FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Environmental Assessment and Restoration, Bureau of Watershed Restoration

NORTHEAST DISTRICT • UPPER EAST COAST BASIN

FINAL
TMDL Report

Fecal Coliform TMDL for the Pellicer Creek (WBID 2580B)

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

STORET Program

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Integrated Report

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

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Basin Status Report: Upper East Coast

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

Water Quality Assessment Report: Upper East Coast
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U.S. Environmental Protection Agency

Region 4: Total Maximum Daily Loads in Florida
http://www.epa.gov/region4/water/tmdl/florida/

National STORET Program

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Chapter 1: INTRODUCTION

1.1 Purpose of Report

This report presents the Total Maximum Daily Load (TMDL) for fecal coliform bacteria for Pellicer Creek, located in the Upper East Coast Basin. The estuary was verified as impaired for fecal coliform, and therefore was included on the Verified List of impaired waters for the Upper East Coast Basin that was adopted by Secretarial Order on February 7, 2012. The TMDL establishes the allowable fecal coliform loading to Pellicer Creek that would restore the waterbody so that it meets its applicable water quality criterion for fecal coliform.

1.2 Identification of Waterbody

For assessment purposes, the Florida Department of Environmental Protection (Department) has divided the Upper East Coast Basin into water assessment polygons with a unique **w**ater**b**ody **id**entification (WBID) number for each watershed or stream reach. Pellicer Creek is WBID 2580B.

1.2.2 The Pellicer Creek

Pellicer Creek, specifically WBID 2580B, is located at the border of St. Johns County and Flagler County (**Figure 1.1**). Pellicer Creek is designated as an Outstanding Florida Water and an Aquatic Preserve by the State of Florida. It is also the only natural watershed drainage feature located in the Pellicer Creek Planning Unit (FDEP, 2008). Faver-Dykes State Park is located immediately downstream of WBID 2580B. Along with typical park amenities, this park offers canoe trails and more than 100 species of birds can be spotted along Pellicer Creek and in Faver-Dykes State Park (SJRWMD, 2009). Pellicer Creek flows from WBID 2580B, through Faver-Dykes State Park and into the Matanzas River, which is part of the Atlantic Intracoastal Waterway (**Figure 1.2**). The Matanzas River can be described as a coastal lagoon with access to the Atlantic Ocean by way of the Matanzas Inlet. The Matanzas Inlet, which is located approximately 2.5 miles north of the Pellicer Creek, is the only natural, uncontrolled inlet in Florida and one of the few uncontrolled inlets on the east coast of the United States.

The watershed of WBID 2580B drains approximately 2500 acres (3.9 mi^2) and consists primarily of forested lands. A breakdown of land use by acreage and percentage is provided below in **Table 4.1**. The data is based on 2004 land cover features and is classified using Level 1 Florida Land Use Classification Codes (FLUCCs).

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).

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.

This TMDL report will be followed by the development and implementation of a restoration plan designed to reduce the amount of fecal coliform that caused the verified impairment of Pellicer Creek. These activities will depend heavily on the active participation of the 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.

Figure 1.1. Location of Pellicer Creek (WBID 2580B) Watershed in the Upper East Coast Basin and Major Hydrologic and Geopolitical Features in the Area

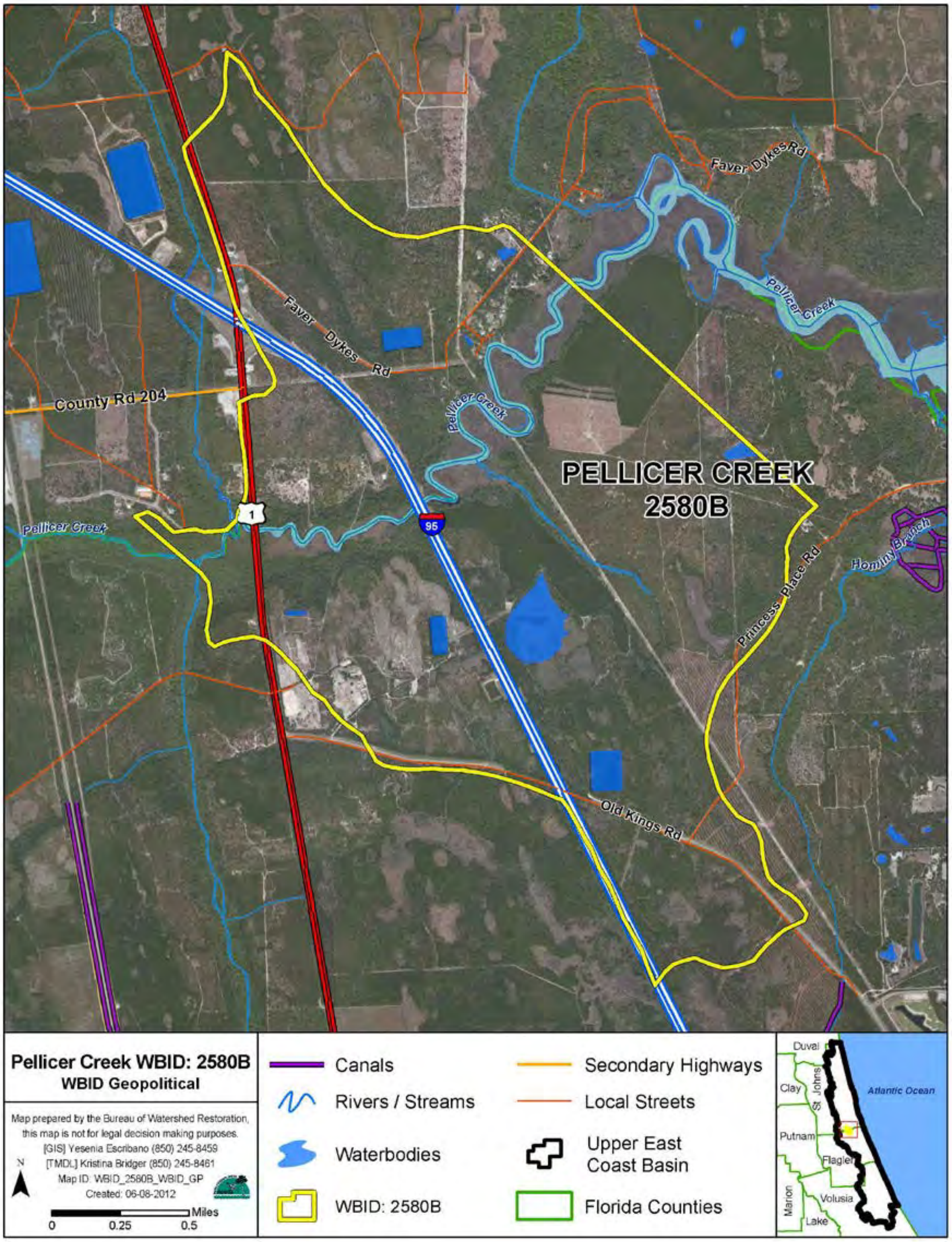


Figure 1.2. Location of Pellicer Creek (WBID 2580B) Watershed with Major Geopolitical and Hydrologic Features in the Area

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) Consent Decree list included 13 waterbodies in the Upper East Coast Basin. Pellicer Creek was one of the waterbodies listed on the 1998 303(d) list. However, the FWRA (Section 403.067, F.S.) stated that all Florida 303(d) lists created before the adoption of the FWRA 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 Pellicer Creek and has verified that this waterbody segment is impaired for fecal coliform bacteria based on data collected during the Cycle 2 verified period (January 1, 2004–June 30,2011). Using the IWR methodology, this waterbody was verified impaired for fecal coliform because more than 10% of the values exceeded the Class II waterbody criterion of 43 counts per 100 milliliters (counts/100mL) for fecal coliform. There were 33 exceedances out of 34 samples. **Table 2.2** summarizes the fecal coliform monitoring results for the Cycle 2 verified period for Pellicer Creek.

To ensure that the fecal coliform TMDL was developed based on current conditions in the estuary and that recent trends in the waterbody's water quality were adequately captured, monitoring data collected from January 1, 2004 to June 30, 2011 were used to develop the TMDL. The data were primarily collected during 2004 – 2009. **Table 2.1** indicates that fecal coliform concentrations exceeding the criterion of 43 counts/100mL have been observed in all three stations located in Pellicer Creek.

Table 2.1. Summary of Fecal Coliform Monitoring Data by Station for Pellicer Creek (WBID 2580B) During the Cycle 2 Verified Period (January 1, 2004–June 30, 2011)

Monitoring Station	N	Minimum Concentration (#/100ml)	Maximum Concentration (#/100ml)	Mean Concentration (#/100ml)	Standard Deviation (#/100ml)	# Samples >43 (#/100ml)
21FLA 27010016	26	44	1580	338	358	26
21FLA 27010073	4	40	220	116	79	3
21FLA 27010074	4	60	100	78	18	4

Table 2.2. Summary of Fecal Coliform Monitoring Data for the Pellicer Creek (WBID 2580B) During the Cycle 2 Verified Period (January 1, 2004–June 30, 2011)

Waterbody (WBID)	Parameter	Fecal Coliform Cycle 2
Pellicer Creek (WBID 2580B)	Total number of samples	34
Pellicer Creek (WBID 2580B)	IWR-required number of exceedances for the Verified List	7
Pellicer Creek (WBID 2580B)	Number of observed exceedances	33
Pellicer Creek (WBID 2580B)	Number of observed nonexceedances	1
Pellicer Creek (WBID 2580B)	Number of seasons during which samples were collected	4
-	**FINAL ASSESSMENT**	**Impaired**

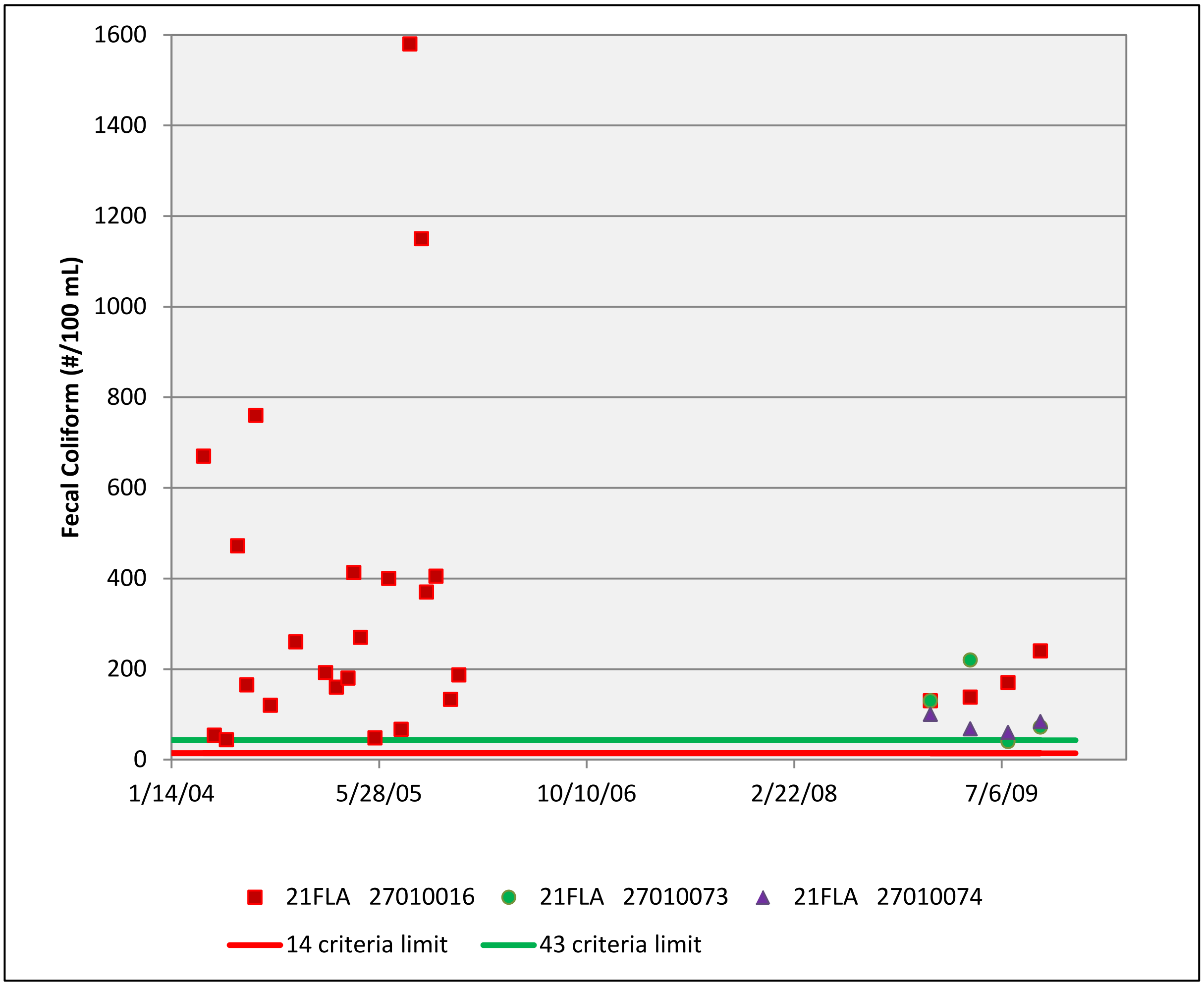


Figure 2.1. Pellicer Creek (WBID 2580B) Measured Fecal Coliform Data

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 I	**Potable 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)**

The Pellicer Creek is a Class II marine waterbody, with a designated use of shellfish propagation or harvesting. The criterion applicable to this TMDL is the Class II criterion for fecal coliform.

3.2 Applicable Water Quality Standards and Numeric Water Quality Target

Numeric criteria for bacterial quality are expressed in terms of fecal coliform bacteria concentration. The water quality criterion for the protection of Class II waters, as established by Rule 62-302, F.A.C., states the following:

> ***Fecal Coliform Bacteria:***
>
> *The most probable number (MPN) or membrane filter (MF) counts per 100 mL of fecal coliform bacteria shall not exceed a median value of 14, nor exceed 43 in 10 percent of the samples, nor exceed 800 on any one day.*

The median value criteria reflect chronic or long-term water quality conditions, whereas the 43 and 800 values reflect acute or short-term conditions. The reduction needed to meet the chronic criteria was calculated by comparing the median value with the 14 counts/100ml criterion. The reduction needed to meet the acute criteria of 43 counts/100mL was calculated by using the 90^{th} percentile of measured concentration in the period from January 1, 2004 through June 30, 2011 , and the reduction needed to meet the acute criteria of 800 counts/100mL was calculated using the highest detection. The 43 count/100ml criterion was selected as the TMDL endpoint, since this resulted in the most stringent reduction and satisfied all three parts of the criteria.

The Department believes that the implementation of the percent reduction through best management practices (BMPs) required by this TMDL will improve water quality in the estuary to meet the water quality criterion. Continued monitoring and assessment efforts by the Department and local stakeholders will provide the data and information necessary to demonstrate whether the estuary has been fully restored.

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 impaired waterbody and the amount of pollutant loadings 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 Fecal Coliform within the Pellicer Creek WBID Boundary

4.2.1 Point Sources

Wastewater Point Sources

There are no NPDES-permitted facilities located within the Pellicer Creek WBID boundary that discharge to Pellicer Creek.

Municipal Separate Storm Sewer System Permittees

The Pellicer Creek watershed is not located within the service area of an MS4.

4.2.2 Land Uses and Nonpoint Sources

Accurately quantifying the fecal coliform loadings from nonpoint sources requires identifying nonpoint source categories, locating the sources, determining the intensity and frequency at which these sources create high fecal coliform loadings, and specifying the relative contributions from these sources. Depending on the land use distribution in a given watershed, frequently cited nonpoint sources in urban areas include failed septic tanks, leaking sewer lines, and pet feces. For a watershed dominated also by rangeland, fecal coliform loadings can come from the runoff from areas with animal feeding operations or direct animal access to the receiving waters.

In addition to the sources associated with anthropogenic activities, birds and other wildlife can also act as fecal coliform contributors to the receiving waters. While detailed source information is not always available for accurately quantifying the fecal coliform loadings from different sources, land use information can provide some hints on the potential sources of observed fecal coliform impairment.

Land Uses

The spatial distribution and acreage of different land use categories were identified using the SJRWMD's 2004 land use coverage contained in the Department's geographic information system (GIS) library. Land use categories within the Pellicer Creek WBID boundary were aggregated using the simplified Level 1 codes and tabulated in **Table 4.1**. **Figure 4.1** shows the spatial distribution of the principal land uses.

As shown in **Table 4.1**, the total area within the WBID boundary is about 2,498.6 acres. The predominant land uses are approximately 1,700 acres (68.0%) of forested areas, 495.5 acres (19.8%) of wetlands, and 85 acres (3.4%) of urbanized activities including residential (78.5 acres) and non-residential (6.5 acres) areas. In WBID 2580B, residential areas include only low-density residential.

Table 4.1. Classification of Land Use Categories within the Pellicer Creek (WBID 2580B) Boundary, 2004

- = Empty cell/no data

Level 1 Code	Land Use	Acreage	% Acreage
1000	Urban & built-up	6.5	0.3%
1100	Low-density residential	78.5	3.1%
1200	Medium-density residential	0	0%
1300	High-density residential	0	0%
2000	Agriculture	3.4	0.1%
3000	Rangeland	19.3	0.8%
4000	Upland forest	1,700	68.0%
5000	Water	68.1	2.7%
6000	Wetland	495.5	19.8%
7000	Barren land	5.5	0.2%
8000	Transportation, communication, and utilities	121.9	4.9%
-	**TOTAL**	**2,498.6**	**100%**

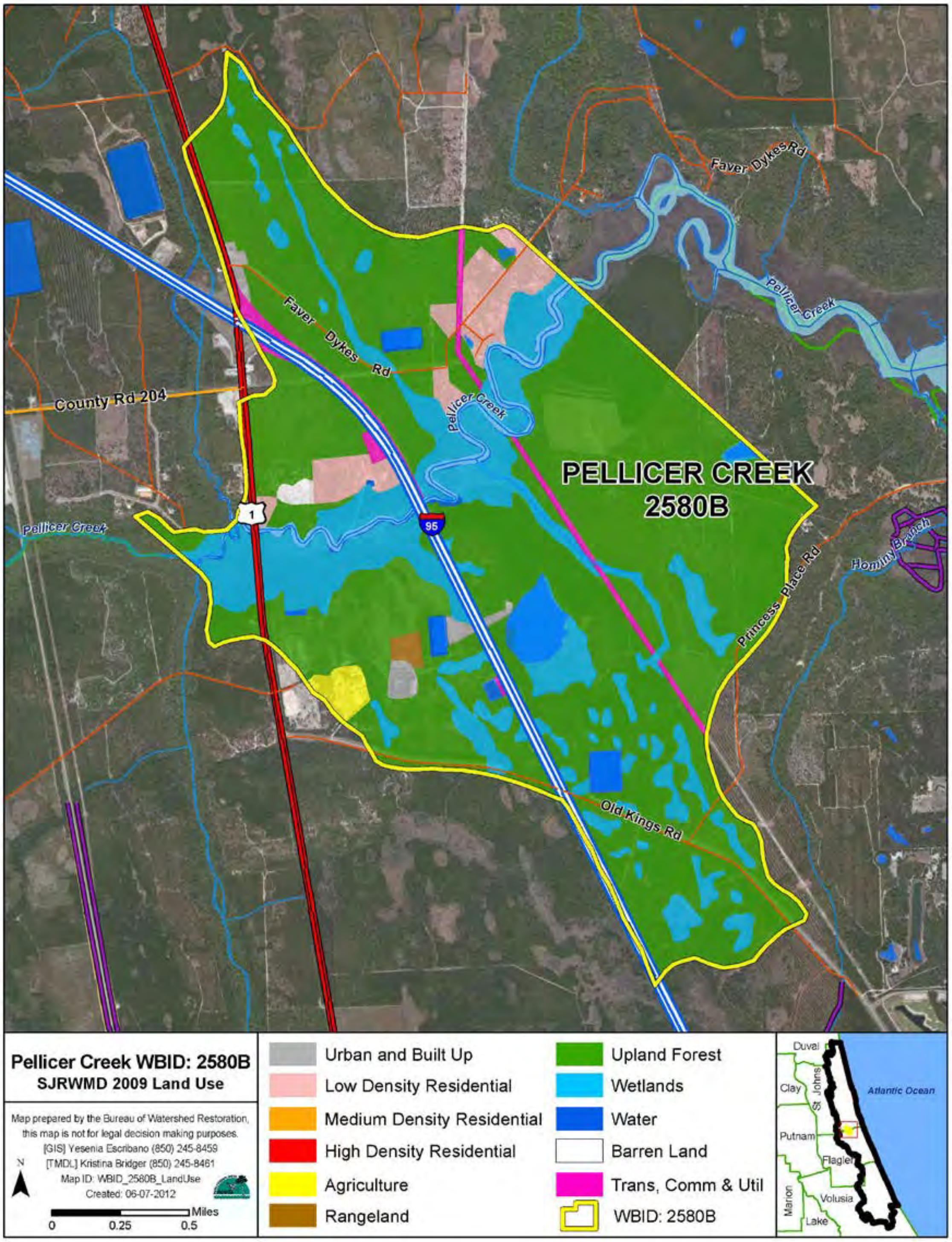


Figure 4.1. Principal Land Uses within the Pellicer Creek (WBID 2580B) Watershed Boundary, 2004

Sources of Fecal Coliform Loads

Nonpoint sources of coliform are diffuse sources that cannot be identified as entering a waterbody through a discrete conveyance at a single location. These sources generally, but not always, involve accumulation of bacteria on land surfaces and wash off as a result of storm events. In the Pellicer Creek watershed typical nonpoint sources of coliform bacteria include:

- Wildlife
- Agricultural animals
- Onsite Sewer Treatment and Disposal Systems (septic tanks)
- Urban development (outside of Phase I or II MS4 permitted areas)
- Sediments

Wildlife

Wildlife contribute coliform bacteria by depositing feces onto land surfaces where it can be transported to nearby streams during storm events and by direct deposition to the waterbody by birds and other warm blooded animals. Bacteria originating from local wildlife are generally considered to represent natural background concentrations. In most impaired watersheds, the contribution from wildlife is small relative to the load from urban and agricultural areas. Approximately 68 percent of the land area within WBID 2580B is designated as forested and 21 percent of the land area is designated as either water or wetlands. Additionally, due to the tidal influence, land use downstream of the WBID, which consists of primarily of a state park, could also be contributing to the coliform bacteria concentrations. With such a high percentage of natural land use in and surrounding WBID 2580B, wildlife could be a potential source of bacteria to Pellicer Creek.

According to St. Johns County and Flagler County representatives the basin has a large population of feral pigs, in addition to a wide variety of other mammals such as deer, raccoon, otter, and opossum, as well as avian wildlife that roost along the waterbody. All these species use the river corridor and drainages to the main channel of Pellicer Creek.

Agriculture

Agriculture is a potential source of coliform delivery to streams, including runoff of manure from pastureland and cropland, and direct animal access to streams. Approximately 0.1 percent of the total land area within WBID 2580B is designated as agricultural. Although agriculture represents only a small portion of the land use within the WBID, it could still be a potential source of pathogen loading to Pellicer Creek.

Onsite Sewerage Treatment and Disposal Systems (Septic Tanks)

Onsite sewage treatment and disposal systems (OSTDs), including septic tanks, are commonly used where providing sewer systems access is not cost effective or practical. When properly sited, designed, constructed, maintained, and operated, OSTDs are a safe means of disposing of domestic waste. The effluent from a well-functioning OSTD is comparable to secondarily treated wastewater from a sewage treatment plant. Effluent from a well-functioning septic tank located in sand and gravel sediment types may also contribute fecal coliform loadings. When not functioning properly, OSTDs can be a source of nutrients, pathogens, and other pollutants to both ground water and surface water. OSTDs located adjacent to tidally influenced waterbodies may also contribute fecal coliform loadings through groundwater seepage during low tide (VIMS, 2012).

Urban Areas/Pervious

Urban areas include land uses such as residential, industrial, utility swaths, extractive and commercial. Fecal coliform loading from urban areas (whether within an MS4 jurisdiction or not) is attributable to multiple sources including storm water runoff, leaks and overflows from sanitary sewer systems, illicit discharges of sanitary waste, runoff from improper disposal of waste materials, leaking septic systems, and domestic animals. Approximately three percent of the total land area within WBID 2580B is designated as urban. Although developed land use represents only a small percentage of the total land use, it is located immediately adjacent to Pellicer Creek. According to St. Johns County representative, other potential sources draining to Pellicer Creek outside the WBID include wastewater package plants, and old septic systems no longer in use but still draining and acting as a source of coliform bacteria. Additionally transportation and utilities land use consists of almost five percent of the total land use within the WBID. Two major highways cross Pellicer Creek along the western portion of WBID 2580B, which include the I-95 and US 1 roadways. As such, urban and transportation land uses combined represent over eight percent of the total land use in the WBID and could be a relevant source of pathogen loading to Pellicer Creek.

Sediments

Studies have shown that fecal coliform bacteria can survive and reproduce in streambed sediments and can be resuspended in surface water when conditions are right (Jamieson et al. 2005). Current methodology cannot quantify the exact amount of fecal coliform coming from each source. Therefore, the Department is unable to provide estimates of fecal coliform loading from sediments.

A preliminary quantification of the fecal coliform loadings from pet feces and septic tanks was conducted to demonstrate the relative contributions. **Appendix B** provides detailed load estimates and describes the methods used for the quantification. It should be noted that the information included in the appendix has been only used to demonstrate the possible relative contributions from different sources. The loading estimates have not been used in establishing the final TMDL.

Chapter 5: DETERMINATION OF ASSIMILATIVE CAPACITY

5.1 Determination of Loading Capacity

In this TMDL the Hazen formula was used to calculate percentiles since it is recommended in Hunter's Applied Microbiology (2002) article concerning bacteria in water. Because bacteriological counts in water are not normally distributed, a nonparametric method is more appropriate for the analysis of fecal coliform data (Hunter 2002). Using the Hazen method, the percent reduction needed to meet the applicable criterion is calculated based on the 90th percentile of all measured concentrations collected during the Cycle 2 Verified Period (January 1, 2004–June 30, 2011). The percent reduction needed to meet the applicable criterion is described in **Section 5.1.4**. EPA Region IV uses this method to develop fecal coliform TMDLs.

5.1.1 Data Used in the Determination of the TMDL

The table and figures presented in this section provide the station locations and time series data for fecal coliform bacteria collected in Pellicer Creek, WBID 2580B. **Table 5.1** provides a list of the water quality monitoring stations in WBID 2580B, including the date range and number of observations. **Figure 5.1** illustrates where the IWR stations are located within the WBID and surrounding landuse categories.

This analysis focuses on fecal coliform data collected from January 1, 2004 to June 30, 2011. The majority of the data was collected in 2004 - 2009. During this period, 34 fecal coliform samples were collected from 3 sampling stations in the WBID. Concentrations ranged from 40 to 1,580 counts/100mL, with a median value of 168 counts/100mL during this period.

Table 5.1. Water Quality Monitoring Stations for Pellicer Creek (WBID 2580B) for the Cycle 2 Verified Period (January 1, 2004 – June 30, 2011)

Station	Station Name	First Date	Last Date	No. Obs
21FLA 27010016	PELLICER CR AT US 1	4/26/2004	10/7/2009	26
21FLA 27010073	PELLICER CR @ NE IS BEND	1/15/2009	10/7/2009	4
21FLA 27010074	PELLICER CR E OF I95	1/15/2009	10/7/2009	4

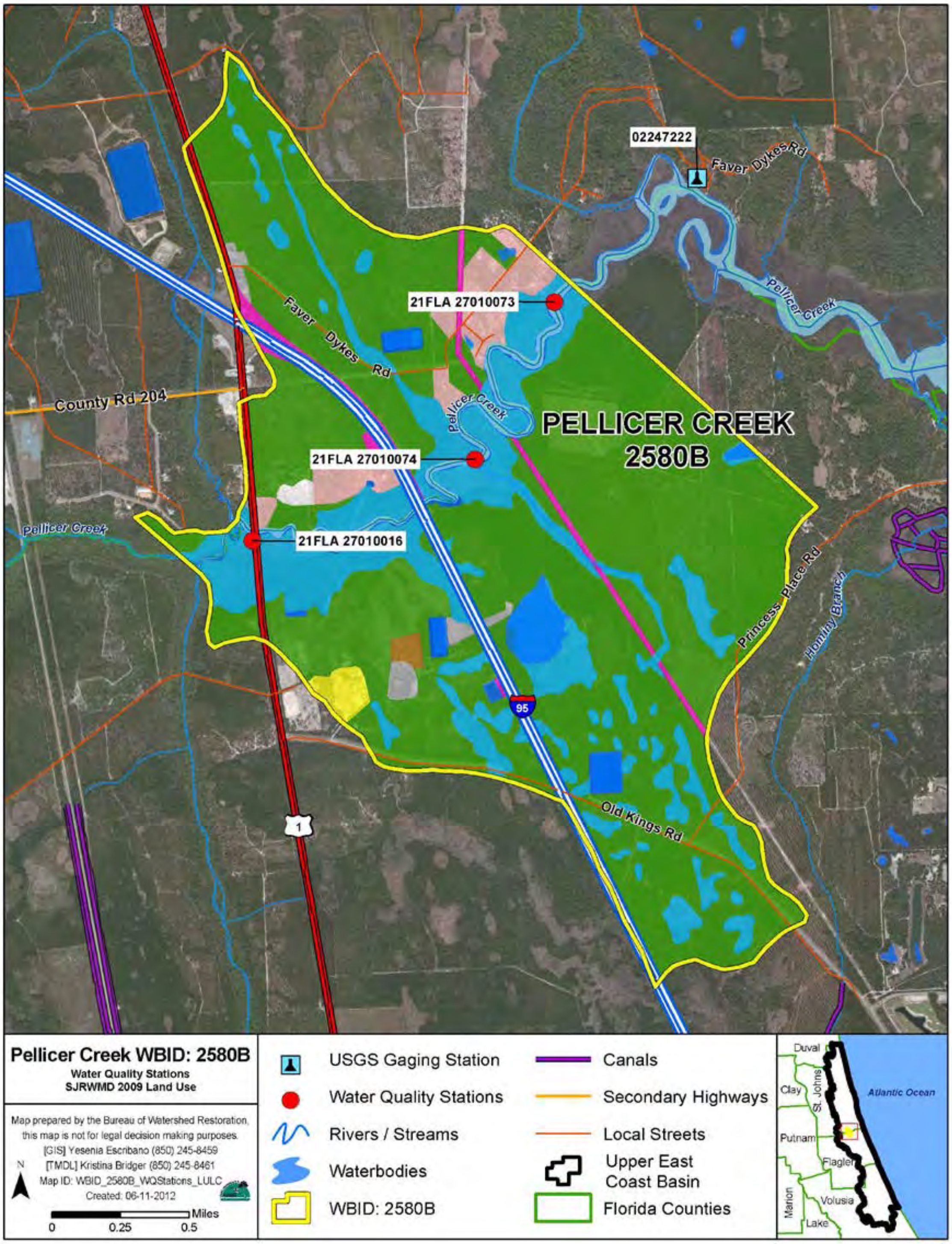


Figure 5.1. Location of Water Quality Monitoring Stations with Fecal Coliform Data in Pellicer Creek (WBID 2580B) with Surrounding Landuse

5.1.2 Hydrologic Condition

Stream flow is an important factor affecting water quality because it can be correlated with observed exceedances and used to determine the available loading capacity for pollutants. Flow data is available for Pellicer Creek, downstream of WBID 2580B at USGS Gage 02247222. However, Pellicer Creek is tidally influenced, resulting in both positive and negative flow rates recorded by the gage. Without more data, such as additional gages along Pellicer Creek, it is difficult to determine to what extent low flow rates are due to low flow conditions, (i.e. dry conditions) or tidal influences reducing the downstream flow. In order to evaluate the relationship between flow rate and bacteria concentrations, a time series graph is provided. For illustration purposes, the information is divided into two separate figures (**Figures 5.2 and 5.3**). **Table 5.2** also provided a tabular summary of the flow rates and bacteria concentrations during sampling events.

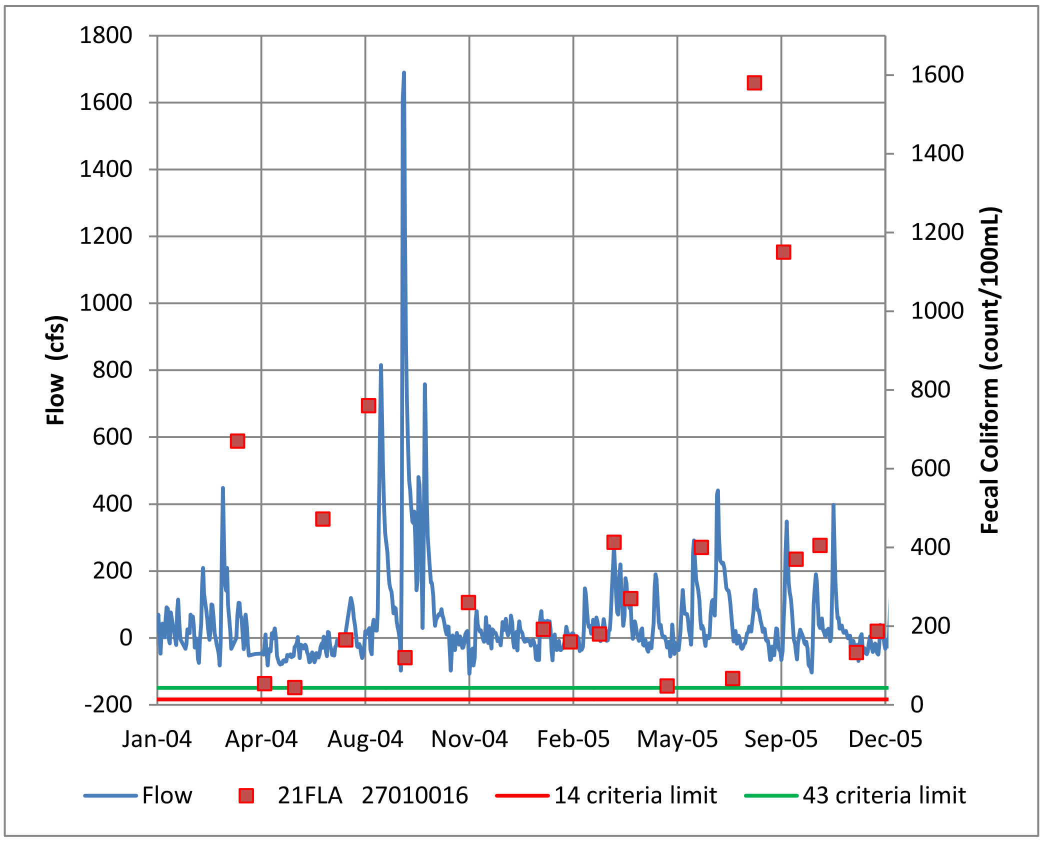


Figure 5.2. Comparison of Fecal Coliform Concentrations in WBID 2580B and Flow Data Collected at USGS Gage (# 02247222) from 2004 - 2005

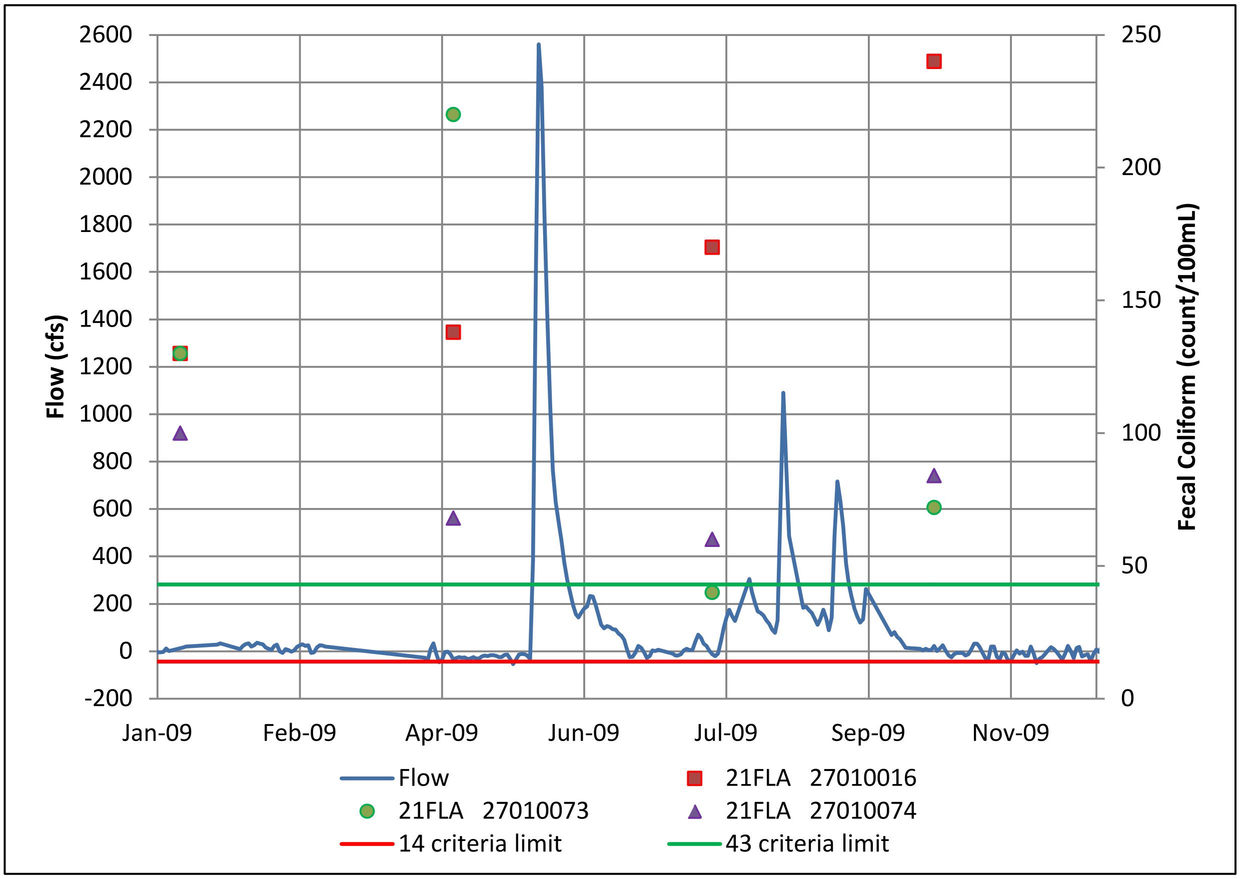


Figure 5.3. Comparison of Fecal Coliform Concentrations in WBID 2580B and Flow Data Collected at USGS Gage (# 02247222) in 2009

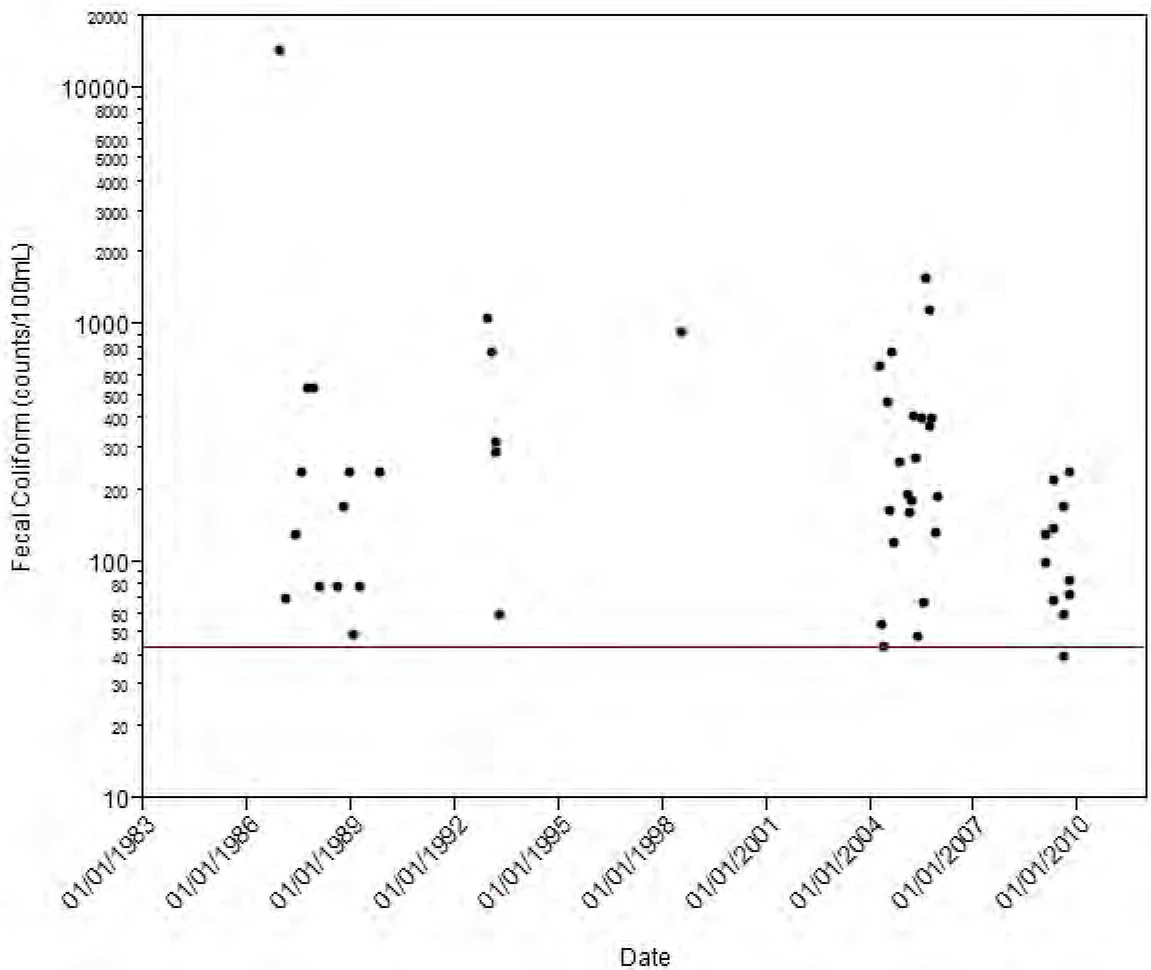
Table 5.2. Summary of Fecal Coliform Data and Flow in the Pellicer Creek (WBID 2580B)

Date	Monitoring Station	Fecal Coliform (#/100 mL)	Flow ft^3/s
3/31/2004	21FLA 27010016	670	65
4/26/2004	21FLA 27010016	54	-28
5/25/2004	21FLA 27010016	44	-27
6/21/2004	21FLA 27010016	472	-30
7/13/2004	21FLA 27010016	165	-5.7
8/4/2004	21FLA 27010016	760	26
9/8/2004	21FLA 27010016	120	1210
11/8/2004	21FLA 27010016	260	-22
1/19/2005	21FLA 27010016	192	48
2/14/2005	21FLA 27010016	160	-9.1
3/14/2005	21FLA 27010016	180	15
3/28/2005	21FLA 27010016	413	275
4/13/2005	21FLA 27010016	270	106
5/18/2005	21FLA 27010016	48	-29
6/20/2005	21FLA 27010016	400	28
7/20/2005	21FLA 27010016	67	20
8/10/2005	21FLA 27010016	1580	129

Date	Monitoring Station	Fecal Coliform (#/100/mL)	Flow ft^3/s
9/7/2005	21FLA 27010016	1150	47
9/19/2005	21FLA 27010016	370	-45
10/12/2005	21FLA 27010016	405	30
11/16/2005	21FLA 27010016	133	-29
12/6/2005	21FLA 27010016	187	-45
1/15/2009	21FLA 27010016	130	1.2
4/21/2009	21FLA 27010016	138	-34
7/21/2009	21FLA 27010016	170	-13
10/7/2009	21FLA 27010016	240	22
1/15/2009	21FLA 27010073	130	1.2
4/21/2009	21FLA 27010073	220	-34
7/21/2009	21FLA 27010073	40	-13
10/7/2009	21FLA 27010073	72	22
1/15/2009	21FLA 27010074	100	1.2
4/21/2009	21FLA 27010074	68	-34
7/21/2009	21FLA 27010074	60	-13
10/7/2009	21FLA 27010074	84	22

Period-of-Record Trend

The period of record for Pellicer Creek (WBID 2580B) is from 1986 to 2009. Plotting the historical fecal coliform data over time revealed that the range of fecal coliform concentrations has been between 40 counts/100mL to 2,000 counts/100mL since 1986 (see **Figure 5.4**). For Pellicer Creek, the data range of fecal coliform concentrations has persisted for approximately 26 years. It should be noted that in 2009, the fecal coliform concentrations ranged from 40 counts/100mL to 300 counts/100mL. Although the data range slightly decreased in 2009, there were 11 exceedances out of 12 samples of the water quality criterion of 43 counts/100mL for the protection of Class II waters. All three sampling locations 21FLA27010016 (upstream), 21FLA27010074 (mid-basin), and 21FLA27010073 (downstream) exceeded the water quality criterion.



Red line indicates the water quality criterion of 43 counts/100mL for Class II waters

Figure 5.4. Fecal Coliform Concentration Trends in the Pellicer Creek (WBID 2580B) for the Entire Period of Record (1986–2009)

5.1.3 Critical Conditions and Seasonal Variation

The critical conditions can be defined as the environmental conditions requiring the largest reduction to meet standards. By achieving the reduction for critical conditions, water quality standards should be achieved during all other times. Seasonal variation must also be considered in TMDL development to ensure that water quality standards will be met during all seasons of the year.

The critical condition for coliform loadings in a given watershed depends on many factors, including the presence of point sources and the land use pattern in the watershed. Typically, the critical condition for nonpoint sources is an extended dry period followed by a rainfall runoff event. During the wet weather period, rainfall washes off coliform bacteria that have built up on the land surface under dry conditions, resulting in the wet weather exceedances. However, significant nonpoint source contributions can also appear under dry conditions without any major surface runoff event. This usually happens when nonpoint sources contaminate the surficial aquifer, and fecal coliform bacteria are brought into the receiving waters through baseflow. In addition, the fecal coliform contribution of wildlife and livestock with direct access to the receiving water can be more noticeable during dry weather. The critical condition for point source loading typically occurs during periods of low stream flow, when dilution is minimized.

Flow data is available for Pellicer Creek, downstream of WBID 2580B at USGS Gage 02247222. However, Pellicer Creek is tidally influenced resulting in both positive and negative flow rates recorded by the gage. Therefore, the flow data and bacteria concentrations were evaluated using a time series graph instead of a load duration curve. Based on the information presented above, exceedances were detected during high and low flow conditions. The low flow conditions include negative flows which are presumably tidally-influenced. Implementation of this TMDL should address control of all sources during both wet and dry weather conditions. Therefore, critical conditions and seasonal variation are accounted for in the TMDL analysis for Pellicer Creek by selecting the largest percent reduction based on the entire period of measured water quality data, and using it to represent the pollutant reduction required year-round, for the entire watershed.

5.1.4 TMDL Development Process

In this TMDL the Hazen formula was used to calculate percentiles since it is recommended in Hunter's Applied Microbiology (2002) article concerning bacteria in water. A simple reduction calculation was performed to determine the reduction in fecal coliform concentration necessary to achieve the concentration target of 43 counts/100mL for Class II waters. The percent reduction needed to reduce pollutant load was calculated by comparing the existing concentrations and target concentration using **Formula 1**:

$$\text{Needed \% Reduction} = \frac{\text{Existing } 90^{th} \text{ Percentile Concentration} - \text{Allowable Concentration}}{\text{Existing } 90^{th} \text{ Percentile Concentration}} \times 100$$

Using the Hazen method for estimating percentiles as described in Hunter (2002), the existing condition concentration was defined as the 90th percentile of all the fecal coliform data collected during the Cycle 2 verified period (January 1, 2004–June 30, 2011January 1, 2004–June 30, 2011). The 90th percentile is also called the 10% exceedance event. This will result in a target condition that is consistent with the state bacteriological water quality assessment threshold for Class II waters.

In applying this method, all of the available data are ranked (ordered) from the lowest to the highest (**Table 5.3**) and **Formula 2** is used to determine the percentile value of each data point:

$$\text{Percentile} = \frac{\text{Rank} - 0.5}{\text{Total Number of Samples Collected}}$$

If none of the ranked values are shown to be the 90th percentile value, then the 90th percentile number (used to represent the existing condition concentration) is calculated by interpolating between the 2 data points adjacent (above and below) to the desired 90th percentile rank using **Formula 3:**

$$90^{th} \text{ Percentile Concentration} = C_{lower} + (P_{90th} * R)$$

Where:

> *C_{lower} is the fecal coliform concentration corresponding to the percentile lower than the 90th percentile;*
>
> *P_{90th} is the percentile difference between the 90th percentile and the percentile number immediately lower than the 90th percentile (90% - percentile $_{lower}$ = P_{90th}); and*
>
> *R is a ratio defined as R= (fecal coliform concentration $_{upper}$ – fecal coliform concentration $_{lower}$)/(percentile $_{upper}$ – percentile $_{lower}$).*

To calculate R, the percentile values below and above the 90th percentile were identified. Next, the fecal coliform concentrations corresponding to the lower and upper percentile values were identified. Then, the fecal coliform concentration difference between the lower and upper percentiles was then calculated and divided by the unit percentile. The unit percentile difference is the difference between the lower and upper percentiles. R was then calculated as (fecal coliform concentration $_{upper}$ – fecal coliform concentration $_{lower}$)/(percentile $_{upper}$ – percentile $_{lower}$) = R.

Then C_{lower}, P_{90th}, and R are substituted into **Formula 3** to calculate the 90th percentile fecal coliform concentration. Based on the ranked values the 90th percentile fecal coliform concentration is 670 counts/100mL.

Using **Formula 1**, the percent reduction for the period of observation (2003–2010) was calculated as 94% for the Pellicer Creek (i.e., % reduction needed = [(670-43)/670]*100 = 94%.

Table 5.3 shows the individual fecal coliform data, the ranks, the percentiles for each individual data, the existing 90th percentile concentration, the allowable concentration (43 counts/100mL), and the percent reduction needed to meet the applicable water quality criterion for fecal coliform.

Table 5.3. TMDL Calculation of Fecal Coliform Reduction for Pellicer Creek (WBID 2580B) Based on the Hazen Method

Date	Station	Result (counts/100mL)	Rank	Percentile by Hazen Method
7/21/2009	21FLA 27010073	40	1	1%
5/25/2004	21FLA 27010016	44	2	4%
5/18/2005	21FLA 27010016	48	3	7%
4/26/2004	21FLA 27010016	54	4	10%
7/21/2009	21FLA 27010074	60	5	13%
7/20/2005	21FLA 27010016	67	6	16%
4/21/2009	21FLA 27010074	68	7	19%
10/7/2009	21FLA 27010073	72	8	22%
10/7/2009	21FLA 27010074	84	9	25%
1/15/2009	21FLA 27010074	100	10	28%
9/8/2004	21FLA 27010016	120	11	31%
1/15/2009	21FLA 27010016	130	12	34%
1/15/2009	21FLA 27010073	130	12	34%
11/16/2005	21FLA 27010016	133	14	40%
4/21/2009	21FLA 27010016	138	15	43%
2/14/2005	21FLA 27010016	160	16	46%
7/13/2004	21FLA 27010016	165	17	49%
7/21/2009	21FLA 27010016	170	18	51%
3/14/2005	21FLA 27010016	180	19	54%
12/6/2005	21FLA 27010016	187	20	57%
1/19/2005	21FLA 27010016	192	21	60%
4/21/2009	21FLA 27010073	220	22	63%
10/7/2009	21FLA 27010016	240	23	66%
11/8/2004	21FLA 27010016	260	24	69%

Date	Station	Result (counts/100mL)	Rank	Percentile by Hazen Method
4/13/2005	21FLA 27010016	270	25	72%
9/19/2005	21FLA 27010016	370	26	75%
6/20/2005	21FLA 27010016	400	27	78%
10/12/2005	21FLA 27010016	405	28	81%
3/28/2005	21FLA 27010016	413	29	84%
6/21/2004	21FLA 27010016	472	30	87%
3/31/2004	21FLA 27010016	670	31	90%
8/4/2004	21FLA 27010016	760	32	93%
9/7/2005	21FLA 27010016	1150	33	96%
8/10/2005	21FLA 27010016	1580	34	99%
90^{th} Percentile				**670**
Percent Reduction to meet TMDL Target				**94 Percent**

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:

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:

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 TMDL for the Pellicer Creek is expressed in terms of counts/100mL and percent reduction, and represents the maximum daily fecal coliform load the estuary can assimilate without exceeding the fecal coliform criterion (**Table 6.1**).

Table 6.1. TMDL Components for Fecal Coliform in the Pellicer Creek (WBID 2580B)

N/A = Not applicable

Parameter	TMDL (counts/100mL)	WLA for Wastewater (counts/100mL)	WLA for NPDES Stormwater (% reduction)	LA (% reduction)	MOS
Fecal coliform	43	N/A	N/A	94%	Implicit

6.2 Load Allocation

Based on a percent reduction approach, the load allocation is a 94% reduction in fecal coliform from nonpoint sources. It should be noted that the LA includes loading from stormwater discharges regulated by the Department and the water management district that are not part of the NPDES Stormwater Program (see **Appendix A**).

6.3 Wasteload Allocation

6.3.1 NPDES Wastewater Discharges

No NPDES-permitted wastewater facilities were permitted to discharge within the Pellicer Creek WBID boundary. The state already requires all NPDES point source dischargers to meet bacteria criteria at the end of the pipe. It is the Department's current practice not to allow mixing zones for bacteria. These requirements will also be applied to any possible future point sources that may discharge in the WBID to meet end-of-pipe standards for coliform bacteria.

6.3.2 NPDES Stormwater Discharges

The Pellicer Creek watershed is not located within the service area of an MS4. Therefore, the WLA for stormwater discharges with an MS4 permit is a not applicable in the Pellicer Creek watershed. 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.

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 this TMDL by not subtracting contributions from natural sources and sediments when the percent reduction was calculated. This makes the estimation of human contribution more stringent and therefore adds to the MOS.

Chapter 7: TMDL IMPLEMENTATION

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 upon 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. Basin Management Action Plans 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 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 obligations of wastewater point source, MS4, and non-MS4 stakeholders in TMDL implementation; enhanced transparency in Department 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.

Many assessment tools are available to assist local governments and interested stakeholders in this 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 Hillsborough Basins, 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.

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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 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/Rnvironmental Resource Permit 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: Estimates of Fecal Coliform Loadings from Potential Sources

The Department provides these estimations for informational purposes only and did not use these estimates to calculate the TMDL. They are intended to give the public a general idea of the relative importance of each source in the waterbody. The estimates were based on the best information available to the Department at the time the calculation was made. The numbers provided do not represent actual loadings from the sources.

Pets

Pets (especially dogs) could be a significant source of coliform pollution through surface runoff within the Pellicer Creek WBID boundary. Studies report that up to 95% of the fecal coliform found in urban stormwater can have nonhuman origins (Alderiso *et al.* 1996; Trial *et al.* 1993).

The most important nonhuman fecal coliform contributors appear to be dogs and cats. In a highly urbanized Baltimore catchment, Lim and Olivieri (1982) found that dog feces were the single greatest source of fecal coliform and fecal strep bacteria. Trial *et al.* (1993) also reported that cats and dogs were the primary source of fecal coliform in urban subwatersheds. Using bacteria source tracking techniques, it was found in Stevenson Creek in Clearwater, Florida, that the amount of fecal coliform bacteria contributed by dogs was as important as that from septic tanks (Watson 2002).

According to the American Pet Products Manufacturers Association (APPMA), about 4 out of 10 U.S. households include at least 1 dog. A single gram of dog feces contains about 2,200,000 counts/gram of fecal coliform bacteria (van der Wel 1995). Unfortunately, statistics show that about 40% of American dog owners do not pick up their dogs' feces. The number of dogs within the Pellicer Creek WBID boundary is not known. Therefore, the statistics produced by APPMA were used in this analysis to estimate the possible fecal coliform loads contributed by dogs.

Using data obtained from the Florida Department of Health (FDOH) to calculate the number of properties in residential land use areas within the Pellicer Creek WBID boundary, the number of households within the WBID boundary was estimated to be 87. The data provided by FDOH are described in the next section. Assuming that 40% of the households in this area have 1 dog, the total number of dogs within the WBID is about 35.

Table B.1 shows the waste production rate for a dog (450 grams/animal/day) and the fecal coliform counts per gram of dog waste (2,200,000 counts/gram). Assuming that 40% of dog owners do not pick up their dogs' feces, the total waste produced by dogs and left on the land surface in residential areas is approximately 6.3×10^3 grams/day. The total produced by dogs is 1.38×10^{10} counts/day of fecal coliform.

It should be noted that this load only represents the fecal coliform load created in the WBID and is not intended to be used to represent a part of the existing load that reaches the receiving waterbody. The fecal coliform load that eventually reaches the receiving waterbody could be significantly less than this value due to attenuation in overland transport.

Table B.1. Dog Population Density, Wasteload, and Fecal Coliform Density (Weiskel *et al.* 1996)

* Number from APPMA

Type	Population Density (animal/household)	Wasteload (grams/animal-day)	Fecal Coliform Density (counts/gram)
Dog	0.4*	450	2,200,000

Septic Tanks

Septic tanks are another potentially important source of coliform pollution in urban watersheds. When properly installed, most of the coliform from septic tanks should be removed within 50 meters of the drainage field (Minnesota Pollution Control Agency 1999). However, the physical properties of an aquifer, such as thickness, sediment type (sand, silt, and clay), and location play a large part in determining whether contaminants from the land surface will reach ground water (USGS 2010b). The risk of contamination is greater for unconfined (water table) aquifers than for confined aquifers because they usually are nearer to the land surface and lack an overlying confining layer to impede the movement of contaminants (USGS 2010b).

Sediment type (sand, silt, and clay) also determines the risk of contamination in a particular watershed. According to the USGS (2010), "Porosity, which is the proportion of a volume of rock or soil that consists of open spaces, tells us how much water rock or soil can retain. Permeability is a measure of how easily water can travel through porous soil or bedrock. Soil and loose sediments, such as sand and gravel, are porous and permeable. They can hold a lot of water, and it flows easily through them. Although clay and shale are porous and can hold a lot of water, the pores in these fine-grained materials are so small that water flows very slowly through them. Clay has a low permeability."

Also, the risk of contamination is increased for areas with a relatively high ground water table. The drain field can be flooded during the rainy season, resulting in ponding, and coliform bacteria can pollute the surface water through stormwater runoff. Additionally, in these circumstances, a high water table can result in coliform bacteria pollution reaching the receiving waters through baseflow.

In addition, watersheds located in karst regions are extremely vulnerable to contamination. Karst terrain is characterized by springs, caves, sinkholes, and a unique hydrogeology that results in aquifers that are highly productive (USGS 2010b). Compared with nonkarst areas, these features act as direct pathways for pollutants to enter waterbodies.

Septic tanks may also cause coliform pollution when they are built too close to irrigation wells. Any well that is installed in the surficial aquifer system will cause a drawdown. If the septic tank system is built too close to the well (e.g., less than 75 feet), the septic tank discharge will be within the cone of influence of the well. As a result, septic tank effluent may enter the well, and once the polluted water is used to irrigate lawns, coliform bacteria may reach the land surface and wash into surface waters through stormwater runoff.

A rough estimate of fecal coliform loads from failed septic tanks within the Pellicer Creek WBID boundary can be made using **Equation B.2**:

$$L = 37.85 * N * Q * C * F \qquad \textbf{Equation B.2}$$

Where:

L is the fecal coliform daily load (counts/day);
N is the number of households using septic tanks in the WBID;
Q is the discharge rate for each septic tank (gallons/day);
C is the fecal coliform concentration for the septic tank discharge (counts/100mL);
F is the septic tank failure rate; and
37.85 is a conversion factor (100 mL/gallon).

Based on data provided by Department of Health, which is currently undertaking a project to inventory the use of onsite treatment and disposal systems (i.e., septic tanks) by determining the methods of wastewater disposal for developed property sites within the State of Florida, 87 housing units *(N)* within the Pellicer Creek WBID boundary are known or believed to be using septic tanks to treat their domestic wastewater (**Figure B.1**).

The discharge rate from each septic tank (*Q*) was calculated by multiplying the average household size by the per capita wastewater production rate. An estimate of fecal coliform loads from failed septic tanks was generated using St. John's County information because most of the septic tanks located within the Pellicer Creek WBID Boundary are found in St. John's County based on DOH OSTDS GIS Coverage. Based on the information published by the Census Bureau (2010), the average household size for St. John's County is about 2.53 people/household. The same population densities were assumed within the Pellicer Creek WBID boundary. A commonly cited value for per capita wastewater production rate is 70 gallons/day/person (EPA 2001). The commonly cited concentration (*C*) for septic tank discharge is 1×10^6 counts/100mL for fecal coliform (EPA 2001).

No measured septic tank failure rate data were available for the WBID when this TMDL was developed. Therefore, the failure rate was derived from the number of septic tanks in St. John's County based on FDOH's septic tank inventory and the number of septic tank repair permits issued in St. John's County as published by FDOH (available: (http://www.doh.state.fl.us/environment/OSTDS/statistics/ostdsstatistics.htm). The cumulative number of septic tanks in St. John's County on an annual basis was calculated by subtracting the number of issued septic tank installation permits for each year from the current number of septic tanks in the county based on FDOH's 2010–11 inventory, and assuming that none of the installed septic tanks will be removed after being installed (**Table B.2**). The reported number of septic tank repair permits was also obtained from the FDOH website. Based on this information, the annual discovery rates of failed septic tanks were calculated and listed in **Table B.2**.

Based on **Table B.2**, the average annual septic tank failure discovery rate is about 0.55% for St. John's County. Assuming that failed septic tanks are not discovered for about 5 years, the estimated annual septic tank failure rate is about 5 times the discovery rate, or 2.77%. Based on **Equation B.2**, the estimated fecal coliform loading from failed septic tanks within the Pellicer Creek WBID boundary is about 1.62×10^{10} counts/day.

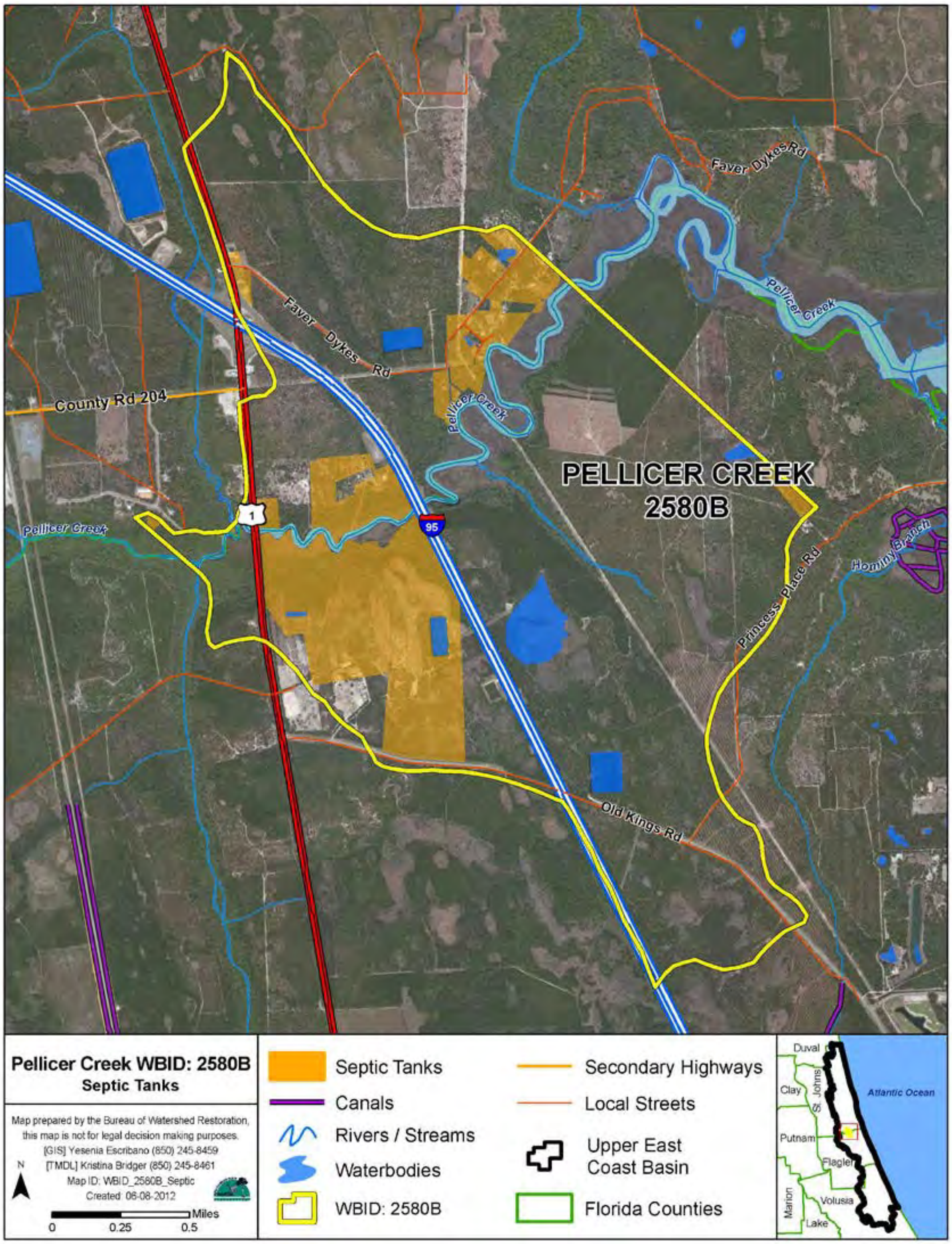

Figure B.1. Distribution of Onsite Sewage Disposal Systems (Septic Tanks) and Sewer Systems in Residential Land Use Areas within the Pellicer Creek (WBID 2580B) Watershed Boundary

Table B.2. Estimated Number of Septic Tanks and Septic Tank Failure Rates for St. John's County, 2006–11

* The failure rate is 5 times the failure discovery rate.

St. John's County	2006	2007	2008	2009	2010	2011	Average
New installations (septic tanks)	526	292	164	170	93	264	252
Accumulated installations (septic tanks)	27778	28304	28596	28760	28930	29023	28565.17
Repair permits (septic tanks)	170	91	114	131	242	203	159
Failure discovery rate (%)	0.61	0.32	0.40	0.46	0.84	0.70	0.55
Failure rate (%)*	3.06	1.61	1.99	2.28	4.18	3.50	2.77

Sediments

Studies have shown that fecal coliform bacteria can survive and reproduce in streambed sediments and can be resuspended in surface water when conditions are right (Jamieson *et al.* 2005). Current methodology cannot quantify the exact amount of fecal coliform coming from each source. Therefore, the Department is unable to provide estimates of fecal coliform loading from sediments.

Wildlife

Wildlife is another possible source of fecal coliform bacteria within the Pellicer Creek WBID boundary. As shown in **Figure 4.1**, wetland areas border the Pellicer Creek. These likely serve as habitat for wildlife that has the potential to contribute fecal coliform to the estuary. Wildlife deposit coliform bacteria with their feces onto land surfaces, where they can be transported during storm events to nearby streams. Some wildlife (such as birds, otters, alligators, and raccoons) deposits their feces directly into the water. Cold-blooded animals, such as fish and iguanas, harbor *E. coli* in their intestines, and it is possible that they may reintroduce *E. coli* bacteria into waterways when they excrete their own waste (Hansen *et al.* 2008). The bacterial load from naturally occurring wildlife is assumed to be background. However, as these represent natural inputs, no reductions are assigned to these sources by this TMDL.

Livestock

Agricultural animal waste is associated with various pathogens in streams; these can include *E. coli, Salmonella, Giardia, Campylobacter, Shigella, and Cryptosporidiumparvum* (Landry and Wolfe 1999). High loading rates of pathogens to soils and waters can result from the presence of livestock and other agricultural animals. Livestock with direct access to receiving water can contribute to exceedances during wet and dry weather conditions.

Problems with grazing animals and pathogen loading rates derive primarily from animal density (Hubbard *et al.* 2004). At low animal densities, livestock with free access to waterbodies can directly deposit urine and manure (Hubbard *et al.* 2004). At high animal densities, large amounts of urine and feces may be deposited in relatively small areas, increasing the probability of nutrients and pathogens being transported to surface waterbodies via surface runoff, or entering ground water (Hubbard *et al.* 2004).

Agricultural land uses occupy 3.4 acres (0.1%) of the total land area in the Pellicer Creek watershed. High loading rates of fecal coliform to soils and waters can result from livestock and other agricultural animals. Livestock with direct access to a receiving water can contribute to the exceedances during wet and dry weather conditions. Livestock data from the 2007 census of agriculture for St. John's County are available at http://www.agcensus.usda.gov/Publications/2007/index.asp (U.S. Department of Agriculture 2007). Since a livestock inventory does not exist for the Pellicer Creek watershed, a possible fecal coliform load from livestock could not be calculated.

Appendix C: TMDL Public Comments for the Pellicer Creek (WBID 2580B) Fecal Coliform TMDL

Administration
1769 E. Moody Blvd Bldg 2
Bunnell, FL 32110

FLAGLER COUNTY FLORIDA

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Phone: (386)313-4001
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July 23, 2012

Ms. Kristina Bridger
Florida Department of Environmental Protection
Bureau of Watershed Restoration
Watershed Evaluation and TMDL Section
2600 Blair Stone Road, Mail Station 3555
Tallahassee, FL 32399-2400

Re: Flagler County Comments concerning Draft TMDL Report Fecal Coliform TMDL for Pellicer Creek WBID 2580B

Dear. Ms. Bridger,

Flagler County has reviewed the Draft TMDL Report Fecal Coliform TMDL for the Pellicer Creek (WBID 2580B) published by the Florida Department of Environmental Protection June 5, 2012. We have concerns regarding the basis for the draft TMDL and wish to record with FDEP our disagreement with the draft TMDL and request its withdrawal pending further sampling and investigation. Out of all the water bodies in our County this is one of the most undeveloped, pristine areas which guides us to ask for a much more thorough scientific analysis before any sweeping conclusions are made.

As described in the draft TMDL, Pellicer Creek WBID 2580B is comprised of primarily upland forest and wetland surrounding Pellicer Creek along the St. Johns and Flagler county borders. Immediately downstream of WBID 2580B, Faver-Dykes State Park and Pellicer Creek Conservation Area comprise most of the creek border. Tidal influences on the creek cause two-way flow to the east and the west, potentially from many miles outside the WBID. The TMDL acknowledges that there are no obvious WBID sources of fecal coliform bacteria. The TMDL report suggests several possible sources based on basin land use data.

We believe that the data collected are inadequate or inappropriate to determine a TMDL for the following reasons:

- WBID Area - The upland forested areas and wetlands that are found along the Pellicer Creek, particularly in Flagler County, have been purchased in partnership with the State of Florida as partners including the St. Johns River Water Management District, FDEP (as Florida Communities Trust) and other local partners. The purchase of the majority of these lands was, in most cases, due to their existing natural and undeveloped character. Anthropogenic inputs of fecal coliform in these areas are expected to be de minimus in contribution to this waterbody. While this is discussed in the presentations, a greater weight to this observation should be observed for an area characterized by such continuous conservation effort. Scientifically, at the very least this should lead to broaden the scope of investigation to consider a variety of causes, a larger area, and other inputs from outside the WBID.

- Historical/Baseline Data - The water quality data collected does not appear to represent a sufficiently long or continuous span of time to adequately characterize the water quality of such a dynamic, tidally influenced system. There are large gaps in the data for a three year period and the data collected may indicate a natural baseline above the state water quality standard. The natural baseline of fecal coliform or other water quality indicators has not been presented. The data that has been collected and presented for this creek system appears to lack sufficient methodology and continuity to implement the regulatory criteria that are proposed.

- Upstream Contributions - The WBID 2580B's location within a very undeveloped, and sparsely populated area provides reason for skepticism for its being placed on the "Verified List" for the TMDL criteria. The majority of the sample data for the TMDL analysis came from a location that is significantly upstream within WBID 2580B. This simple observation requires that the data collected and analyzed at that site be allocated to inputs from upstream of the site. This may help determine what is from the WBID 2580B and what is from another area. Downstream sampling sites within WBID 2580B were underrepresented in the total findings and indicate a significantly different snapshot of the water quality for the site. Considering the potentially confounding tidal influence of Pellicer creek, further investigation is warranted before the TMDL is determined.

- Tidal Influence/Siltation Deposit – A large impact on water quality for this area is likely related to tidal flow. This creates mixing within the basin daily. We are skeptical of attempting to select a section of a brackish creek that has such significant amounts of water movement and implementing specific scientific or regulatory conclusions. Additionally, such tidal influence is may carry sediments to this area. Such sediment transport may release trapped fecal coliform matter with tides and weather events.

  "Fecal coliform and E. Coli can attach to sediments suspended in the water column and can survive and multiply in bottom sediments for an extended period of time." – Study from Department of Forestry and Natural Resources, Clemson University

- Weather Events – The majority of your samples were clustered in the 2004/05 timeframe. The hurricanes of 2004 resulted in flooding conditions and possible mixing of sediment resulting in potential spikes in fecal coliform numbers during that timeframe. Varying weather events adding water to the system or stirring up sediments should be considered with the sampling methodology and correctional adjustments should be made to account for these effects.

" Natural bacteria levels in streams can vary significantly; bacteria conditions are strongly correlated with rainfall, and thus comparing wet and dry weather bacteria data can be a problem;" - EPA

In summary, Flagler County believes that WBID 2580B sample locations are inappropriately located and evaluated to indicate the presence of in-basin pollution sources. Also, the data is not sufficiently continuous, nor has the data been collected with sufficient history to engage in the determination of a TMDL for fecal coliform at this time. Any analysis should also be expanded to evaluate the impact of tidal influences, upstream contributions, weather and sediment on these results, before any further steps are taken in the process. We are monitoring the process and are willing to sit down and further discuss opportunities to make the analysis more accurate and therefore more useful in helping FDEP accomplish its regulatory responsibilities. It is for these reasons that we respectfully request that FDEP reconsider and withdraw this TMDL pending further DEP sampling and investigations.

Sincerely,

Craig M. Coffey

Craig M. Coffey, AICP
County Administrator

September 21, 2012

Mr. Craig M. Coffey
Flagler County
Administration
1769 E. Moody Blvd Bldg 2
Bunnell, FL 32110

Dear Mr. Coffey:

The Department appreciates the time and effort you and your staff put into reviewing these draft TMDLs. Thank you for your insights and help in improving the quality of our TMDL for Pellicer Creek (WBID 2580B). We have made applicable edits to the draft TMDL report 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 (in black), followed by the Department's response to each (in blue), in the order in which they were presented.

Comments

"We have concerns regarding the basis for the draft TMDL and wish to record with FDEP our disagreement with the draft TMDL and request its withdrawal pending further sampling and investigation."

In Florida, EarthJustice sued EPA on April 1998 and settled with a detailed schedule for TMDL development. FDEP was NOT a party to the suit, but participated in some settlement discussions. EPA agreed to a 13 year schedule, mainly based on FDEP's basin management cycle. 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 Florida Watershed Restoration Act (FWRA) (Subsection 403.067[4], Florida Statutes [F.S.]); the state's 303(d) list is amended annually to include basin updates. On the 1998 303(d) Consent Decree List, every listed water was given a specific due date (year) for TMDL development. Pellicer Creek (WBID 2580B) was one of the waterbodies listed on the 1998 303(d) list. Because of the lawsuit, EPA is obligated to complete a Fecal Coliform TMDL for Pellicer Creek (WBID 2580B) by November 30, 2012. EPA has already proposed a Fecal Coliform TMDL for Pellicer Creek (http://www.epa.gov/waters/tmdldocs/7e_final_tmdl_2580b_pellicer_creek_fc.pdf). However, upon review of EPA's proposed TMDL, FDEP intends to submit to EPA a TMDL that is based on local stakeholder input and the best available data. When EPA approves FDEP's Fecal Coliform TMDL for Pellicer Creek, EPA's proposed document will be removed and replaced with FDEP's document.

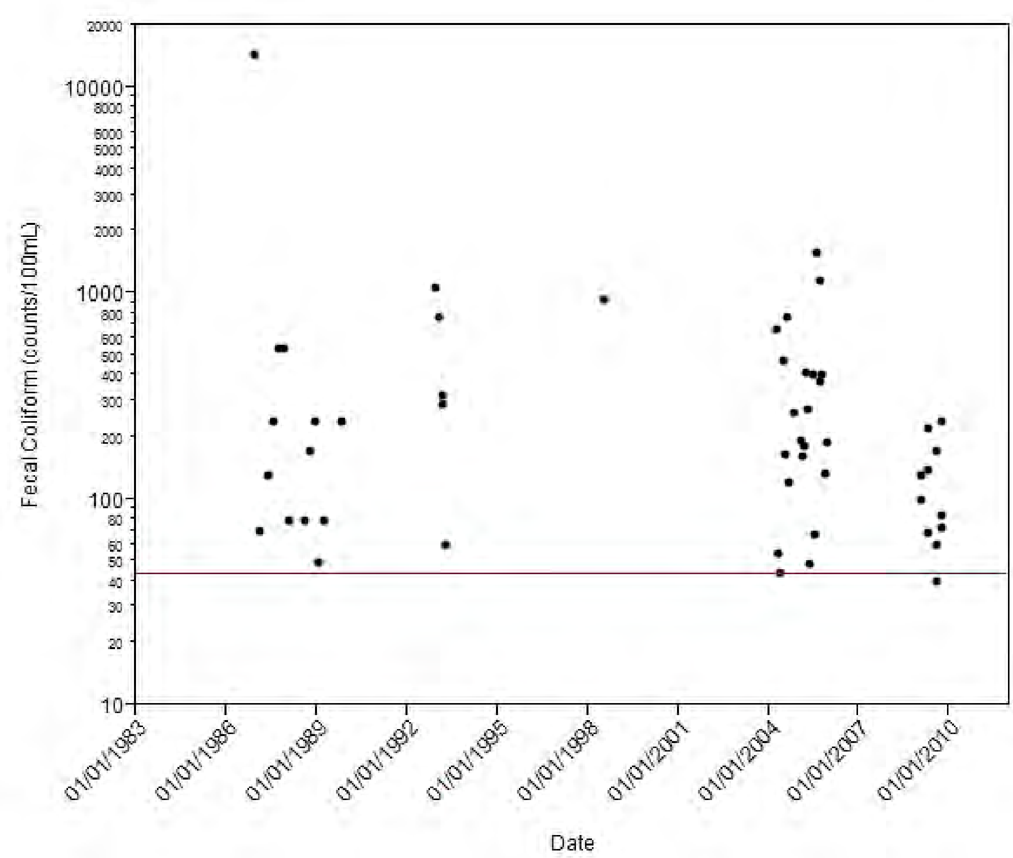
"We believe that the data collected are inadequate or inappropriate to determine a TMDL for the following reasons:
WBID Area – The upland forested areas and wetlands that are found along the Pellicer Creek, particularly in Flagler County, have been purchased in partnership with the State of Florida as partners including the St. Johns River Water Management District, FDEP (as Florida Communities Trust), and other local partners. The purchase of the majority of these lands was, in most cases, due to their existing natural and undeveloped character. Anthropogenic inputs of fecal coliform in these areas are expected to be de minimus in contribution to this waterbody. While this is discussed in the presentations, a greater weight to this observation should be observed for an area characterized by such continuous conservation effort. Scientifically, at the very least this should lead to broaden the scope of investigation to consider a variety of causes, a larger area, and other inputs from outside the WBID."
Local entities are only responsible for reducing the anthropogenic fecal coliform loads. Pellicer Creek (WBID 2580B) routinely has fecal coliform concentrations exceeding the water quality criterion (43 counts/100mL). There were 33 exceedances out of 34 samples, with exceedances at all three sampling locations. Identifying the extent of the anthropogenic fecal coliform loading to Pellicer Creek requires extensive documentation, which according to Tim Telfer of Flagler County (teleconference on Friday, July 20, 2012 at 9:09 AM) is currently not available. In the future, this information can be obtained by performing a Walk the Waterbody exercise during the implementation phase of this TMDL. For more information regarding the Walk the Waterbody process please refer to the following website (http://www.dep.state.fl.us/water/watersheds/docs/fcg_toolkit.pdf).). In addition, identifying and quantifying the contribution of fecal coliform from natural sources using various source tracking techniques can also be very helpful. If local entities and stakeholders can quantify the percent contribution of fecal coliform from natural sources, the needed percent reduction to anthropogenic sources can be altered accordingly by subtracting the natural source contribution.
"Historical/Baseline Data – The water quality data collected does not appear to represent a sufficiently long or continuous span of time to adequately characterize the water quality of such a dynamic, tidally influenced system. There are large gaps in the data for a three year period and the data collected may indicate a natural baseline above the state water quality standard. The natural baseline of fecal coliform or other water quality indicators has not been presented. The data that has been collected and presented for this creek system appears to lack sufficient methodology and continuity to implement the regulatory criteria that are proposed."
For regulatory purposes, the methodology that FDEP uses to assess water quality samples for Pellicer Creek (WBID 2580B) is Rule 62-160, FAC (Quality Assurance). Rule 62-160 defines the minimum field and laboratory quality assurance, methodology, and reporting requirements of the Department. The water quality data are assessed using Rule 62-303, FAC (Identification of Impaired Surface Waters Rule or IWR). Electronic

versions of these rules can be found at the following Department's website (http://www.dep.state.fl.us/water/rulesprog.htm#sw).

In regards to historical data, the following discussion has been added to the draft Fecal Coliform TMDL for Pellicer Creek (WBID 2580B).

Period-of-Record Trend

The period of record for Pellicer Creek (WBID 2580B) is from 1986 to 2009. Plotting the historical fecal coliform data over time revealed that the range of fecal coliform concentrations has been between 40 counts/100mL to 2,000 counts/100mL since 1986 (see **Figure 5.4**). For Pellicer Creek, the data range of fecal coliform concentrations has persisted for approximately 26 years. It should be noted that in 2009, the fecal coliform concentrations ranged from 40 counts/100mL to 300 counts/100mL. Although the data range slightly decreased in 2009, there were 11 exceedances out of 12 samples of the water quality criterion of 43 counts/100mL for the protection of Class II waters. Samples collected at all three sampling locations 21FLA27010016 (upstream), 21FLA27010074 (mid-basin), and 21FLA27010073 (downstream) exceeded the water quality criterion.



Red line indicates the water quality criterion of 43 counts/100mL for Class II waters

Figure 5.4. Fecal Coliform Concentration Trends in the Pellicer Creek (WBID 2580B) for the Entire Period of Record (1986–2009)

"Upstream Contributions – The WBID 2580B's location within a very undeveloped, and sparsely populated area provides reason for skepticism for its being placed on the

"Verified List" for the TMDL criteria. The majority of the sample data for the TMDL analysis came from a location that is significantly upstream within WBID 2580B. This simple observation requires that the data collected and analyzed at that site be allocated to inputs from upstream of the site. This may help determine what is from the WBID 2580B and what is from another area. Downstream sampling sites within WBID 2580B were underrepresented in the total findings and indicate a significantly different snapshot of water quality for the site. Considering the potentially confounding tidal influence of Pellicer Creek, further investigation is warranted before the TMDL is determined."

Based on the Florida Watershed Restoration Act, TMDLs must be developed and adopted for each instance of impairment identified on the verified lists. Using the IWR methodology, this waterbody was verified impaired for fecal coliform because more than 10% of the values exceeded the Class II waterbody criterion of 43 counts per 100 milliliters (counts/100mL) for fecal coliform. There were 33 exceedances out of 34 samples. Samples collected at all three sampling locations 21FLA27010016 (upstream), 21FLA27010074 (mid-basin), and 21FLA27010073 (downstream) exceeded the water quality criterion of 43 counts/100mL for the protection of Class II waters. The fecal coliform data at the 2 downstream stations would have listed the waterbody as impaired because there were 7 exceedances out of 8 samples.

Monitoring Station	N	Minimum Concentration (#/100ml)	Maximum Concentration (#/100ml)	Mean Concentration (#/100ml)	Standard Deviation (#/100ml)	# Samples exceeding 43 (counts/100ml)
21FLA 27010016	26	44	1580	338	358	26
21FLA 27010074	4	60	100	78	18	4
21FLA 27010073	4	40	220	116	79	3

Because bacteriological counts in water are not normally distributed, the Hazen method is used to determine the percent reduction needed to meet the applicable water quality criterion of 43 counts/100mL for the protection of Class II waters, which all three sampling locations exceeded. The Hazen method is described in Section 5.1.4 of the draft Fecal Coliform TMDL for Pellicer Creek (WBID 2580B).

The goal of this TMDL is to define the needed reduction of fecal coliform from the watershed so that the fecal coliform concentration in the Pellicer Creek will meet the state water quality criteria. Allocating the needed reduction to specific local sources, especially non-point sources, is beyond the scope of this TMDL. After the adoption of this TMDL, counties and local stakeholders can work with the FDEP to develop a restoration plan to implement the TMDL. Reduction needs can be allocated to specific local sources in the plan. This process should identify sources within the local watershed area as well as influence from upstream segment and allocate needed reduction to local and upstream sources. In addition, if the counties and local stakeholders feel that the existing WBID boundary delineation and/or the station WBID assignment do not reflect the natural hydrology of the creek, revised WBID boundary delineation and station re-assignment can be proposed to the Watershed Assessment Section of the Department so that the impairment listing can be conducted more accurately and efficient. The Department appreciates help from local entities and stakeholders.

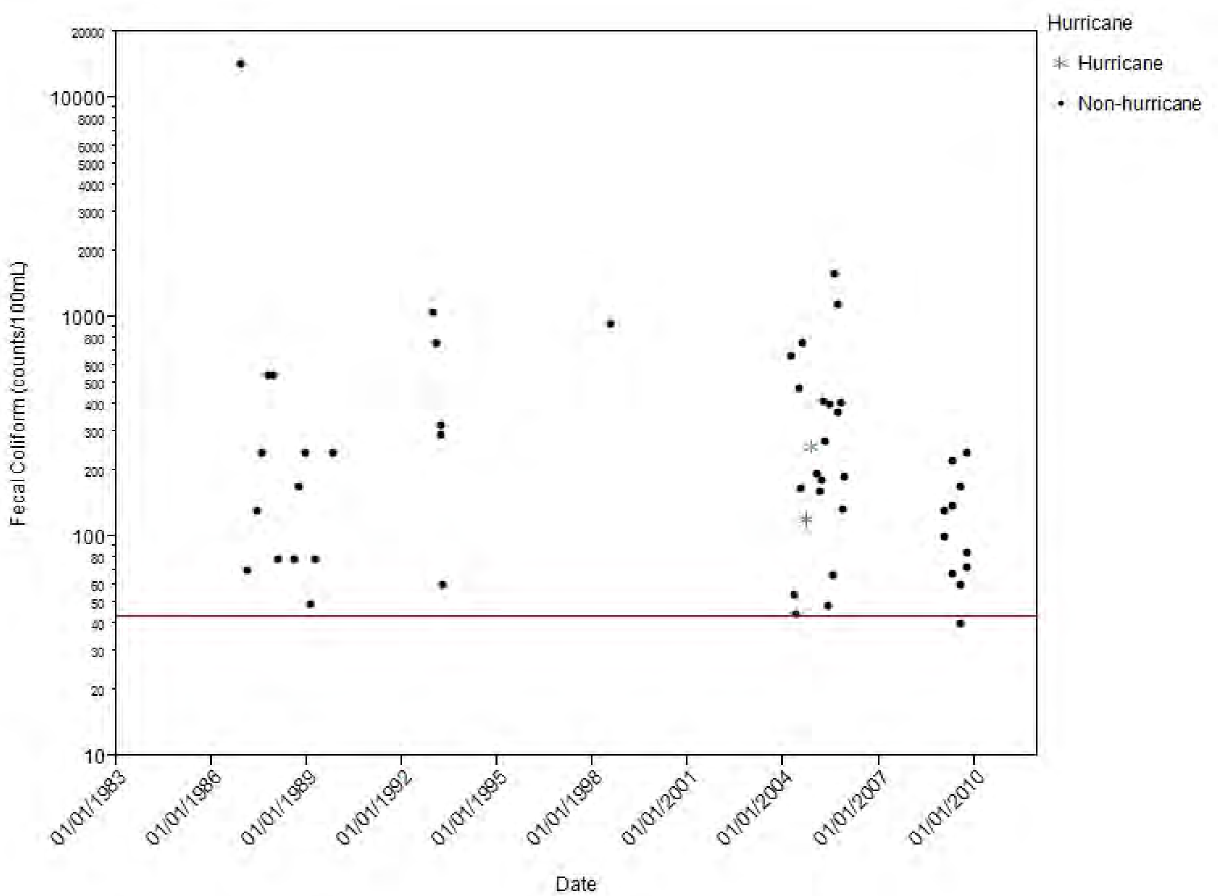
"Tidal Influence/Siltation Deposit – A large impact on water quality for this area is likely related to tidal flow. This creates mixing within the basin daily. We are skeptical of attempting to select a section of brackish creek that has such significant amounts of water movement and implementing specific or regulatory conclusions. Additionally, such tidal influence may carry sediments to this area. Such sediment transport may release trapped fecal coliform matter with tides and weather events."

Pellicer Creek is tidally influenced. Tidal effects on fecal coliform concentrations are discussed in the draft TMDL document. Please refer to Chapter 5 Section 5.1.2 – Hydrologic Condition and 5.1.3 – Critical Conditions and Seasonal Variation.

Onsite sewage treatment and disposal systems (OSTDs), can be a source of nutrients, pathogens, and other pollutants to both ground water and surface water. Effluent from a well-functioning septic tank located in sand and gravel sediment types may also contribute fecal coliform loadings. Also, OSTDs located adjacent to tidally influenced waterbodies may also contribute fecal coliform loadings through groundwater seepage during low tide (VIMS, 2012). Sediments and OSTDs as potential sources of fecal coliform bacteria are discussed in the draft TMDL document. Please refer to Chapter 4 and Appendix B.

"Weather Events – The majority of your samples were clustered in the 2004/05 timeframe. The hurricanes of 2004 resulted in flooding conditions and possible mixing of sediment resulting in potential spikes in fecal coliform numbers during that timeframe. Varying weather events adding water to the system or stirring up sediments should be considered with the sampling methodology and correctional adjustments should be made to account for these effects."

Of the 22 water quality samples taken between 2004/05, only 2 samples were affected by the hurricanes. The figure below identifies the 2 samples that were affected by the hurricanes as blue stars among the entire period of record from 1986 – 2009 (black dots). The figure reveals that the 2 samples fall within the data range of 40 counts/100mL to 2000 counts/100mL), which has persisted for approximately 26 years.



Red line indicates the water quality criterion of 43 counts/100mL for Class II waters

"Natural bacteria levels in streams can vary significantly; bacteria conditions are strongly correalated with rainfall, and thus comparing wet and dry weather bacteria data can be a problem – EPA."

Flow data are available for Pellicer Creek, downstream of WBID 2580B at USGS Gage 02247222. However, Pellicer Creek is tidally influenced resulting in both positive and negative flow rates recorded by the gage. Therefore, the flow data and bacteria concentrations were evaluated using a time series graph instead of a load duration curve. Based on the information presented above, exceedances were detected during high and low flow conditions. The low flow conditions include negative flows which are presumably tidally-influenced. Implementation of this TMDL should address control of all sources during both wet and dry weather conditions. Therefore, critical conditions and seasonal variation are accounted for in the TMDL analysis for Pellicer Creek. Please refer to Chapter 5 Section 5.1.2 – Hydrologic Condition and 5.1.3 – Critical Conditions and Seasonal Variation.

In closing, we thank you for your interest in water quality issues in your area and look forward to working with you on implementing this and future TMDLs. Katie Hallas is the Basin Management Action Plan (BMAP) Coordinator for the Upper East Coast Basin. She will be able to assist you with the Walk the Waterbody process in order to identify and eliminate fecal pollution within the Pellicer Creek watershed. Her contact information is phone: (850) 245-8432 and e-mail: Katie.Hallas@dep.state.fl.us.

Please contact me at Jan.Mandrup-Poulsen@dep.state.fl.us, if you have any further questions.

Sincerely,

Jan Mandrup-Poulsen, Environmental Administrator
Watershed Evaluation and TMDL Section

St. Johns County Board of County Commissioners

Public Works | Engineering Division

July 23, 2012

Mr. Jan Mandrup-Poulsen
Florida Department of Environmental Protection
Bureau of Watershed Restoration
Watershed Evaluation and TMDL Section
2600 Blair Stone Road, Mail Station 3565
Tallahassee, FL 32399-2400

Re: St. Johns County Comments concerning Draft TMDL Report Fecal Coliform TMDL for Pellicer Creek WBID 2580B

Dr. Mr. Mandrup-Poulsen:

St. Johns County has reviewed the Draft TMDL Report Fecal Coliform TMDL for the Pellicer Creek (WBID 2580B) published by the Florida Department of Environmental Protection June 5, 2012. We have concerns regarding the basis for the draft TMDL and wish to record with FDEP our disagreement with the draft TMDL and request its withdrawal pending further sampling and investigation.

As described in the draft TMDL, Pellicer Creek WBID 2580B comprises 2,500 acres of primarily upland forest and wetland (90.5% of basin land use types) straddling Pellicer Creek and the border of St. Johns and Flagler counties. Immediately downstream of WBID 2580B, Faver-Dykes State Park and Pellicer Creek Conservation Area comprise most of the creek border. Tidal influences on the creek cause two-way flow. The TMDL acknowledges that there are no obvious WBID sources of fecal coliform bacteria. The TMDL report suggests several possible sources based on basin land use data.

We believe that the data collected are inadequate to determine a TMDL for the following reasons:

- Sample data used for the TMDL analysis came primarily from a location at the extreme upstream end of the basin, a location that would reflect runoff from lands within and upstream of WBID 2580B. Furthermore, the contributing WBIDs upstream of this boundary sampling point have no data (WBID 2597- Hulett Branch and WBID 2580C- Pellicer Creek upstream freshwater section). The draft TMDL used 34 fecal coliform values to make the determination that the WBID required a TMDL. Of the 34 sample values collected from three sampling stations in Pellicer Creek, sample location 21FLA27010016, at the upstream end of the basin contributed 26 samples. Two other stations, located at mid-basin and downstream locations contributed four samples each. Six of those eight samples fell in the lowest 10 ranked values. The maximum value of the data from mid-basin and downstream sampling locations had a rank of 22 of 32.
- Upland forest (68%) along with water and wetland (21%) comprise the large majority of basin land uses. Less than 1% of the basin includes agriculture and rangeland, and low density residential land uses account for only 3%. Human-related sources of fecal coliforms are insufficient to cause the levels of pollution found in the samples unless the discharges from those sources occurred immediately in the sampling area and were relatively continuous. If they exist, such conditions are not apparent.

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Page 2 St. Johns County Comments concerning Draft TMDL Report Fecal Coliform TMDL for Pellicer Creek WBID 2580B

   - The basin has a large population of feral pigs, in addition to a wide variety of other mammals such as deer, raccoon, otter, and opossum, as well as avian wildlife that roost along the waterbody. All these species use the river corridor and drainages to the main channel of Pellicer Creek.
   - Agricultural sources at the basin upstream border (such as a horse farm) and immediately outside the basin may contribute indirectly to fecal coliform bacteria measured in the stream. Runoff from domesticated animal populations may provide the basis for growth of coliform populations in ditches that connect to the watercourse. Again, these ditch populations would not represent a human health risk.
- The other possible sources of fecal coliforms within the basin include transportation corridors (4.9% of the basin land area), which include I-95 and US1 roadways as well as and other smaller roads. It seems unlikely that the roadways are direct sources of human or animal wastes at the levels reported. However, the technical literature includes reports of high fecal coliforms generated from roadway runoff swales where the adjacent roadways comprised unlikely human waste sources or significant human health risks. A similar situation may occur in WBID 2580B.
- Other potential sources draining to Pellicer Creek outside the WBID include wastewater package plants, and old septic systems no longer in use but still draining and acting as a source of coliform bacteria.

In summary, the primary sampling station for fecal coliforms within WBID 2580B is inappropriately located to indicate the presence of in-basin pollution sources. Fecal coliform data presented in the draft TMDL are associated with insufficient source investigation to determine whether the source of the coliform bacteria is anthropogenic and manageable in origin, or natural and unmanageable in origin. A first examination suggests that most of the potential sources, if human activity-related, more likely occur outside the basin, or are related to secondary sources (such as roadway ditches) that do not present human health risk. In addition, the river basin and forests of WBID 2580B include abundant wildlife, which presents a possible source of fecal coliform bacteria in addition to upstream (or downstream, due to flow reversals) sources outside the basin. We request that FDEP reconsider and withdraw this TMDL pending further DEP sampling and investigations.

Best Regards,

Andrew Ames, P.E.
Assistant County Engineer

C: Kristina Bridger

September 27, 2012

Andrew J. Ames, P.E.
Assistant County Engineer
St. Johns County Engineering Division
2740 Industry Center Road
St. Augustine, FL 32084

Dear Mr. Ames:

The Department appreciates the time and effort you and your staff put into reviewing these draft TMDLs. Thank you for your insights and help in improving the quality of our TMDL for Pellicer Creek (WBID 2580B). We have made applicable edits to the draft TMDL report 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 (in black), followed by the Department's response to each (in blue), in the order in which they were presented.

Comments

"We have concerns regarding the basis for the draft TMDL and wish to record with FDEP our disagreement with the draft TMDL and request its withdrawal pending further sampling and investigation."

In Florida, EarthJustice sued EPA on April 1998 and settled with a detailed schedule for TMDL development. FDEP was NOT a party to the suit, but participated in some settlement discussions. EPA agreed to a 13 year schedule, mainly based on FDEP's basin management cycle. 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 Florida Watershed Restoration Act (FWRA) (Subsection 403.067[4], Florida Statutes [F.S.]); the state's 303(d) list is amended annually to include basin updates. On the 1998 303(d) Consent Decree List, every listed water was given a specific due date (year) for TMDL development. Pellicer Creek (WBID 2580B) was one of the waterbodies listed on the 1998 303(d) list. Because of the lawsuit, EPA is obligated to complete a Fecal Coliform TMDL for Pellicer Creek (WBID 2580B) by November 30, 2012. EPA has already proposed a Fecal Coliform TMDL for Pellicer Creek (http://www.epa.gov/waters/tmdldocs/7e_final_tmdl_2580b_pellicer_creek_fc.pdf). However, upon review of EPA's proposed TMDL, FDEP intends to submit to EPA a TMDL that is based on local stakeholder input and the best available data. When EPA approves FDEP's Fecal Coliform TMDL for Pellicer Creek, EPA's proposed document will be removed and replaced with FDEP's document.

"Sample data used for the TMDL analysis came primarily from a location at the extreme upstream end of the basin, a location that would reflect runoff from lands within and upstream of WBID 2580B. Furthermore, the contributing WBIDs upstream of this boundary sampling point have no data (WBID 2597 Hulett Branch and WBID 2580C Pellicer Creek – Freshwater Segment). The draft TMDL used 34 fecal coliform values to make the determination that the WBID required a TMDL. Of the 34 sample values collected from three sampling stations in Pellicer Creek, sample location 21FLA27010016, at the upstream end of the basin contributed 26 samples. Two other stations, located at mid-basin and downstream locations contributed 4 samples each. Six of those eight samples fell in the lowest 10 ranked values. The maximum value of the data from mid-basin and downstream sampling locations had a rank of 22 out of 34."

Based on the Florida Watershed Restoration Act, TMDLs must be developed and adopted for each instance of impairment identified on the verified lists. Using the IWR methodology, this waterbody was verified impaired for fecal coliform because more than 10% of the values exceeded the Class II waterbody criterion of 43 counts per 100 milliliters (counts/100mL) for fecal coliform. There were 33 exceedances out of 34 samples. All three sampling locations 21FLA27010016 (upstream), 21FLA27010074 (mid-basin), and 21FLA27010073 (downstream) exceeded the water quality criterion of 43 counts/100mL for the protection of Class II waters. The fecal coliform data at the 2 downstream stations would have listed the waterbody as impaired because there were 7 exceedances out of 8 samples.

Monitoring Station	N	Minimum Concentration (#/100ml)	Maximum Concentration (#/100ml)	Mean Concentration (#/100ml)	Standard Deviation (#/100ml)	# Samples exceeding 43 (counts/100ml)
21FLA 27010016	26	44	1580	338	358	26
21FLA 27010074	4	60	100	78	18	4
21FLA 27010073	4	40	220	116	79	3

Because bacteriological counts in water are not normally distributed, the Hazen method is used to determine the percent reduction needed to meet the applicable water quality criterion of 43 counts/100mL for the protection of Class II waters, which all three sampling locations exceeded. The Hazen method is described in Section 5.1.4 of the draft Fecal Coliform TMDL for Pellicer Creek (WBID 2580B).

The goal of this TMDL is to define the needed reduction of fecal coliform from the watershed so that the fecal coliform concentration in the Pellicer Creek will meet the state water quality criteria. Allocating the needed reduction to specific local sources, especially non-point sources, is beyond the scope of this TMDL. After the adoption of this TMDL, counties and local stakeholders can work with the FDEP to develop a restoration plan to implement the TMDL. Reduction needs can be allocated to specific local sources in the plan. This process should identify sources within the local watershed area as well as influence from upstream segment and allocate needed reduction to local and upstream sources. In addition, if the counties and local stakeholders feel that the existing WBID boundary delineation and/or the station WBID assignment do not reflect the natural hydrology of the creek, revised WBID boundary delineation and station re-assignment can be proposed to the Watershed Assessment Section of the Department so that the impairment listing can be conducted more accurately and efficient. The Department appreciates help from local entities and stakeholders.

"Upland forest (68%) along with water and wetland (21%) comprise the large majority of basin land uses. Less than 1% of the basin includes agriculture and rangeland, and low density residential land uses account for only 3%. Human-related sources of fecal coliforms are insufficient to cause the levels of pollution found in samples unless the discharges from those sources occurred immediately in the sampling area and were relatively continuous. If they exist, such conditions are not apparent."

Local entities are only responsible for reducing the anthropogenic fecal coliform loads. Pellicer Creek (WBID 2580B) routinely has fecal coliform concentrations exceeding the water quality criterion (43 counts/100mL). There were 33 exceedances out of 34 samples, with exceedances at all three sampling locations. Identifying the extent of the anthropogenic fecal coliform loading to Pellicer Creek requires extensive documentation, which according to St. Johns County during the TMDL public workshop is currently not available. In the future, this information can be obtained by performing a Walk the Waterbody excercise during the implementation phase of this TMDL. For more information regarding the Walk the Waterbody process please refer to the following website (http://www.dep.state.fl.us/water/watersheds/docs/fcg_toolkit.pdf). In addition, identifying and quantifying the contribution of fecal coliform from natural sources using various source tracking techniques can also be very helpful. If local entities and stakeholders can quantify the percent contribution of fecal coliform from natural sources, the needed percent reduction to anthropogenic sources can be altered accordingly by subtracting the natural source contribution.

"The basin has a large population of feral pigs, in addition to a wide variety of other mammals such as deer, raccoon, otter, and opossum, as well as avian wildlife that roost along the waterbody. All these species use the river corridor and drainages to the main channel of Pellicer Creek."

This information has been added to the draft Fecal Coliform TMDL for Pellicer Creek (WBID 2580B) document. Please refer to Chapter 4 Section 4.2.2 Land Uses and Nonpoint Sources.

"Agricultural sources at the basin upstream border (such as horse farm) and immediately outside the basin may contribute indirectly to fecal coliform bacteria loads measured in the stream. Runoff from domesticated animal populations may provide the basis for growth of coliform populations in ditches that connect to the watercourse. Again, these ditch populations would not represent a human health risk."

This information has been added to the draft Fecal Coliform TMDL for Pellicer Creek (WBID 2580B) document. This is a potential anthropogenic source of fecal coliform bacteria that could prevent Pellicer Creek (WBID 2580B) from obtaining its Class II designated use of shellfish propagation or harvesting.

"The other possible sources of fecal coliforms within the basin include transportation corridors (4.9% of the basin land area), which include I-95 and US1 roadways as well as and other smaller roads. It seems unlikely that the roadways are direct sources of human or animal wastes at the levels reported. However, the technical literature includes reports of high fecal coliforms generated from roadway runoff swales where the adjacent roadways comprised likely human waste sources or significant human health risks. A similar situation may occur in WBID 2580B."

This information has been added to the draft Fecal Coliform TMDL for Pellicer Creek (WBID 2580B) document. Please refer to Chapter 4 Section 4.2.2 Land Uses and Nonpoint Sources."Other potential sources draining to Pellicer Creek outside the WBID include wastewater package plants, and old septic systems no longer in use but still draining and acting as a source of coliform bacteria."

This information has been added to the draft Fecal Coliform TMDL for Pellicer Creek (WBID 2580B) document.

"Additionally, during our review we noticed that the WBID is labeled as a Class 2 water while shellfish harvesting does not appear to be permitted in the WBID. Please help us understand why this is not considered a Class 3 waterbody for this WBID as its use and function seem to be more appropriate."

Pellicer Creek is identified in 62-302.400(16)(b), FAC as a Class II water in both St. Johns [62-302.400(16)(b)(55), FAC] and Flagler [62-302.400(16)(b)(18), FAC] Counties. It has been in FDEP rules without change since at least the late 1970s.

The Class II waters for Pellicer Creek include:

1. 62-302.400(15)(a) The landward extent of a classification shall coincide with the landward extent of waters of the state, as defined in Rule 62-340.600, FAC. and
2. (15)(b) Water quality classification s shall be interpreted to include associated water bodies such as tidal creeks, coves, bays and bayous.
3. Two other documents show all of Pellicer Creek and at least some of the tributaries as Class II. (A 1979-80 version of the classification rule described all the tributaries to the Matanzas River as Class II waters, and Pellicer Creek would have been included as Class II then; and a 1982 draft atlas [prepared by DER] shows the creek as Class II west to the St. Johns County line).

Changing a surface water classification requires rulemaking. If you are interested in reclassification, please have them contact Janet Klemm. Her contact information is phone: (850) 245-8427 and email Janet.Klemm@dep.state.fl.us.

In closing, we thank you for your interest in water quality issues in your area and look forward to working with you on implementing this and future TMDLs. Katie Hallas is the Basin Management Action Plan (BMAP) Coordinator for the Upper East Coast Basin. She will be able to assist you with the Walk the Waterbody process in order to identify and eliminate fecal pollution within the Pellicer Creek watershed. Her contact information is phone: (850) 245-8432 and e-mail: Katie.Hallas@dep.state.fl.us.

Please contact me at Jan.Mandrup-Poulsen@dep.state.fl.us, if you have any further questions.

Sincerely,

Jan Mandrup-Poulsen, Environmental Administrator
Watershed Evaluation and TMDL Section

The fecal coliform data supplied by the City of Palm Coast was received after the Department's requested deadline of Noon on Friday, August 3, 2012. Refer to email train below. Therefore, this data was NOT included in the Final TMDL Calculation of Fecal Coliform Reduction for Pellicer Creek (WBID 2580B), which is based on the Hazen Method (**Table 1**). An additional analysis was performed to determine how the City of Palm Coast's fecal coliform data for Pellicer Creek (WBID 2580B) would affect the TMDL calculation of fecal coliform reduction for Pellicer Creek (WBID 2580B) if it was supplied prior to the deadline (**Table 2**). The analysis revealed the 90th percentile (670 counts/100mL) and the percent reduction (94%) remains the same.

From: Bridger, Kristina
Sent: Thursday, August 09, 2012 12:08 PM
To: 'Juan Bostwick'
Subject: RE: Fecal Coliform TMDL for Pellicer Creek (WBID 2580B) COPC Data

Table 1 – Final TMDL Calculation of Fecal Coliform Reduction for Pellicer Creek (WBID 2580B) Based on the Hazen Method

Date	Station	Result (counts/100mL)	Rank	Percentile by Hazen Method
7/21/2009	21FLA 27010073	40	1	1%
5/25/2004	21FLA 27010016	44	2	4%
5/18/2005	21FLA 27010016	48	3	7%
4/26/2004	21FLA 27010016	54	4	10%
7/21/2009	21FLA 27010074	60	5	13%
7/20/2005	21FLA 27010016	67	6	16%
4/21/2009	21FLA 27010074	68	7	19%
10/7/2009	21FLA 27010073	72	8	22%
10/7/2009	21FLA 27010074	84	9	25%
1/15/2009	21FLA 27010074	100	10	28%
9/8/2004	21FLA 27010016	120	11	31%
1/15/2009	21FLA 27010016	130	12	34%
1/15/2009	21FLA 27010073	130	12	34%
11/16/2005	21FLA 27010016	133	14	40%
4/21/2009	21FLA 27010016	138	15	43%
2/14/2005	21FLA 27010016	160	16	46%
7/13/2004	21FLA 27010016	165	17	49%
7/21/2009	21FLA 27010016	170	18	51%
3/14/2005	21FLA 27010016	180	19	54%
12/6/2005	21FLA 27010016	187	20	57%
1/19/2005	21FLA 27010016	192	21	60%
4/21/2009	21FLA 27010073	220	22	63%
10/7/2009	21FLA 27010016	240	23	66%
11/8/2004	21FLA 27010016	260	24	69%
4/13/2005	21FLA 27010016	270	25	72%
9/19/2005	21FLA 27010016	370	26	75%
6/20/2005	21FLA 27010016	400	27	78%
10/12/2005	21FLA 27010016	405	28	81%

Date	Station	Result (counts/100mL)	Rank	Percentile by Hazen Method
3/28/2005	21FLA 27010016	413	29	84%
6/21/2004	21FLA 27010016	472	30	87%
3/31/2004	21FLA 27010016	670	31	90%
8/4/2004	21FLA 27010016	760	32	93%
9/7/2005	21FLA 27010016	1150	33	96%
8/10/2005	21FLA 27010016	1580	34	99%
			90th Percentile	**670**
			Allowable Concentration (counts/100mL)	**43**
			Percent Reduction to meet TMDL Target	**94 Percent**

Table 2 – Additional Analysis to Determine How the City of Palm Coast's Fecal Coliform Data for Pellicer Creek (WBID 2580B) Would Affect the TMDL Calculation of Fecal Colliform Reduction for Pellicer Creek (WBID 2580B) if it was Supplied Prior to the Deadline

Date	Station	Rank	Result (counts/100mL)	Percentile
2/14/2005	City of Palm Coast	1	1	1%
7/21/2009	21FLA 27010073	2	40	3%
5/25/2004	21FLA 27010016	3	44	5%
5/18/2005	21FLA 27010016	4	48	7%
7/15/2008	City of Palm Coast	5	50	10%
4/26/2004	21FLA 27010016	6	54	12%
7/21/2009	21FLA 27010074	7	60	14%
7/20/2005	21FLA 27010016	8	67	16%
4/21/2009	21FLA 27010074	9	68	18%
10/7/2009	21FLA 27010073	10	72	20%
10/7/2009	21FLA 27010074	11	84	22%
1/15/2009	21FLA 27010074	12	100	24%
8/10/2009	City of Palm Coast	13	110	27%
9/8/2004	21FLA 27010016	14	120	29%
1/15/2009	21FLA 27010016	15	130	31%
1/15/2009	21FLA 27010073	16	130	33%
7/11/2005	City of Palm Coast	17	130	35%
11/16/2005	21FLA 27010016	18	133	37%
4/21/2009	21FLA 27010016	19	138	39%
2/14/2005	21FLA 27010016	20	160	41%
2/10/2009	City of Palm Coast	21	160	44%
7/13/2004	21FLA 27010016	22	165	46%

Date	Station	Rank	Result (counts/100mL)	Percentile
7/21/2009	21FLA 27010016	23	170	48%
3/14/2005	21FLA 27010016	24	180	50%
1/10/2006	City of Palm Coast	25	180	52%
12/6/2005	21FLA 27010016	26	187	54%
1/19/2005	21FLA 27010016	27	192	56%
4/21/2009	21FLA 27010073	28	220	59%
8/15/2011	City of Palm Coast	29	220	61%
10/7/2009	21FLA 27010016	30	240	63%
11/8/2004	21FLA 27010016	31	260	65%
4/13/2005	21FLA 27010016	32	270	67%
1/8/2007	City of Palm Coast	33	280	69%
8/10/2006	City of Palm Coast	34	360	71%
9/19/2005	21FLA 27010016	35	370	73%
6/20/2005	21FLA 27010016	36	400	76%
10/12/2005	21FLA 27010016	37	405	78%
3/28/2005	21FLA 27010016	38	413	80%
6/21/2004	21FLA 27010016	39	472	82%
8/9/2004	City of Palm Coast	40	500	84%
8/13/2007	City of Palm Coast	41	590	86%
1/14/2008	City of Palm Coast	42	600	88%
3/31/2004	21FLA 27010016	43	670	90%
8/4/2004	21FLA 27010016	44	760	93%
1/12/2004	City of Palm Coast	45	770	95%
9/7/2005	21FLA 27010016	46	1150	97%
8/10/2005	21FLA 27010016	47	1580	99%
Existing Condition Concentration 90th Percentile (counts/100mL)				670
Allowable Concentration (counts/100mL)				43
Final % reduction				94

FYI – The percent reduction remains the same. Please call if you have any questions.

Cheers,
Kristina Bridger
Environmental Specialist III
Watershed Evaluation and TMDL Section, FDEP
2600 Blair Stone Rd. MS #3555
Tallahassee, FL 32399

(850) 245-8023

From: Juan Bostwick [mailto:JBostwick@palmcoastgov.com]
Sent: Monday, August 06, 2012 4:13 PM
To: Bridger, Kristina
Cc: Denise Bevan
Subject: Fecal Coliform TMDL for Pellicer Creek (WBID 2580B) COPC Data
Importance: High

Good Day Kristina,

Here is the spreadsheet I promised you this morning.
Once again I do apologize for the delay as I was out of the office most of last week.
Please give me a call if you wish to discuss.

Thanks,

Juan E. Bostwick, P.E.
City Stormwater Engineer
City of Palm Coast
160 Cypress Point Pkway, Suite B-106
Palm Coast, FL 32164
Tel: 386-986-4771
Mobile: 386-931-1465
www.palmcoastgov.com

From: Bridger, Kristina
Sent: Friday, August 03, 2012 12:02 PM
To: 'jbostwick@ci.palm-coast.fl.us'; Juan Bostwick
Subject: Fecal Coliform TMDL for Pellicer Creek (WBID 2580B)

As per our conversation on Thursday, July 26, 2012...

In a separate effort from uploading the City of Palm Coast water quality data into Florida STORET, I requested from the City of Palm Coast (Juan Bostwick) to provide me with a spreadsheet containing only their fecal coliform data by Noon on Friday, August 3, 2012. An email was sent out on Thursday, August 2 and a phone call was made on the morning of Friday, August 3, 2012. Because I have not received any correspondence from the City of Palm Coast and FDEP to obligated to meet EPA's Consent Decree deadline, FDEP is moving forward with Rule Adoption for the Fecal Coliform TMDL for Pellicer Creek (WBID 2580B).

If you have any questions please call me at (850) 245-8023.

Cheers,
Kristina Bridger
Environmental Specialist III
Watershed Evaluation and TMDL Section, FDEP
2600 Blair Stone Rd. MS #3555
Tallahassee, FL 32399
(850) 245-8023

From: Bridger, Kristina
Sent: Thursday, August 02, 2012 3:57 PM
To: 'jbostwick@ci.palm-coast.fl.us'
Subject:

What is the progress on the fecal coliform data for Pellicer Creek? Upper management wants to move forward asap.

Cheers,
Kristina Bridger
Environmental Specialist III
Watershed Evaluation and TMDL Section, FDEP
2600 Blair Stone Rd. MS #3555
Tallahassee, FL 32399
(850) 245-8023

From: Juan Bostwick [mailto:JBostwick@palmcoastgov.com]
Sent: Wednesday, July 25, 2012 3:11 PM
To: Mandrup-Poulsen, Jan
Cc: Bridger, Kristina; Denise Bevan; Brian Matthews; John Moden
Subject: Formal Comments For the Public Workshop on a Draft TMDL for the Upper East Coast Basin

Good Day Mr. Mandrup-Poulsen,

The City of Palm Coast attended the Public Workshop on a Draft TMDL for the Upper East Coast Basin held last week Wednesday in your Northeast District Office in Jacksonville, FL.
After watching the presentation on the Fecal Coliform TMDL for Pellicer Creek (WBID 2580B), the City of Palm Coast would like to offer a formal comment.
The City of Palm Coast would like to be afforded the opportunity to present the FDEP with our water quality test results from our Hulett Branch and Pellicer Creek locations.
We believe the use of this data will assist FDEP in redefining the boundary lines for the proposed WBID 2580B.

As of July 20, 2012 Kristina Bridger has made the STORET Coordinator, Vilma Quant aware of the need to upload our data.
As of July 20, 2012 Vlima Quant has made the City of Palm Coast aware that the Siteria Gregory is the coordinator for our area and that she is on vacation and will return at the end of this week.

Regards,

Juan E. Bostwick, P.E.

City Stormwater Engineer
City of Palm Coast
160 Cypress Point Pkway, Suite B-106
Palm Coast, FL 32164
Tel: 386-986-4771
Mobile: 386-931-1465
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PLEASE NOTE: Florida has a very broad public records law. Most written communications to or from City of Palm Coast officials and employees regarding public business are public records available to the public and media upon request. Your e-mail communications may be subject to public disclosure.

From: Juan Bostwick [mailto:JBostwick@palmcoastgov.com]
Sent: Wednesday, July 25, 2012 2:55 PM
To: Bridger, Kristina
Cc: Denise Bevan
Subject: Formal Comments
Importance: High

Hello Kristina,

We met last week at the Public Workshop on a Draft TMDL for the Upper East Coast Basin.
I have tried to call you for the last two days and finally spoke with someone who told me that your offices are moving and your phones may be down.
Sorry if that is the case.
Can you please give me call a.s.a.p., so I can discuss the formal comments.

Thanks,

Juan E. Bostwick, P.E.
City Stormwater Engineer
City of Palm Coast
160 Cypress Point Pkway, Suite B-106
Palm Coast, FL 32164
Tel: 386-986-4771
Mobile: 386-931-1465
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PLEASE NOTE: Florida has a very broad public records law. Most written communications to or from City of Palm Coast officials and employees regarding public business are public records available to the public and media upon request. Your e-mail communications may be subject to public disclosure.

Florida Department of Environmental Protection
Division of Environmental Assessment and Restoration
Bureau of Watershed Restoration
2600 Blair Stone Road
Tallahassee, FL 32399-2400