitrogen is identified as the possible causative pollutant, no relationship could be established between TN and DO (TMDL p. 52). BOD was also identified as the causative pollutant for DO impairment in WBID 2893F (median BOD of 2.2 mg/L, above the 2.0 mg/L threshold identified in Table 2.4) (TMDL p. 9-11, 52).
Sources and Concentrations of Nutrient Enrichment	The majority of nutrient loadings are generated from nonpoint sources (including watershed contributions, upstream contributions and direct atmospheric deposition). Point sources account for less than 1 percent of total nutrient loading (TMDL p. 61, 109). Nutrient loading in the MSJR were simulated using Hydrologic Simulation Program Fortran (HSPF) (TMDL p. 61). As part of this modeling the MSJR was split into the Lake Harney Basin (WBIDs 2964, 2964A, and 2893F) and the Lake Monroe Basin (WBIDs 2893E, 2893D, and 2893C) (TMDL p. 61-66). Natural land uses in the Lake Harney watershed including open land, forest, waters, and wetlands account for approximately 72 percent of the surface area, while urban uses account for only about 6 percent of the surface area (2% impervious cover) (TMDL p. 66-67). Approximately 92 percent of TN load and 89 percent of TP load for WBIDs 2964 and 2893F were modeled to be contributed from upstream sources, with 7.4 percent of TN load and 11.2 percent TP load contributed from watershed input (discharged from watersheds adjacent to the segment) (TMDL p. 96-98). Seven NPDES permitted facilities discharge in the watersheds of the modeled MSJR that discharge to the six WBIDs covered by this TMDL. These seven facilities include five concrete batch plants, a steam electric power plant, and a domestic wastewater treatment facility. The concrete batch plants and the power plant are not considered significant sources of nutrients and no nutrient monitoring is required in these permits (TMDL p. 56-58). All of these facilities are located in the northern portion of the WBIDs covered in this TMDL, downstream of WBID 2964 and 2893F, and none discharge directly to WBID 2964 (TMDL p. 56-58). The MSJR contains three Phase I MS4 permit holders affected by this TMDL: Seminole County, City of Lake Mary, and City of Sanford; in addition to eight other Phase II MS4 permit holders (TMDL p. 61).
Nutrient Watershed	Peninsular Stream (IWR Run 40)

Region in Proposed 62.302	
Proposed Nitrogen SSAC and Frequency	The TMDL for the Middle St. Johns River for WBIDs 2893F and 2964 adopted at 62-304.505(14) for TN of 1,697 tons/yr. The TN annual average in WBIDs 2964 and 2893F to reach a target annual average concentration of 1.18 mg/L TN (TMDL p. 49, 108).
Proposed Phosphorus SSAC and Frequency	The TMDL for the Middle St. Johns River for WBIDs 2893F and 2964 adopted at 62-304.505(14) for TP of 125 tons/yr. The TP annual average in WBIDs 2964 and 2893F to reach a target annual average concentration of 0.07 mg/L TP (TMDL p. 49, 108).
Biological Index Score(s) (e.g. SCI, TSI, IBI)	NA.

Decision Document for Hierarchy 1 Site Specific Alternative Criteria for Middle St. Johns River (MSJR)

Summary Information

WBID	Description	Class	Waterbody Type *Impaired Waters Rule (IWR) Run 40*	Listing Parameter
2893D	Lake Monroe	Class III (freshwater)	Lake	Dissolved Oxygen (DO) and Nutrients (Trophic State Index (TSI))
2893E	St. Johns River above Lake Monroe	Class III (freshwater)	Stream	DO and Nutrients (Chlorophyll-*a* (chl-*a*))

A nutrient and DO Total Maximum Daily Load (TMDL) for the MSJR WBIDs 2893D and E was developed by the Florida Department of Environmental Protection (FDEP) and approved by the Environmental Protection Agency on September 30, 2009 pursuant to section 303(d) of the Clean Water Act (CWA). This TMDL was developed to identify the level of nutrients that would prevent an imbalance of flora and fauna as required by the state's narrative nutrient criterion at paragraph 62-302.530(47)(b), Florida Administrative Code (F.A.C.). FDEP determined that a total nitrogen (TN) load of 1,892 tons/year (yr) and a total phosphorus (TP) load of 143 tons/yr, not to be exceeded as annual loads, would meet its narrative criterion and adopted the loads as TMDL values at subsection 62-304.505(12), F.A.C. FDEP has submitted the TN and TP loads from the TMDL for EPA review as hierarchy 1 site specific alternative nutrient criteria (SSAC) for the MSJR WBIDs 2893D and E, pursuant to section 303(c) of the CWA and EPA's implementing regulations at 40 CFR Part 131. This decision document approves the SSAC for TN of 1,892 tons/yr and for TP of 143 tons/yr, not to be exceeded as annual loads, as hierarchy 1 criteria for MSJR WBIDs 2893D and E. Any other criteria applicable to this waterbody remain in effect. Specifically as to nutrients, chlorophyll *a* criteria consistent with paragraph 62-302.531(2)(b)1., F.A.C. continue to apply, as well as the requirements of paragraph 62-302.530(47)(a), F.A.C.

In a letter dated June 13, 2012, from Thomas M. Beason, General Counsel for FDEP, to Gwendolyn Keyes Fleming, Regional Administrator of the EPA's Region 4 Office, FDEP submitted the numeric interpretations of the state narrative nutrient criterion for WBIDs 2893D and E as expressed in the MSJR TMDL as the SSAC for the MSJR. These SSAC serve as the primary site specific interpretations of Florida's narrative water quality criterion for nutrients set out in paragraph 62-302.530(47)(b), F.A.C. in accordance with paragraph 62-302.531(2)(a), F.A.C. Pursuant to section 303(c) of the CWA, these revised water quality standards are subject to review and approval by the EPA since FDEP intends for these SSAC to serve as the numeric nutrient criteria for TN and TP for the MSJR in the place of the otherwise applicable TN and TP criteria set out in paragraph 62-302.531(2)(b)1. and 62-302.531(2)(c), F.A.C. In the June 13, 2012, letter, the FDEP General Counsel certified that the revised water quality standards were duly adopted pursuant to Florida law.

The EPA's decision to approve the criteria is subject to the results of consultation under section 7 of the Endangered Species Act with the U.S. Fish and Wildlife Service. By approving the standards "subject to the results of consultation," the EPA retains its discretion to take appropriate action if the consultation identifies deficiencies in the standards requiring remedial action by the EPA. The EPA will notify FDEP of the results of the section 7 consultation upon completion of the action.

Description of waters for which the SSAC have been proposed

According to the TMDL the six waterbodies included in this TMDL are within the portion of the Middle St. Johns River spanning from the inlet of Lake Harney to the confluence with the Wekiva River to the north (see maps on pages 5 – 7). The Middle St. Johns River stretches 33 miles and flows southeast to northwest, eventually draining into the Lake George watershed.

Lake Monroe WBID 2893D is a lake segment located north (downstream) of Lake Jesup along the Middle St. Johns River. The lake is located immediately north of the major municipalities of Sanford and Lake Monroe and south of the cities of Deltona, DeBary, and Enterprise. Interstate 4 crosses the outlet of Lake Monroe and runs in a north-south direction, skirting the edge of the western side of the lake. Lake Monroe is a shallow lake (mean depth of 6 feet) with a surface area of 8,814 acres, 30-day mean flow rate of 2,472 feet per second (cfs), and a 23-day residence time. The waterbody is an alkaline, colored lake with a mean color level of 170.4 Platinum Cobalt Units (PCU). The majority of flows for WBID 2893D are from upstream flows from the Upper St. Johns River and Econlockhatchee River. Direct surface drainage (excluding the upstream contributions from the watersheds draining the Upper St. Johns River and Econlockhatchee River) to the impaired WBIDs downstream of Lake Jesup (WBIDs 2893E, 2893D, and 2893C) is received from about 71,380 acres, which is primarily urban and has a small percent of agricultural, mining, pasture, and range land uses. WBID 2893E is a riverine segment located upstream and adjacent to Lake Monroe and downstream of Lake Jesup on the Middle St. Johns River. The majority of flows for WBID 2893E are from upstream flows from the Upper St. Johns River watershed and Econlockhatchee River watershed including Lake Jesup. WBIDs 2893D and E are Class III waterbodies with designated uses of recreation, propagation, and the maintenance of a healthy, well-balanced population of fish and wildlife. Development in the watersheds surrounding the Middle St. Johns River has contributed to deterioration of the area's water quality, including both WBIDs 2893D and E.

Discussion of how the loads were derived

According to the TMDL WBID 2893D was verified as impaired for both nutrients and DO on the basis of water quality assessments revealing elevated TSI and depressed DO concentrations, during the Cycle 2 verified period from January 1, 2001 to June 30, 2007. WBID 2893D was verified as impaired for DO based on the observation that concentrations in more than 10 percent of samples from 2001-2007 were below the DO criterion. BOD related to phosphorus was identified as the causative pollutant for this impairment. FDEP verified WBID 2893D as impaired for nutrients on the basis of a significant positive correlation between BOD and chl-*a* concentrations. WBID 2893D had a 75th percentile monthly average chl-*a* concentration of 29.0 µg/L, while WBIDs upstream of Lake Jesup had 75th percentile monthly average chl-*a* concentrations of 10 µg/L or less.

WBID 2893E was verified as impaired for both nutrients and DO on the basis of water quality assessments revealing elevated chl-*a* and depressed DO concentrations, based on data collected from January 1, 2001 to June 30, 2007. WBID 2893E was verified as impaired for nutrients based on FDEP's findings that annual average chl-*a* exceeded the IWR threshold of 20 µg/L in three years between 2001 and 2007. WBID 2893E had a 75th percentile monthly average chl-*a* concentration of 22.9 µg/L, while WBIDs upstream of Lake Jesup had 75th percentile monthly average chl-*a* concentrations of 10 µg/L or less. WBID 2893E was verified as impaired for DO based on FDEP's findings that concentrations in more than 10 percent of samples from 2001-2007 were below the DO criterion. BOD was identified as the causative pollutant for this impairment because the average BOD concentration exceeded the BOD pollutant threshold value. Segments 2983D and E had significantly higher chl-*a* levels than the waterbodies upstream of Lake Jesup during the 1996 - 2007 period which the TMDL attributes to chl-a input from Lake Jesup. The cause of both WBIDs' increases in chl-*a* is most likely due to inputs from Lake Jesup. To address the impairment in WBIDs 2893D and E, FDEP developed a nutrient and DO TMDL dated September 3, 2009, which was approved by EPA on September 30, 2009.

The primary targets utilized in this TMDL were TN and TP targets set by selecting the median value of three different approaches. The final TN and TP target concentrations were 1.18 mg/L and 0.07 mg/L, respectively, which were derived by taking the median values from the three methods described below.

The TSI method set target concentrations that resulted in TN TSI and TP TSI values less than the state target for overall TSI (60 for lakes with color > 40 Platinum Cobalt Units) using the TSI equations from Huber et al. (1982). The TSI is a composite measurement used in evaluating the level of nutrient enrichment in lakes, rivers and estuaries. The paleolimnological method utilized studies that analyzed and interpreted the diverse information contained in the sedimentary records of lakes and other water bodies. The paleolimnological study identified nutrient accumulation rates in Lake Monroe. A low-impact period (1920s - 1960s) was differentiated from existing conditions (1990s) by identifying a significant increase in silica (indicator for diatom productivity, emergent plants, and attached sponges) in the 1970s, which was supported by changes in diatom taxonomy results. This paleolimnological method compared the ratio of the accumulation rate in the low-impact period to the accumulation rate of the existing conditions period and applied the ratio to the existing conditions annual average TP concentration. The TN target was then correlated to the annual average TP concentrations. The reference lake method utilized data from 1993-1997 from 200 Florida reference lakes that were grouped by biological assemblages and selected a target using the 75th percentile concentrations of the alkaline, colored lake class.

The TN and TP nutrient targets represent the median values from the methods described above and although each had a different approach linking nutrient reductions to biological conditions, all approaches resulted in very similar values. The TN and TP targets were developed for the two lakes (Lake Harney and Lake Monroe) and then applied to the four riverine segments. Because of the longer residence time, FDEP expected the lakes to be more vulnerable to nutrient pollution than the associated river channels. FDEP determined that TN and TP concentrations were not dramatically different in the segments upstream of the Lake Jesup outlet (WBIDs 2964A, 2964, and 2893F) to the segments downstream of the Lake Jesup outlet (WBIDs 2893E, 2893D, and

2893C). However, chl-*a* concentrations were found to be two to three times higher in the downstream segments than the upstream segments. Therefore, FDEP found it reasonable to apply the same TN and TP targets to both the upstream and downstream segments, but with the expectation of achievable chl-*a* concentrations and TSI being relatively higher in the downstream segments than the upstream segments.

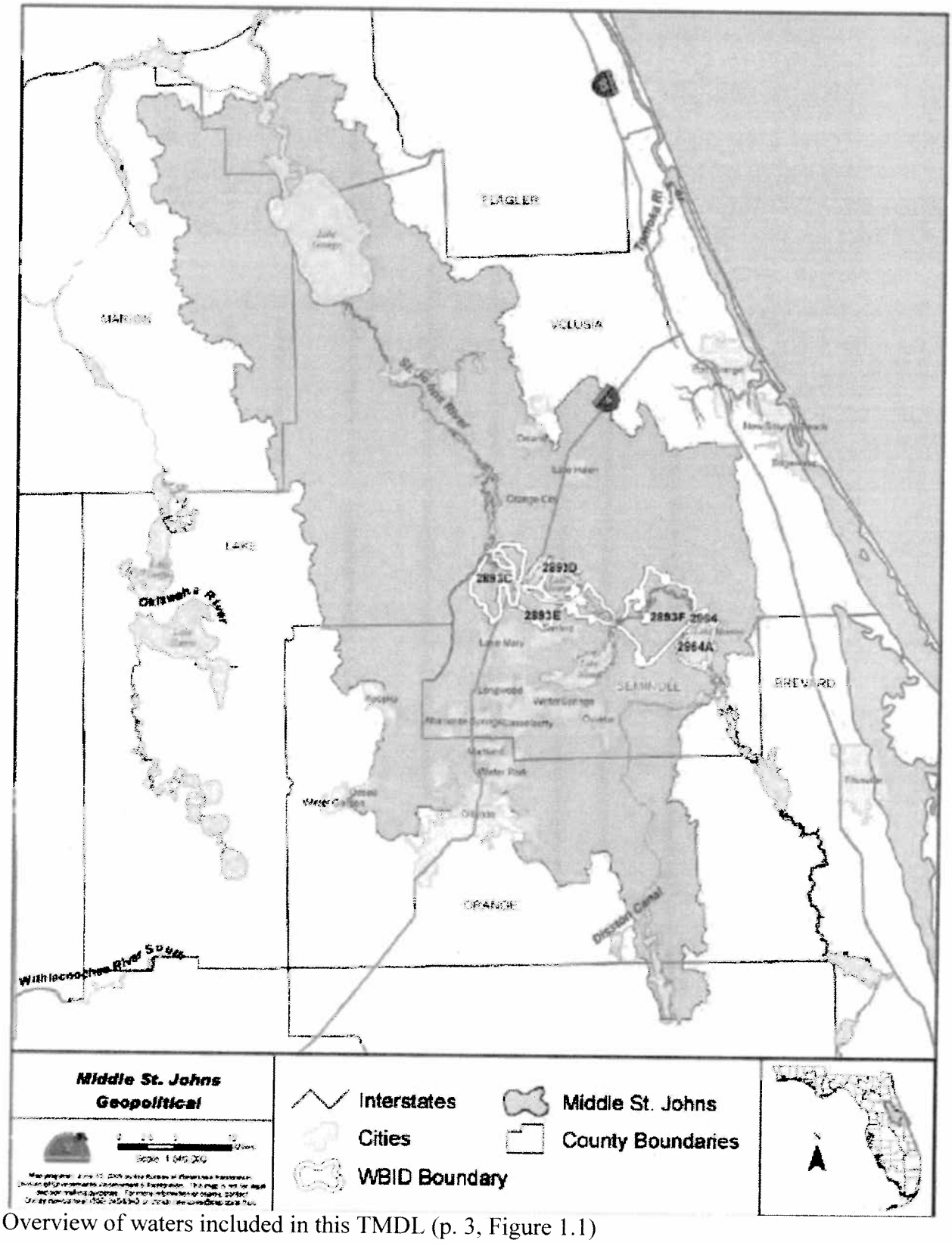
To determine the expression of the TMDL, nutrient loads were simulated in the MSJR using computer models. Modeled TN and TP loads were reduced until the annual average TN and TP concentrations in all of the impaired segments met the identified TN and TP target concentrations of 1.18 mg/L and 0.07 mg/L respectively. Meeting the DO standard was based upon a correlation found between TP and DO such that if monthly average TP was reduced to the TP target, the monthly average DO concentrations were greater than 5.0 mg/L. The TSI of 54 for the lake segment and TSI of 48 and chl-*a* of 9.1ug/l for the riverine segment correspond to the TN and TP targets. The nutrient and DO TMDLs for Lake Monroe and St. Johns River above Lake Monroe adopted at subsection 62-304.505(12) F.A.C. were for a TP load of 1,892 tons/yr and TN load of 143 tons/yr not to be exceeded as annual loads.

Consideration of TMDL loads as new or revised water quality standards

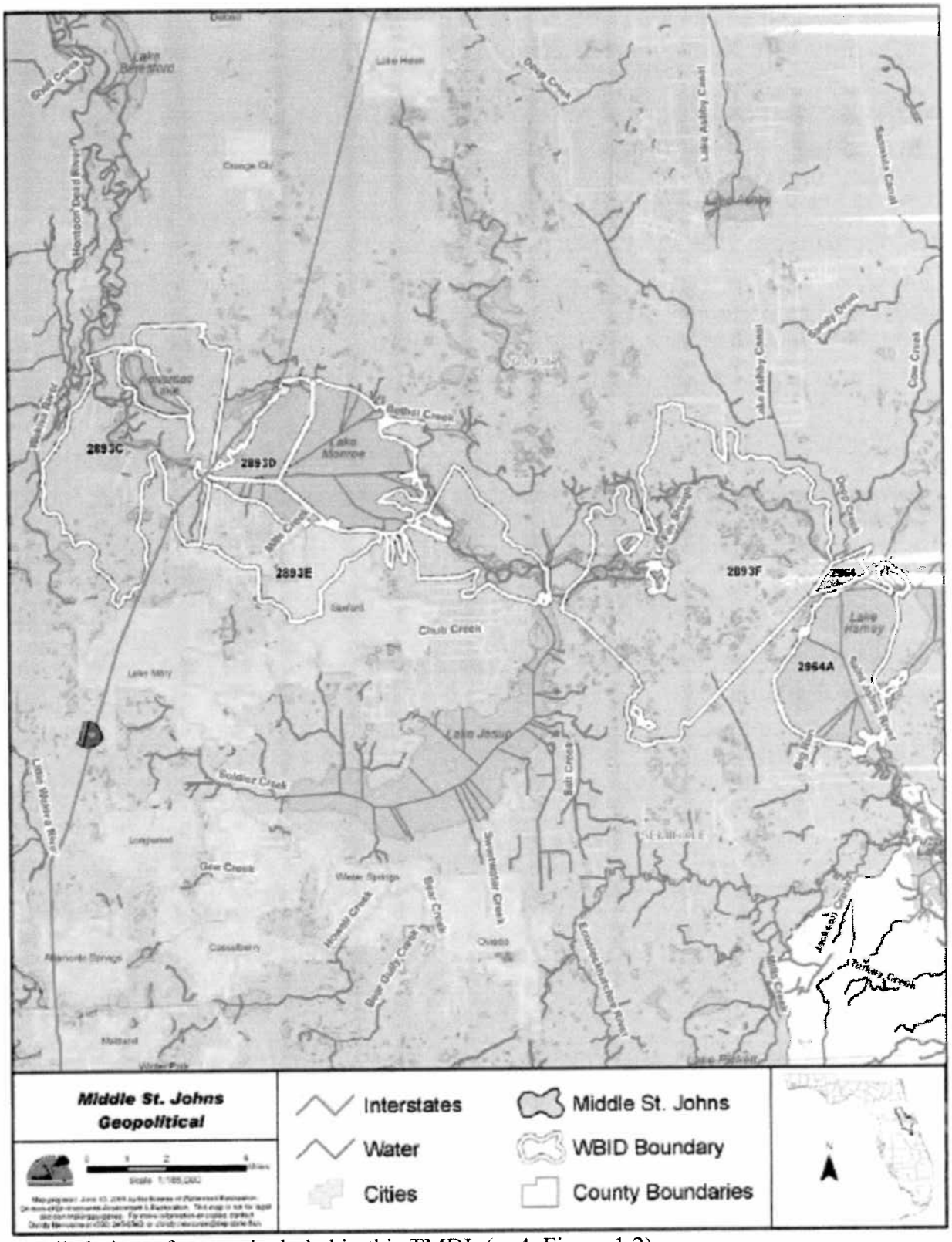
The TN and TP nutrient targets were derived by selecting the median values derived from three approaches including TSI, paleolimnological data, and reference lakes. Modeled loadings were developed to meet the TN and TP targets and TSI value for Lake Harney. The TMDL loads will achieve the TSI value and will ensure that Lake Monroe, St. Johns River above Lake Monroe and the associated MSJR segments are kept in a lower mesotrophic status and that healthy and balanced aquatic flora and fauna are maintained in these segments. This TMDL represents the annual TN and TP loadings that the river segment can assimilate and maintain balanced aquatic flora and fauna.

Conclusion

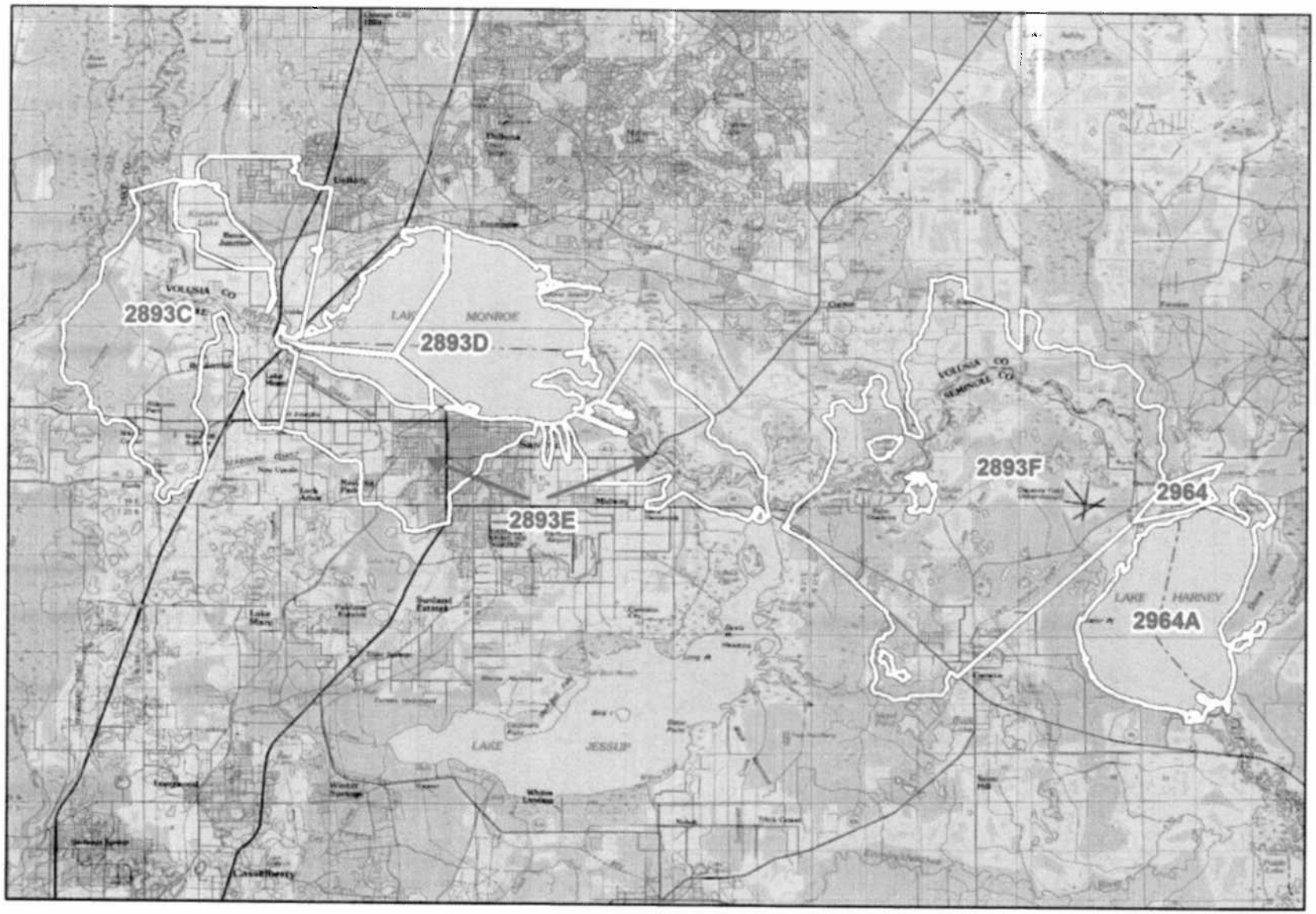
Based on the chemical, physical and biological data presented in the development of the SSAC, the EPA concludes that the SSAC for TN and TP established for MSJR WBIDs 2893D and E protect healthy, well-balanced biological communities in the waters to which the SSAC apply and are consistent with the CWA and its implementing regulations. More specifically, the SSAC are consistent with both 40 CFR Part 131.11(b)(1)(ii), and the EPA's 304(a) guidance on nutrient criteria. The TN and TP SSAC for Lake Monroe WBID 2893D and St. Johns River above Lake Monroe WBID 2893E which provide for TN and TP loadings of 1,892 tons/yr and 143 tons/yr respectively, will protect water quality and aquatic life. FDEP did not address downstream protection in this TMDL. Paragraph 62-302.531(4), F.A.C. will apply to this WBID in conjunction with the Hierarchy 1 SSAC to ensure attainment and maintenance of water quality standards of downstream waters, in accordance with 40 CFR Part 131.10. In accordance with section 303(c) of the CWA, the SSAC for Lake Monroe WBID 2893D and St. Johns River above Lake Monroe WBID 2893E for TN of 1,892 tons/yr and TP of 143 tons/yr, not to be exceeded as annual loads, are hereby approved as consistent with the CWA and 40 CFR Part 131.



Overview of waters included in this TMDL (p. 3, Figure 1.1)



Detailed view of waters included in this TMDL (p. 4, Figure 1.2)



Detailed view of WBIDs included in this TMDL as outlined in IWR Run 44 (map not in TMDL, created to illustrate the WBIDs covered by this TMDL)

Appendix 1 – Summary of the TMDL Background

Name(s) of Addressed Water(s)	Lake Monroe and St. Johns River above Lake Monroe
Waterbody Type(s)	Lake (IWR Run 40) and Stream
WBIDs	2893D and 2893E
Latitude/Longitude	NA.
Description	The overall TMDL includes mainstem segments of the Middle St. Johns River from the inlet of Lake Harney to the confluence with Wekiva River to the north. The Middle St. Johns River stretches 33 miles and flows southeast to northwest, eventually draining into the Lake George watershed (TMDL p. 1). WBID 2893D is a lacustrine segment located north (downstream of Lake Jesup). WBID 2893D is located immediately north of the major municipalities of Sanford and Lake Monroe and south of the cities of Deltona, DeBary, and Enterprise. Interstate 4 crosses the outlet of Lake Monroe and runs in a north-south direction, skirting the edge of the western side of the lake (TMDL p. 1). WBID 2893E is located upstream of Lake Monroe and downstream of Lake Jesup on the Middle St. Johns River.
Classification(s)	Class III (freshwater) (TMDL p. 35)
Basin	Middle St. Johns Basin (TMDL p. 1)
Date Placed on Verified List	May 19, 2009 (TMDL p. 1)
Date TMDL was approved by EPA	September 30, 2009 (EPA WATERS database query 6/4/12)
Reference Streams/Lakes	One of three approaches used to establish nutrient targets for these WBIDs was based on using the 75th percentile of 200 reference lakes in Florida from research by Paul and Gerritsen (2002). These lakes, however, were not described further in this TMDL (TMDL p. 47).
Source of Majority of Flow	The majority of flows for WBID 2893D and E are from upstream flows from the Upper St. Johns River and Econlockhatchee River. Direct surface drainage (excluding the upstream contributions from the watersheds draining the Upper St. Johns River and Econlockhatchee River) to the impaired WBIDs downstream of Lake Jesup (WBIDs 2893E, 2893D, and 2893C) is received from about 71,380 acres, which is primarily urban (43%) and has about 15 percent of the area in agricultural, mining, pasture, and range land uses (TMDL p. 66-67). The 30-day mean flow at WBID 2893D is 2,472 cfs (TMDL p. 40).
Indicators	Three different approaches were used to select nutrient targets: state target (TSI) for colored lakes, paleolimnological data (i.e., significant increases in diatom productivity and taxonomy changes as an inflection point between low-impact conditions and existing conditions), and the 75th percentile concentrations of reference lakes

	(TMDL p. 44-48). In addition, algal biomass was observed as a biological indicator that is affected by nutrient composition, low turbidity, low color, and residence time (TMDL p. 39). The TMDL noted that while nutrient loads upstream and downstream of Lake Jesup are similar chl-*a* is higher in downstream segments (WBID 2893D is downstream of Lake Jesup). This was attributed to inputs to the downstream segments from Lake Jesup, which has a longer residence time, large surface area, shallow depth, and average annual chl-*a* of 66.5 µg/L (TMDL p. 37-42). Relationships between BOD and nutrients and chl-*a* were examined and a strong relationship between BOD and chl-*a* was found suggesting that BOD concentrations are controlled by algal biomass (TMDL p. 52).
Identification of Causative Pollutants (as determined by measurements of response endpoints or indicators)	WBID 2893D was verified as impaired for nutrients on the basis of low DO and a positive correlation between BOD and chl-*a* concentrations, indicating that some portions of BOD may be caused by elevated phytoplankton biomass produced due to excess nutrient input in the lake. The lake was considered co-limited by TN and TP based on a median TN/TP ratio of 18 from 2001-2008 (TMDL p. 6-7). BOD (related to phosphorus) was identified as the causative pollutant for DO impairment in WBID 2893D; however the median BOD of 2.7 mg/L did not exceed the 2.9 mg/L threshold identified in Table 2.4 (TMDL p. 9-11, 52). WBID 2893E was verified as impaired for nutrients on the basis of exceedances of the chl-*a* IWR threshold of 20 µg/L. Phytoplankton were considered co-limited by TN and TP based on a median TN/TP ratio of 17 from 2001-2008 (TMDL p. 6). BOD was identified as the causative pollutant for DO impairment in WBID 2893E (median BOD of 3.0 mg/L, above the 2.0 mg/L threshold identified in Table 2.4) (TMDL p. 10-11, 52).
Sources and Concentrations of Nutrient Enrichment	The majority of nutrient loadings are generated from nonpoint sources (including watershed contributions, upstream contributions and direct atmospheric deposition). Point sources account for less than 1 percent of total nutrient loading (TMDL p. 61, 109). Nutrient loading in the MSJR was simulated using Hydrologic Simulation Program□Fortran (HSPF) (TMDL p. 61). As part of this modeling the MSJR was split into the Lake Harney Basin (WBIDs 2964, 2964A, and 2893F) and the Lake Monroe Basin (WBIDs 2893E, 2893D, and 2893C) (TMDL p. 61-66). Urban land uses in the Lake Monroe watershed account for 43 percent of the total area, considerably higher than the Lake Harney watershed (6%). Natural land uses (open land, forest, water, and wetlands) account for 41 percent of the total area. Sixteen percent of the Lake Monroe watershed was estimated to be covered with impervious cover

	(TMDL p. 67-68). Approximately 88 percent of TN load and 87 percent of TP load for WBIDs 2893E and 2893D were modeled to be contributed from upstream sources, while an additional 8.2 percent of TN load and 8.1 percent of TP load were estimated to be contributed from Lake Jesup outlet (TMDL p. 96-98). Seven NPDES permitted facilities discharge in the watersheds of the MSJR that discharge to the six WBIDs covered by this TMDL. These seven facilities include five concrete batch plants, a steam electric power plant, and a domestic wastewater treatment facility. The concrete batch plants and the power plant are not considered significant sources of nutrients and no nutrient monitoring is required in these permits (TMDL p. 56-58). Most of these facilities are located in the northern (downstream) portion of the WBIDs covered in this TMDL. The aforementioned power plant discharges within this WBID, however this facility is not considered to be a significant source of nutrient discharge to WBID 2893D (TMDL p. 56-58). The MSJR contains three Phase I MS4 permit holders affected by this TMDL: Seminole County, City of Lake Mary, and City of Sanford; in addition to eight other Phase II MS4 permit holders (TMDL p. 61).
Nutrient Watershed Region in Proposed 62.302	Peninsular Lake (Color > 40 PCU) (IWR Run 40; TMDL p. 6)
Proposed Nitrogen SSAC and Frequency	For WBIDs 2893D and 2893E the TMDL adopted at 62-304.505(12) was for TN of 1,892 tons/yr. 4,171,255 lbs/yr (38% reduction) TN long-term annual average in WBIDs 2893D and 2893E to reach a target annual average concentration of 1.18 mg/L TN (TMDL p. 49, 108).
Proposed Phosphorus SSAC and Frequency	For WBIDs 2893D and 2893E the TMDL adopted at 62-304.505(12) was for TP of 143 tons/yr. 315,512 lbs/yr (31% reduction) TP annual average in WBIDs 2893D and 2893E to reach a target annual average concentration of 0.07 mg/L TP (TMDL p. 49, 108).
Biological Index Score(s) (e.g. SCI, TSI, IBI)	A TSI of 60 was used as the assessment threshold for Lake Monroe (WBID 2893D) as lake color data indicated the lake had long-term color >40 PCU (170.4 long-term average from 1996-2007) (TMDL p. 6, 40). During the Cycle 2 assessment (2001-2007), the annual average TSI for WBID 2893D exceeded the TSI threshold of 60 only in 2001 (TMDL p. 6). The target TN and TP concentrations for WBID 2893D correspond to a TSI of 54 (TMDL p. 49).

Decision Document for Hierarchy 1 Site Specific Alternative Criteria for Middle St. Johns River (MSJR)

Summary Information

WBID	Description	Class	Waterbody Type *Impaired Waters Rule (IWR) Run 40*	Listing Parameter
2964A	Lake Harney	Class III (freshwater)	Lake	Dissolved Oxygen (DO) and Nutrients (Trophic State Index (TSI))

A nutrient and DO Total Maximum Daily Load (TMDL) for the MSJR WBID 2964A was developed by the Florida Department of Environmental Protection (FDEP) and approved by the Environmental Protection Agency on September 30, 2009 pursuant to section 303(d) of the Clean Water Act (CWA). This TMDL was developed to identify the level of nutrients that would prevent an imbalance of flora and fauna as required by the state's narrative nutrient criterion at paragraph 62-302.530(47)(b), Florida Administrative Code (F.A.C.). FDEP determined that a total nitrogen (TN) load of 1,522 tons/year (yr) and a total phosphorus (TP) load of 109 tons/yr, not to be exceeded as annual loads, would meet its narrative criterion and adopted the loads as TMDL values at subsection 62-304.505(7), F.A.C. FDEP has submitted the TN and TP loads from the TMDL for EPA review as hierarchy 1 site specific alternative nutrient criteria (SSAC) for the MSJR WBID 2964A, pursuant to 303(c) of the CWA and EPA's implementing regulations at 40 CFR Part 131. This decision document approves the SSAC for TN of 1,522 tons/yr and for TP of 109 tons/yr, not to be exceeded as annual loads, as hierarchy 1 criteria for MSJR WBID 2964A. Any other criteria applicable to this waterbody remain in effect. Specifically as to nutrients, chlorophyll *a* criteria consistent with paragraph 62-302.531(2)(b)1., F.A.C. continue to apply, as well as the requirements of paragraph 62-302.530(47)(a), F.A.C.

In a letter dated June 13, 2012, from Thomas M. Beason, General Counsel for FDEP, to Gwendolyn Keyes Fleming, Regional Administrator of the EPA's Region 4 Office, FDEP submitted the numeric interpretations of the state narrative nutrient criterion for WBID 2964A as expressed in the MSJR TMDL as the SSAC for the MSJR WBID 2964A. These SSAC serve as the primary site specific interpretations of Florida's narrative water quality criterion for nutrients set out in paragraph 62-302.530(47)(b), F.A.C. in accordance with paragraph 62-302.531(2)(a), F.A.C. Pursuant to section 303(c) of the CWA, these revised water quality standards are subject to review and approval by the EPA since FDEP intends for these SSAC to serve as the numeric nutrient criteria for TN and TP for the MSJR in the place of the otherwise applicable TN and TP criteria set out in paragraph 62-302.531(2)(b)1., F.A.C. In the June 13, 2012, letter, the FDEP General Counsel certified that the revised water quality standards were duly adopted pursuant to Florida law.

The EPA's decision to approve the criteria is subject to the results of consultation under section 7 of the Endangered Species Act with the U.S. Fish and Wildlife Service. By approving the standards "subject to the results of consultation," the EPA retains its discretion to take appropriate action if the consultation identifies deficiencies in the standards requiring remedial

action by the EPA. The EPA will notify FDEP of the results of the section 7 consultation upon completion of the action.

Description of waters for which the SSAC have been proposed

According to the TMDL, the waterbodies included in this TMDL are within the portion of the Middle St. Johns River spanning from the inlet of Lake Harney to the confluence with the Wekiva River to the north (see maps on pages 5 – 7). The Middle St. Johns River stretches 33 miles and flows southeast to northwest, eventually draining into the Lake George watershed. Lake Harney WBID 2964A is the most upstream waterbody in the Middle St. Johns River segment addressed in this TMDL. The majority of flows for Lake Harney WBID 2964A are from upstream flows from the Upper St. Johns River and Econlockhatchee River. The waterbody is an alkaline, colored lake with a mean color level of 182 Platinum Cobalt Units (PCU). Lake Harney WBID 2964A is a Class III waterbody with designated uses of recreation, propagation, and the maintenance of a healthy, well-balanced population of fish and wildlife.

Discussion of how the loads were derived

According to the TMDL, Lake Harney WBID 2964A was verified as impaired using assessment methodologies in Florida's IWR at Chapter 62-303, F.A.C. The WBID was included on Florida's verified list of impaired waters on May 19, 2009 for both nutrients and DO. Lake Harney WBID 2964A was verified as impaired for nutrients based on a number of considerations. The TSI, a composite measurement used in evaluating the level of enrichment in lakes, rivers and estuaries, is one consideration. Although Lake Harney WBID 2964A only exceeded the IWR TSI threshold of 60 for colored lakes in 2001, Lake Harney WBID 2964A was verified as impaired for nutrients based on nutrients being the suspected cause for the low DO conditions in the lake and evidence of an elevated nutrient accumulation rate for the lake. FDEP found a significant inverse correlation between monthly average DO and TP values. In addition, a study by Anderson et al. (2006) indicated current conditions in Lake Harney WBID 2964A had an elevated nutrient accumulation rate compared to historical conditions using paleolimnological data. FDEP's use of evidence beyond TSI and chlorophyll-*a* (chl-*a*) levels to find nutrient causation is permitted by the IWR.

To address the impairment in WBID 2964A, FDEP developed a nutrient and DO TMDL dated September 3, 2009, which was approved by EPA on September 30, 2009. The water quality targets utilized in this TMDL were TN and TP concentrations set by selecting the median value of three different approaches. The final TN and TP target concentrations were 1.18 mg/L and 0.07 mg/L, respectively, which were derived by taking the median values from the three methods described below.

The TSI method set target concentrations that resulted in TN TSI and TP TSI values less than the state target for overall TSI (60 for lakes with color > 40 PCU) using the TSI equations from Huber et al. (1982). The paleolimnological method utilized studies that analyzed and interpreted the diverse information contained in the sedimentary records of lakes and other water bodies. The paleolimnological study identified nutrient accumulation rates in Lake Monroe, a nearby lake. A low-impact period (1920s - 1960s) was differentiated from existing conditions (1990s) by identifying a significant increase in silica (indicator for diatom productivity, emergent plants, and attached sponges) in the 1970s, which was supported by changes in diatom taxonomy

results. This paleolimnological method compared the ratio of the accumulation rate in the low-impact period to the accumulation rate of the existing conditions period and applied the ratio to the existing conditions annual average TP concentration. The TN target was then correlated to the annual average TP concentrations. The reference lake method utilized data from 1993-1997 from 200 Florida reference lakes that were grouped by biological assemblages and selected a target using the 75th percentile concentrations of the alkaline, colored lake class.

The TN and TP nutrient targets represent the median values from the methods described above and although each had a different approach linking nutrient reductions to biological conditions, all approaches resulted in very similar values. The TN and TP targets were developed for the two lakes (Lake Harney and Lake Monroe) and then applied to the four riverine segments. Because of the longer residence time, FDEP expected the lakes to be more vulnerable to nutrient pollution than the associated river channels. FDEP determined that TN and TP concentrations were not dramatically different in the segments upstream of the Lake Jesup outlet (WBIDs 2964A, 2964, and 2893F) to the segments downstream of the Lake Jesup outlet (WBIDs 2893E, 2893D, and 2893C). However, chl-*a* concentrations were found to be two to three times higher in the downstream segments than the upstream segments. Therefore, FDEP found it reasonable to apply the same TN and TP targets to both the upstream and downstream segments, but with the expectation of achievable chl-*a* concentrations and TSI being relatively higher in the downstream segments than the upstream segments.

To determine the expression of the TMDL, nutrient loads were simulated in the MSJR using computer models. Modeled TN and TP loads were reduced until the annual average TN and TP concentrations in all of the impaired segments met the identified TN and TP target concentrations of 1.18 mg/L and 0.07 mg/L respectively. Meeting the DO standard was based upon a correlation found between TP and DO such that if monthly average TP was reduced to the TP target, the monthly average DO concentrations were greater than 5.0 mg/L. The TSI of 51 for this lake segment corresponds to the TN and TP targets. The nutrient and DO TMDL for Lake Harney WBID 2964A adopted at 62-304.505(7), F.A.C. included a TP load of 1,522 tons/yr and TN load of 109 tons/yr, not to be exceeded as annual loads.

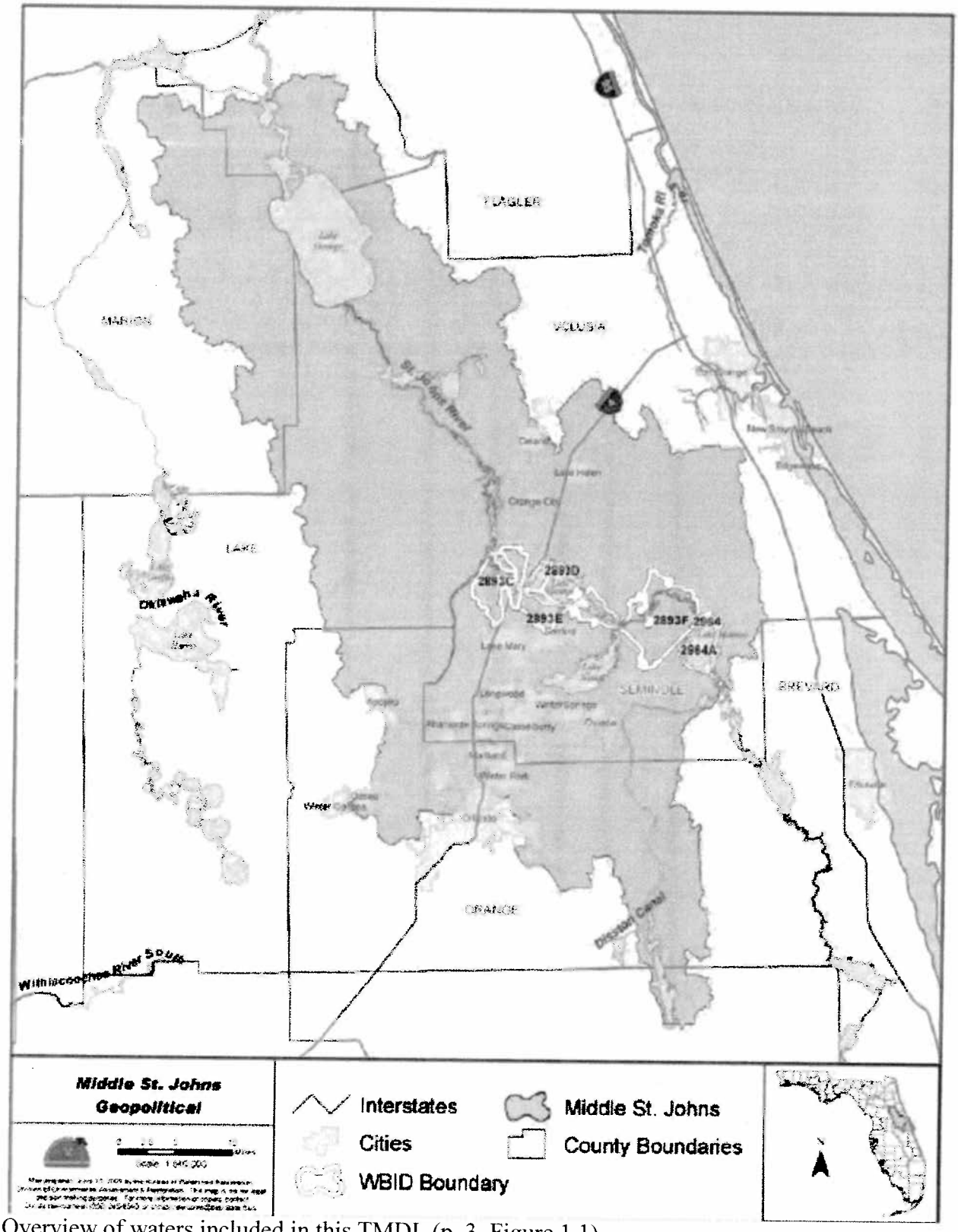
Consideration of TMDL loads as new or revised water quality standards

The TN and TP nutrient targets were derived by selecting the median values derived from three approaches including TSI, paleolimnological data, and reference lakes. The modeled loadings were then developed to meet the TN and TP targets and TSI value for Lake Harney. The TMDL loads will achieve the TSI value and will ensure that the Lake Harney and the associated MSJR segments are kept in a lower mesotrophic status and that healthy and balanced aquatic flora and fauna are maintained in these segments. This TMDL represents the annual TN and TP loadings that the lake segment can assimilate and maintain balanced aquatic flora and fauna.

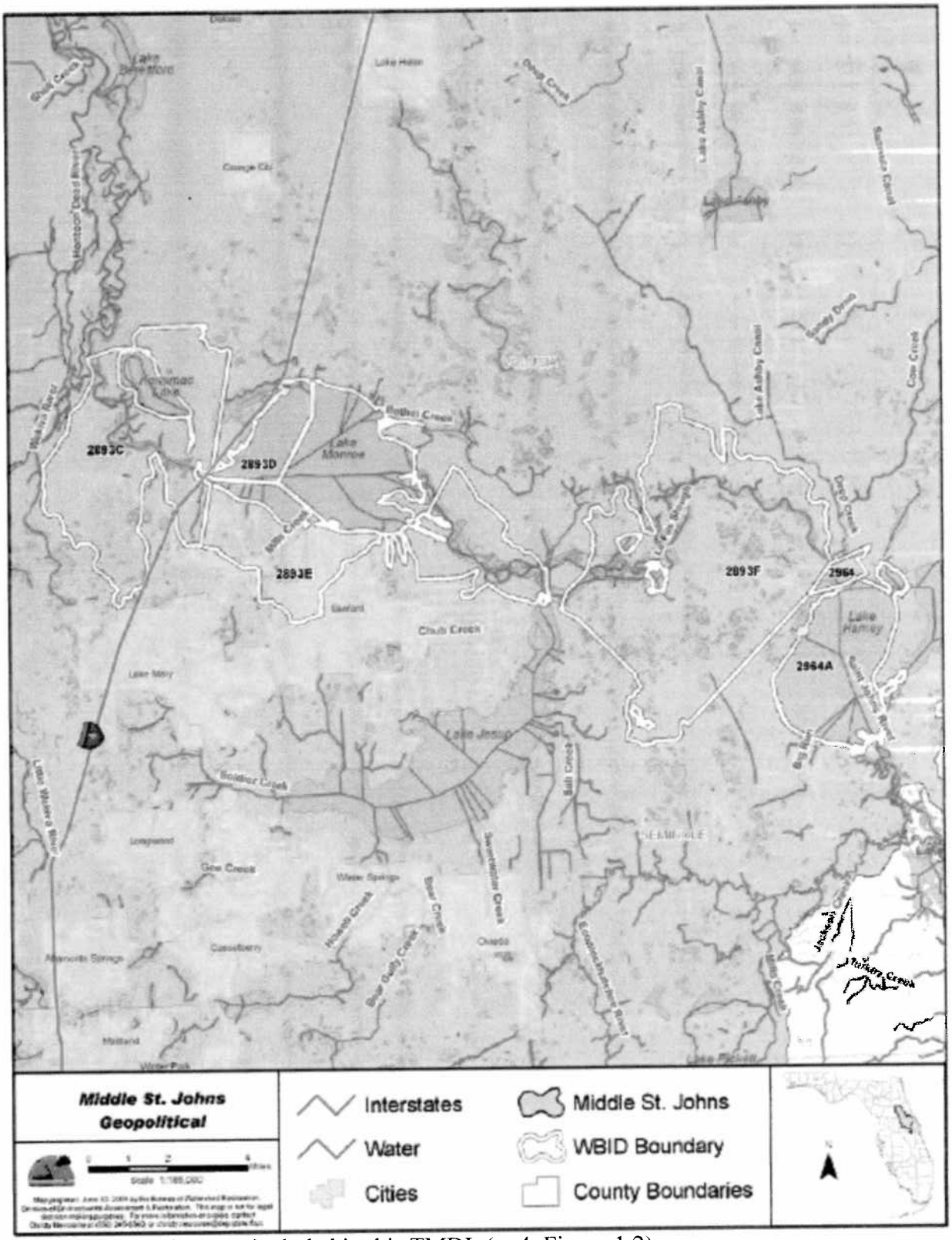
Conclusion

Based on the chemical, physical and biological data presented in the development of the SSAC, the EPA concludes that the SSAC for TN and TP established for the MSJR WBID 2964A protect healthy, well-balanced biological communities in the waters to which the SSAC apply and are consistent with the CWA and its implementing regulations. More specifically, the SSAC are consistent with both 40 CFR Part 131.11(b)(1)(ii), and the EPA's 304(a) guidance on nutrient

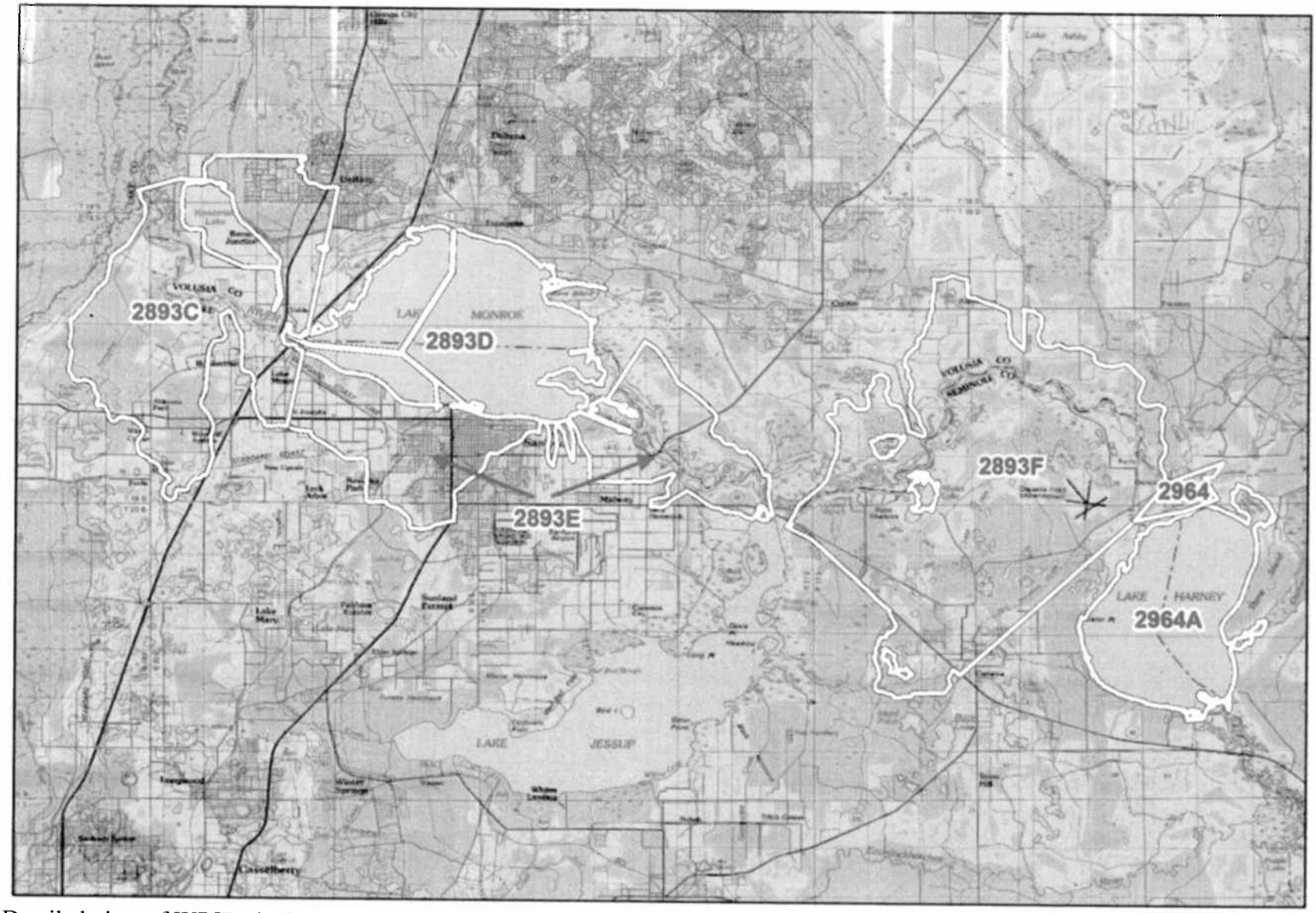
criteria. The TN and TP SSAC for LSJR WBID 2964A which provide for TN and TP loadings of 1,522 tons/yr and 109 tons/yr, respectively, will protect water quality and aquatic life. FDEP did not address downstream protection in this TMDL. Paragraph 62-302.531(4), F.A.C. will apply to this WBID in conjunction with the Hierarchy 1 SSAC to ensure attainment and maintenance of water quality standards of downstream waters, in accordance with 40 CFR Part 131.10. In accordance with section 303(c) of the CWA, the SSAC for LSJR WBID 2964A for TN of 1,522 tons/yr and TP of 109 tons/yr, not to be exceeded as annual loads, are hereby approved as consistent with the CWA and 40 CFR Part 131.



Overview of waters included in this TMDL (p. 3, Figure 1.1)



Detailed view of waters included in this TMDL (p. 4, Figure 1.2)



Detailed view of WBIDs included in this TMDL as outlined in IWR Run 44. (This map was created to further illustrate the WBIDs covered by this TMDL but was not included in the TMDL.)

Appendix 1 – Summary of the TMDL Background

Name(s) of Addressed Water(s)	Lake Harney
Waterbody Type(s)	Lake (IWR Run 40)
WBIDs	2964A
Latitude/Longitude	NA.
Description	The overall TMDL includes mainstem segments of the Middle St. Johns River from the inlet of Lake Harney to the confluence with Wekiva River to the north. The Middle St. Johns River stretches 33 miles and flows southeast to northwest, eventually draining into the Lake George watershed (TMDL p. 1). Lake Harney WBID 2964A is the most upstream (southeast) waterbody in the Middle St. Johns River, receiving flows from the Upper St. Johns River and Econlockhatchee River to the south (TMDL p. 66). Lake Harney WBID 2964A is a shallow (7 ft mean depth) lake with a surface area of 7,935 acres, 30-day mean flow rate of 2,038 cfs, and a 15-day residence time (TMDL p. 40). The waterbody is an alkaline, colored lake with a mean color level of 182 PCU (TMDL p. 39, 40, 44, 48).
Classification(s)	Class III (freshwater) (TMDL p. 35)
Basin	Middle St. Johns Basin (TMDL p. 1)
Date Placed on Verified List	May 19, 2009 (TMDL p. 1)
Date TMDL was approved by EPA	September 30, 2009 (EPA WATERS database query 6/4/12)
Reference Streams/Lakes	One of three approaches used to establish nutrient targets for these WBIDs was based on using the 75th percentile of 200 reference lakes in Florida from research by Paul and Gerritsen (2002).
Source of Majority of Flow	The majority of flows for Lake Harney WBID 2964A are from upstream flows from the Upper St. Johns River and Econlockhatchee River. Direct surface drainage (excluding the watersheds of these upstream contributions) to Lake Harney WBID 2964A and the WBIDs directly downstream (WBIDs 2964 and 2893F) comes from about 145,106 acres, which is primarily (72%) composed of natural land uses (i.e., open land, waters, forest, wetlands) (TMDL p. 66). The 30-day mean flow at Lake Harney WBID 2964A is 2,038 cfs (TMDL p. 40).
Indicators	Three different approaches were used to select nutrient targets: state standard (TSI) for colored lakes, paleolimnological data (i.e., significant increases in diatom productivity and taxonomy changes as an inflection point between low-impact conditions and existing conditions), and the 75th percentile concentrations of reference lakes (TMDL p. 44-48). In addition, algal biomass was observed as a biological indicator that

	is affected by nutrient composition, low turbidity, low color, and residence time (TMDL p. 39). The TMDL noted that while nutrient loads upstream and downstream of Lake Jesup are similar, chl-*a* is higher in downstream segments (Lake Harney WBID 2964A is upstream of Lake Jesup). This was attributed to inputs to the downstream segments from Lake Jesup, which has a longer residence time, large surface area, shallow depth, and average annual chl-*a* of 66.5 µg/L (TMDL p. 37-42). Relationships between BOD and nutrients and chl-*a* were examined and a strong relationship between BOD and chl-*a* was found suggesting that BOD concentrations are controlled by algal biomass (TMDL p. 52).
Identification of Causative Pollutants (as determined by measurements of response endpoints or indicators)	Lake Harney WBID 2964A was verified as impaired for nutrients based on a significant inverse correlation between monthly average DO and TP values, suggesting nutrients were the possible causative pollutant for the DO impairment (TMDL p. 7, 12, 50). In addition, a study by Anderson et al. (2006) indicated current conditions in Lake Harney WBID 2964A had an elevated nutrient accumulation rate compared to historical conditions using paleolimnological data (TMDL p. 7-8). FDEP's use of reasoning beyond TSI and chl-*a* levels to find nutrient causation is permitted by the IWR.
Sources and Concentrations of Nutrient Enrichment	The majority of nutrient loadings are generated from nonpoint sources (including watershed contributions, upstream contributions and direct atmospheric deposition). Point sources account for less than 1 percent of total nutrient loading (TMDL p. 61, 109). Nutrient loading in the MSJR were simulated using Hydrologic Simulation Program Fortran (HSPF) (TMDL p. 61). As part of this modeling the MSJR was split into the Lake Harney (WBIDs 2964, 2964A, and 2893F) and the Lake Monroe Basin (WBIDs 2893E, 2893D, and 2893C) (TMDL p. 61-66). Natural land uses in the Lake Harney Basin including open land, forest, waters, and wetlands account for approximately 72 percent of the surface area, while urban uses account for only about 6 percent of the surface area (2% impervious cover) (TMDL p. 66-67). Approximately 98 percent of TN load and 99 percent of TP load for Lake Harney WBID 2964A were modeled to be contributed from upstream sources, with little input from within the watershed, rainfall, or point sources (TMDL p. 96-98). The MSJR contains three Phase I MS4 permit holders affected by this TMDL: Seminole County, City of Lake Mary, and City of Sanford; in addition to eight other Phase II MS4 permit holders (TMDL p. 61).
Nutrient Watershed Region in Proposed 62.302	Peninsular Lake (Color > 40 PCU) (IWR Run 40; TMDL p. 7)
Proposed Nitrogen SSAC and Frequency	3,355,570 lbs/yr (39% reduction) TN long-term annual average in Lake Harney WBID 2964A to reach a target annual average

	concentration of 1.18 mg/L TN (TMDL p. 49, 108). The nutrient and DO TMDLs for Lake Harney WBID 2964A adopted at 62-304.505(7) for TN of 1,522 tons/yr.
Proposed Phosphorus SSAC and Frequency	241,026 lbs/yr (33% reduction) TP long-term annual average in Lake Harney WBID 2964A to reach a target annual average concentration of 0.07 mg/L TP (TMDL p. 49, 108). The nutrient and DO TMDLs for Lake Harney WBID 2964A adopted at 62-304.505(7) for TP of 109 tons/yr.
Biological Index Score(s) (e.g. SCI, TSI, IBI)	A TSI of 60 was used as the assessment threshold for Lake Harney (WBID 2964A) as lake color data indicated the lake had long-term color >40 PCU (182.4 long-term average from 1996-2007) (TMDL p. 7, 40). During the Cycle 2 assessment (2001-2007), the annual average TSI for Lake Harney WBID 2964A exceeded the TSI threshold of 60 only in 2001 (TMDL p. 7). The target TN and TP concentrations for Lake Harney WBID 2964A correspond to a TSI of 51 (TMDL p. 49).