FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Environmental Assessment and Restoration, Bureau of Watershed Restoration

SOUTHEAST DISTRICT • SOUTHEAST COAST–BISCAYNE BAY BASINS

FINAL TMDL Report

Fecal Coliform TMDLs for C-8 (Biscayne) Canal (WBID 3285), C-7 (Little River) Canal (WBID 3287), C-6 (Miami River) Canal (WBID 3288), C-6 (Miami River) Lower Segment (WBID 3288B), and C-6 (Miami) Canal (WBID 3290)

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May 16, 2012

Acknowledgments

This Total Maximum Daily Load (TMDL) analysis could not have been accomplished without significant contributions from staff in the Miami–Dade County Department of Environmental Resources Management, Miami–Dade Water and Sewer Department, and Florida Department of Environmental Protection's (Department) Southeast District Office, Watershed Assessment Section, and Watershed Evaluation and TMDL Section. Map production assistance was provided by Jason Griffin, Environmental Specialist in the Watershed Data Services Section with the Department's Division of Environmental Assessment and Restoration.

Editorial assistance was provided by Jan Mandrup-Poulsen and Linda Lord.

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Chapter 1: INTRODUCTION

1.1 Purpose of Report

This report presents the Total Maximum Daily Loads (TMDLs) for fecal coliform bacteria for the C-8 (Biscayne) Canal, C-7 (Little River) Canal, C-6 (Miami River) Canal, C-6 (Miami River) Lower Segment, and C-6 (Miami) Canal, located in the Southeast Coast–Biscayne Bay Basins. These systems were verified as impaired for fecal coliform, and therefore were included on the Verified List of impaired waters for the Southeast Coast–Biscayne Bay Basins that was adopted by Secretarial Order in May 2006. The impairments in these WBIDs were verified by the Florida Department of Environmental Protection (Department) during the Cycle 2 assessment period (January 1, 2003–June 30, 2010). The TMDLs establish the allowable fecal coliform loadings to these water segments that would restore the waterbodies so that they meet the applicable water quality criterion for fecal coliform.

1.2 Identification of Waterbody

For assessment purposes, the Department has divided the Southeast Coast–Biscayne Bay Basins into water assessment polygons with a unique **w**ater**b**ody **id**entification (WBID) number for each watershed or stream reach. **Table 1.1** lists the WBID numbers for the waterbodies addressed in this report.

Table 1.1. WBID Numbers for Waterbodies Included in this TMDL Report

This is a two-column table. Column 1 lists the WBID number, and Column 2 lists the waterbody segment.

WBID	Waterbody Segment
3285	C-8 (Biscayne) Canal
3287	C-7 (Little River) Canal
3288	C-6 (Miami River) Canal
3288B	C-6 (Miami River) Lower Segment
3290	C-6 (Miami) Canal

These waterbodies comprise 5 of the 23 waterbody segments in the North Dade County Planning Unit within the Southeast Coast–Biscayne Bay Basins. WBIDs 3285, 3287, and 3288 are 3 of 19 waterbody segments in the Southeast Coast–Biscayne Bay Basins included on the initial 1998 303(d) list submitted by the Department to the U.S. Environmental Protection Agency (EPA). The initial 1998 303(d) list was incorporated into a 1999 Consent Decree between the EPA and Earthjustice.

The initial list used data from stations listed in the Department's 1996 305(b) report. The report used the best available information to generally characterize the quality of Florida's waters. Some of the delineations of waterbody areas and locations of sampling stations for the 1998 303(d) list were inaccurate due to metadata limitations at that time.

With the primary goal of providing more accurate assessments, the Department has revised the delineations over time. The EPA has labeled the redrawing of WBID boundaries "resegmentation," as the original stations corresponded to specific WBID areas or segments.

Resegmented WBIDs are those WBIDs that have been altered from the initial 1998 303(d) Consent Decree or previous cycle boundaries.

As a result of the resegmentation process for the Group 4 basins, there are currently 37 Consent Decree waterbody segments in the Southeast Coast–Biscayne Bay Basins, including WBIDs 3288B and 3290. This number is based on Impaired Surface Waters Rule (IWR) Run 41x.

The WBIDs addressed by the TMDLs are located within Miami–Dade County (**Figures 1.1** and **1.2**), which contains an extensive water management system of canals. As a result, hydrology within the county is highly manipulated by a series of water control structures, pumps, and levees that have altered the natural hydroperiods and flows within these watersheds (U.S. Geological Survey [USGS] 1999) and have effectively manageed water in the region, allowing for the current urban development and agricultural landscape (South Florida Water Management District [SFWMD] 2010).

The primary drainage system in Miami–Dade County, managed by the SFWMD, includes 17 primary canals and their watersheds, which serve as the water management or stormwater management system for the county: C-1 (Black Creek) Canal, C-2 (Snapper Creek) Canal, C-3 (Coral Gables) Canal, C-4 (Tamiami) Canal, C-5 (Comfort) Canal, C-6 (Miami) Canal, C-7 (Little River) Canal, C-8 (Biscayne) Canal, C-9 (Snake Creek) Canal, C-100 Canal, C-102 Canal, C-103 Canal, C-111 Canal, North Canal, Florida City Canal, Model Land, and Homestead Air Force Base (**Figure 1.3**).

These canals were built to meet population needs by controlling water levels and movement for water supply, flood control, drainage, and navigation, in addition to providing water necessary to maintain natural communities in lakes, wetlands, rivers, and estuaries (SFWMD 2010a). Water levels are managed to maintain ground water control during dry periods, which is particularly important in meeting water supply needs by preventing saltwater intrusion. During dry periods, stored water can be delivered throughout the county to help meet local urban and agricultural needs and prevent saltwater intrusion. During wet periods, the canals remove excess water from the watersheds to prevent flooding.

Within urban areas, the canals are used primarily for flood control. However, secondary uses include the drainage of land for development, wellfield recharge for local municipalities, and the discharge of excess water to and from the Water Conservation Areas (WCAs) of the Everglades (Cooper and Lane 1987), with primary canals functioning as an outlet for excess water from the Everglades and Lake Okeechobee during wet periods.

All canal segments contain either a water control structure within them or are directly influenced by the operation of an upstream or downstream control structure (SFWMD 2010a) (**Figure 1.3**). Structures regulate the flow and level of water in these canals. Coastal structures also prevent saltwater from a tidal or storm surge from entering canals that discharge to tide.

Canals are notably different from most natural waterbodies. As a result of their design, management, and maintenance, these systems provide limited support for aquatic life. In addition, water levels and flow can have extreme fluctuations depending on operational needs. While canals are designed to move high flows at high velocities, during periods of drought and dry season operations, they may be stagnant for extended periods, and some may contain little or no water (SFWMD 2010a).

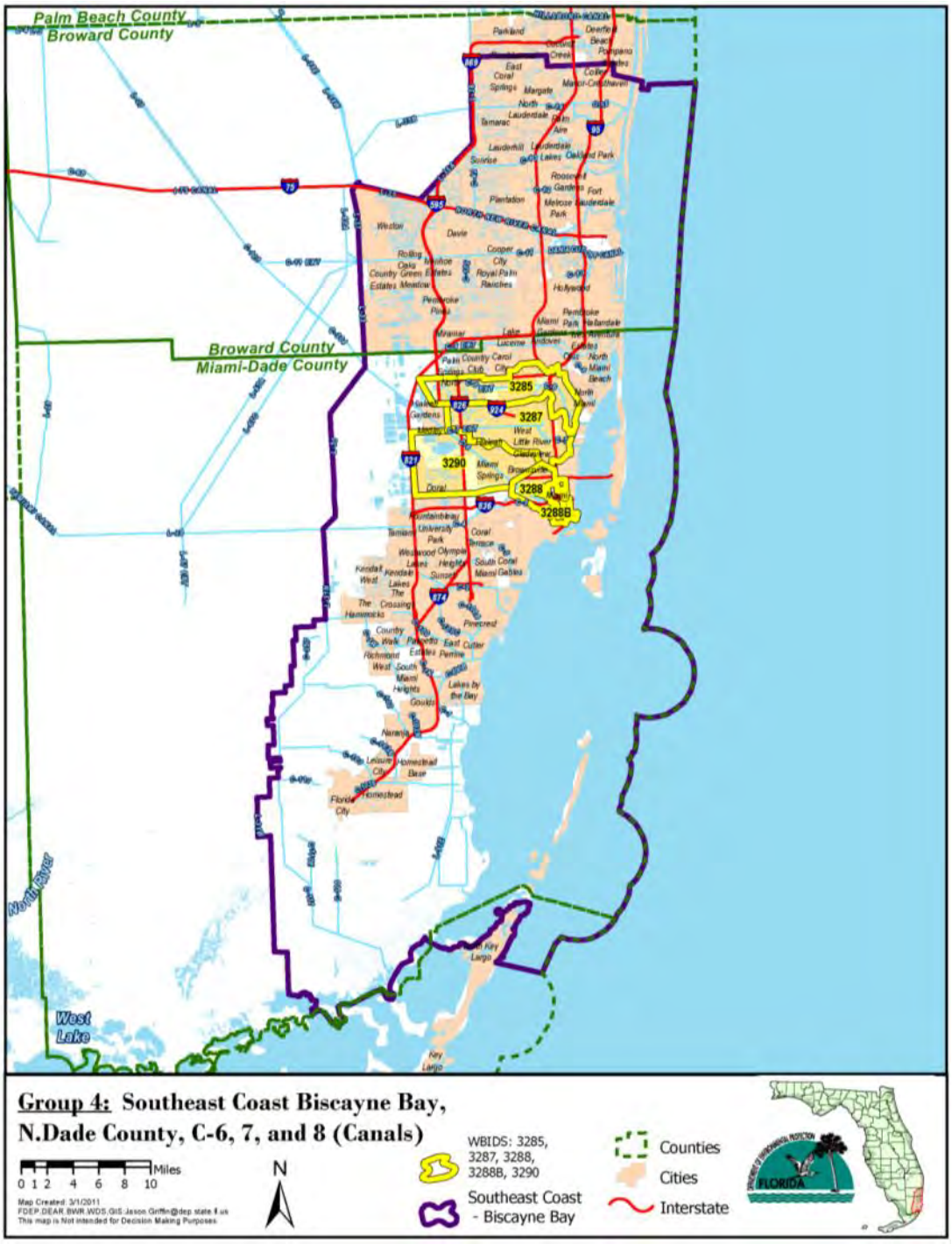

Figure 1.1. Location of WBIDs 3285, 3287, 3288, 3288B, and 3290 in the Southeast Coast–Biscayne Bay Basins and Major Hydrologic and Geopolitical Features in the Area

Figure 1.2. Location of WBIDs 3285, 3287, 3288, 3288B, and 3290 in Miami–Dade County and Major Hydrologic and Geopolitical Features in the Area

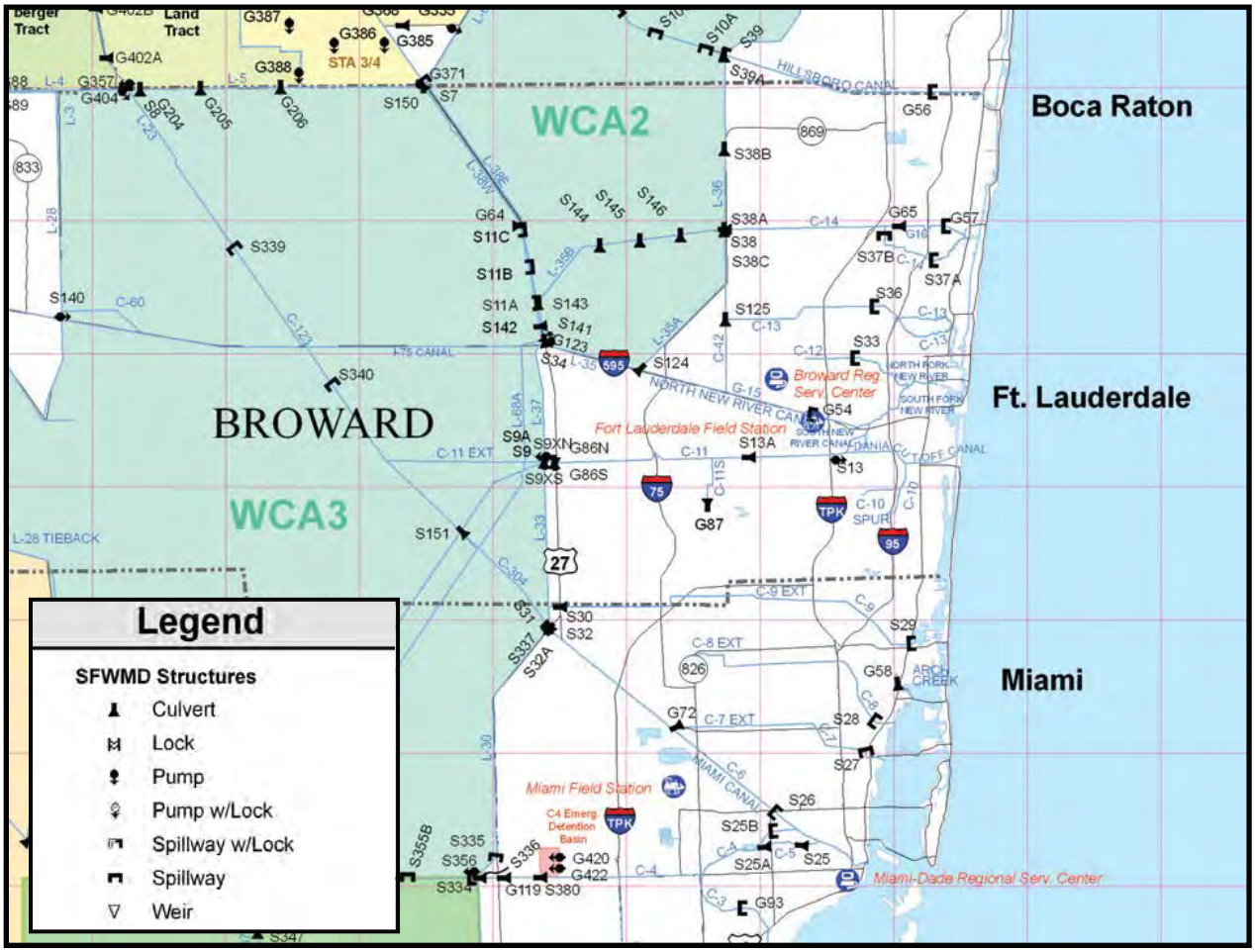

Figure 1.3. Location of Canals, WCAs, and Water Control Structures in Miami–Dade County (SFWMD 2010a)

The C-8 (Biscayne) Canal (WBID 3285) is located in northeastern Miami–Dade County. The canal was designed for two purposes: providing flood protection and drainage for the C-8 watershed, and maintaining an adequate ground water table elevation to prevent saltwater intrusion into local ground water (Cooper and Lane 1987). The C-8 originates in the east borrow of the Palmetto Expressway at the northwest corner of the Miami Lakes subdivision. Flow in the canal is to the east with discharge via the S-28 water control structure to Biscayne Bay. The S-28 controls stages in the C-8 and regulates discharges to tidewater (**Figures 1.2** and **1.3**).

The C-7 (Little River) Canal (WBID 3287) is located in northeastern Miami–Dade County. The canal was designed with two purposes: providing flood protection and drainage for the C-7 watershed, and maintaining an adequate ground water table elevation to prevent saltwater intrusion into local ground water (Cooper and Lane 1987). During periods of low natural flow, the C-6 Canal supplies water to the C-7 watershed (Cooper and Lane 1987). The C-7 flows to the east, with a discharge via the S-27 water control structure to Biscayne Bay. The S-27 controls stages in the C-7 and regulates discharges to tidewater. The G-72 water control structure, which is normally closed, acts as a divide between the C-7 and the C-6. When water

in the C-7 is below the optimum level, G-72 can be opened to supply water from the C-6 to the C-7 watershed (Cooper and Lane 1987) (**Figures 1.2** and **1.3**).

The C-6 (Miami) Canal (WBIDs 3288, 3288B, and 3290) is located in eastern Miami–Dade County. The canal was designed for four purposes: providing flood protection and drainage for the C-6 watershed; supplying water to the C-6, C-7, and C-9 watersheds for irrigation and municipal water supply; maintaining an adequate ground water table elevation to prevent saltwater intrusion into local ground water; and receiving flows from the C-5 and C-4 Canals and transporting these discharges to Biscayne Bay (Cooper and Lane 1987). The C-6 originates at Lake Okeechobee and passes through the Everglades Agricultural Area and the WCA. The C-6 discharges excess water from the WCA to tidewater. The canal begins at the S-31 water control structure at the intersection of the L-30 and L-33 borrow canal. Normal flows are from the C-6 to the borrow canal. Flow in the C-6 is to the southeast, with discharge via the S-26 water control structure to Biscayne Bay (**Figures 1.2** and **1.3**).

Table 1.2 lists the area, in square miles and acres, within each WBID boundary; land use in the the WBIDs is predominantly medium- and high-density residential. Additional information about the hydrology and geology of the area is available in the report *Canals in South Florida: A technical support document* (SWFWMD 2010a).

WBIDs 3285, 3287, 3288, 3288B, and 3290 are located in the Atlantic Coastal Ridge, Sandy Flatlands, and Everglades physiographic regions. In Miami–Dade County, the ridge is composed of mainly of limestone (Schroeder *et al.* 1956). The sandy flatlands lie between the Atlantic Coastal Ridge and the Everglades on the east coast and are characterized by very low topographic relief; this area was poorly drained prior to development (Schroeder *et al.* 1956). The Everglades, a topographically flat area characterized by organic soils, is located west of the ridge and is dedicated primarily to agriculture and conservation areas (Schroeder *et al.*1956).

This part of southeastern Florida is underlain by the Biscayne aquifer, an unconfined and shallow part of the surficial aquifer system that consists of highly permeable limestone and less permeable sandstone and sand (Fish and Stewart 1991). The aquifer supplies large quantities of water for municipal, industrial, and irrigational use in Miami–Dade County. The Biscayne aquifer is particularly susceptible to contamination because it is unconfined, highly permeable, and shallow, and because it is located near the surface in highly urbanized areas (Whitman 1997). Potential sources of contamination include saltwater encroachment and infiltration of contaminants carried in canal water, direct infiltration of contaminants (chemicals or pesticides applied to or spilled on the land, fertilizer carried in surface runoff), landfills, septic tanks, sewage plant treatment ponds, and wells used to dispose of stormwater runoff or industrial waste (Miller 1990).

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, Section 403.067, 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 WBIDs 3285, 3287, 3288, 3288B, and 3290. These activities will depend heavily on the active participation of the SFWMD, 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.

Table 1.2. Area within Each WBID Boundary in Square Miles and Acres

This is a four-column table. Column 1 lists the WBID number, Column 2 lists the waterbody name parameter, Column 3 lists the WBID area in square miles, and Column 4 lists the WBID area in acres.

WBID	Waterbody	WBID Area (square miles)	WBID Area (acres)
3285	C-8 (Biscayne) Canal	27.9	17,838
3287	C-7 (Little River) Canal	32.0	20,495
3288	C-6 (Miami River) Canal	8.6	5,534
3288B	C-6 (Miami River) Lower Segment	2.3	1,461
3290	C-6 (Miami) Canal	36.7	23,459

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 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 identified 19 impaired waterbodies in the Southeast Coast–Biscayne Bay Basins on its initial 1998 303(d) list. As a result of the resegmentation process for the Group 4 basins, there are currently 37 Consent Decree waterbody segments in the Southeast Coast–Biscayne Bay Basins (see **Section 1.2**). 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 WBIDs 3285, 3287, 3288, 3288B, and 3290, and has verified that these waterbody segments are impaired for fecal coliform bacteria. The verified impairment was based on the observation that, with a 90% confidence limit based on binomial distribution, more than 10% of the values exceeded the assessment threshold of 400 counts per 100 milliliters (counts/100mL) (see **Section 3.2** for details) in all these WBIDs.

WBIDs 3285, 3287, 3288, 3288B, and 3290 were verified as impaired during the Cycle 1 verified period (January 1, 1998–June 30, 2005). These impairments were confirmed in the Cycle 2 assessment verified period (January 1, 2003–June 30, 2010).

Tables 2.1a and **2.1b** summarize the fecal coliform monitoring results used for verifying impairment for the Cycle 1 and Cycle 2 assessments, respectively. The Cycle 2 assessment results are based on IWR Run 41x. As they better represent the current conditions, only the results for the Cycle 2 verified period were used in the TMDL development process.

Table 2.1a. Summary of Fecal Coliform Monitoring Data for WBIDs 3285, 3287, 3288, 3288B, and 3290 During the Cycle 1 Verified Period (January 1, 1998–June 30, 2005)

This is a six-column table. Column 1 lists the parameter, and Columns 2 through 6 list corresponding Cycle 1 results for each WBID.

- = Empty cell/no data

Parameter	WBID 3285	WBID 3287	WBID 3288	WBID 3288B	WBID 3290
Total number of samples	255	148	434	26	149
IWR-required number of exceedances for the Verified List	33	21	52	6	21
Number of observed exceedances	105	45	202	16	33
Number of observed nonexceedances	150	103	232	10	116
Number of seasons during which samples were collected	4	4	4	4	4

Table 2.1b. Summary of Fecal Coliform Monitoring Data (based on IWR Run 41x) for WBIDs 3285, 3287, 3288, 3288B, and 3290 During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

This is a six-column table. Column 1 lists the parameter, and Columns 2 through 6 list the corresponding Cycle 2 results for each WBID.

Parameter	WBID 3285	WBID 3287	WBID 3288	WBID 3288B	WBID 3290
Total number of samples	159	313	378	226	154
IWR-required number of exceedances for the Verified List	22	39	46	29	21
Number of observed exceedances	30	125	127	87	27
Number of observed nonexceedances	129	188	251	139	127
Number of seasons during which samples were collected	4	4	4	4	4
Highest observation (counts/100mL)	13,000	10,000	78,000	27,000	8,000
Lowest observation (counts/100mL)	10	10	10	2	10
Median observation (counts/100mL)	130	300	263	310	138
Mean observation (counts/100mL)	458	640	750	783	353

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)**

All WBIDs addressed in this report are Class III waterbodies, with a designated use of recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife. WBIDs 3288 and 3288B are Class III marine waterbodies, and WBIDs 3285, 3287, and 3290 are Class III freshwater waterbodies. The criterion applicable to these TMDLs is the Class III waters (marine and freshwater) 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 III waters (marine and freshwater), 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 monthly average of 200, nor exceed 400 in 10 percent of the samples, nor exceed 800 on any one day.*

The criterion states that monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30-day period. There were insufficient data (fewer than 10 samples in a given month) available to evaluate the geometric mean criterion for fecal coliform bacteria. Therefore, the criterion selected for these TMDLs was not to exceed 400 counts/100mL for fecal coliform.

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 Boundaries of WBIDs 3285, 3287, 3288, 3288B, and 3290

4.2.1 Point Sources

Wastewater Point Sources

Table 4.1 lists the six NPDES-permitted facilities located in each WBID addressed in this report. All of them are concrete batch plants and are therefore unlikely to contribute to observed levels of fecal coliform bacteria.

Table 4.1. Wastewater Point Sources: NPDES-Permitted Facilities by WBID

This is a four-column table. Column 1 lists the WBID number, Column 2 lists the facility permit number, Column 3 lists the facility name, and Column 4 lists the type of facility.

WBID	Permit	Facility Name	Type of Facility
3285	FLG110552	Central Concrete Supermix - Opa Locka	Concrete Batch General Permit (GP)
3285	FLG110537	Tarmac America - N Miami Plant	Concrete Batch General Permit (GP)
3288	FLG110208	Tarmac America - Buena Vista Plant	Concrete Batch General Permit (GP)
3288	FLG110156	Central Concrete Supermix - Miami Springs	Concrete Batch General Permit (GP)
3288	FLG110781	Tarmac America - Miami Intermodal Center	Concrete Batch General Permit (GP)
3290	FLG110614	Quickcrete Ready Mix	Concrete Batch General Permit (GP)

Municipal Separate Storm Sewer System Permittees

Table 4.2 lists all NPDES municipal separate storm sewer system (MS4) permits covering WBIDs 3285, 3287, 3288, 3288B, and 3290. In addition, the table lists whether the permit includes joint participation with the Florida Department of Transportation (FDOT) within the WBID. See **Appendix B** for a list and maps of municipalities/permittees within each WBID boundary.

Table 4.2. MS4 Permittees by WBID

This is a four-column table. Column 1 lists the WBID number, Column 2 lists the permit number, Column 3 lists the permit name, and Column 4 lists whether the permit includes joint participation with FDOT.

- = Empty cell/no data
[1] Y = FDOT is a co-permittee.

WBID	Permit ID	Permit Name	FDOT[1]
3285	FLS000003	Miami-Dade County and Co-permittees	Y
3285	FLS000023	City of Hialeah	-
3285	FLR04E098	Village of Biscayne Park	-
3287	FLS000003	Miami-Dade County and Co-permittees	Y
3287	FLS000023	City of Hialeah	-
3287	FLS000002	City of Miami	-
3288	FLS000003	Miami-Dade County and Co-permittees	Y
3288	FLS000023	City of Hialeah	-
3288	FLS000002	City of Miami	-
3288B	FLS000002	City of Miami	-
3290	FLS000003	Miami-Dade County and Co-permittees	Y
3290	FLS000023	City of Hialeah	-
3290	FLR04E093	Village of Virginia Gardens	-
3290	FLS000002	City of Miami	-

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.

In addition to the sources associated with anthropogenic activities, birds and other wildlife can also act as fecal coliform contributors to 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 SFWMD's 2004–05 land use coverage contained in the Department's geographic information system (GIS) library. Land use categories within the boundaries for WBIDs 3285, 3287, 3288, 3288B, and 3290 were aggregated using the Florida Land Use Code and Classification System (FLUCCS) expanded Level 1 codes (including low-, medium-, and high-density residential) and tabulated in **Table 4.3**. The table also shows the total area within each WBID. **Figure 4.1** shows the spatial distribution of the principal land uses within the WBID boundary.

Within all WBID boundaries, the dominant land use categories are residential (low-, medium- and high-density) and urban built-up (commercial and services, industrial, institutional, and recreational). These land uses account for approximately 71% to 92% of the total acreage for each WBID. Low-impact land uses, including rangeland, upland forest, water, wetlands, and barren lands, make up 2% to 16% of the total area in each WBID. Agricultural lands are negligible, accounting from 0% to less than 1% of the total area of each WBID.

Urban Development

Given that the dominant land use categories contributing to nonpoint source pollution are urban land areas—urban and built-up (commercial and services); medium- and high-density residential—possible sources for fecal coliform loadings can include failed septic tanks, sewer line leakage, and pet feces. A preliminary quantification of the fecal coliform loadings from these sources was conducted to demonstrate the relative contributions. **Appendix C** provides detailed load estimates and describes the methods used for the quantification. It should be noted that the information included in **Appendix C** was only used to demonstrate possible relative contributions from different sources. These loading estimates were not used in establishing the final TMDLs.

Wildlife and Sediments

Wildlife and sediments could also contribute to fecal coliform exceedances in each watershed. Animals such as iguanas, birds, and raccoons have direct access to the waterbody and can deposit their feces directly into the water. Wildlife also deposit coliform bacteria with their feces onto land surfaces, where they can be transported during storm events to nearby streams. 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; Solo-Gabriele *et al.* 2002).

Current source identification methodologies cannot quantify the exact amount of fecal coliform loading from wildlife and/or sediment sources.

Table 4.3. Classification of Land Use Categories for WBIDs 3285, 3287, 3288, 3288B, and 3290

This is a 12-column table. Column 1 lists the Level 1 land use code, Column 2 lists the land use description, and Columns 3 through 12 list the acreage and percent acreage, respectively, of each land use in each WBID.

- = Empty cell/no data

Level 1 Code	Land Use	WBID 3285 Acreage	WBID 3285 % Acreage	WBID 3287 Acreage	WBID 3287 % Acreage	WBID 3288 Acreage	WBID 3288 % Acreage	WBID 3288B Acreage	WBID 3288B % Acreage	WBID 3290 Acreage	WBID 3290 % Acreage
1000	Urban and built-up	4,899	27.5%	6,180	30.2%	2,041	36.9%	582	39.9%	10,067	42.9%
-	Low-density residential	765	4.3%	114	0.6%	0	0.0%	0	0.0%	20	0.1%
-	Medium-density residential	6,709	37.6%	9,930	48.5%	1,290	23.3%	85	5.8%	3,850	16.4%
-	High-density residential	1,282	7.2%	2,337	11.4%	1,760	31.8%	574	39.3%	2,734	11.7%
2000	Agriculture	116	0.7%	0	0.0%	0	0.0%	0	0.0%	138	0.6%
3000	Rangeland	127	0.7%	30	0.1%	0	0.0%	0	0.0%	87	0.4%
4000	Upland forest	131	0.7%	155	0.8%	4	0.1%	0	0.0%	207	0.9%
5000	Water	1,054	5.9%	876	4.3%	126	2.3%	108	7.4%	2,175	9.3%
6000	Wetland	181	1.0%	8	0.0%	0	0.0%	0	0.0%	1,075	4.6%
7000	Barren land	0	0.0%	0	0.0%	0	0.0%	0	0.0%	102	0.4%
8000	Transportation, communication, and utilities	2,575	14.4%	864	4.2%	311	5.6%	110	7.6%	3004	12.8%
-	**Total**	**17,838**	**100.0%**	**20,495**	**100.0%**	**5,534**	**100.0%**	**1,461**	**100.0%**	**23,459**	**100.0%**

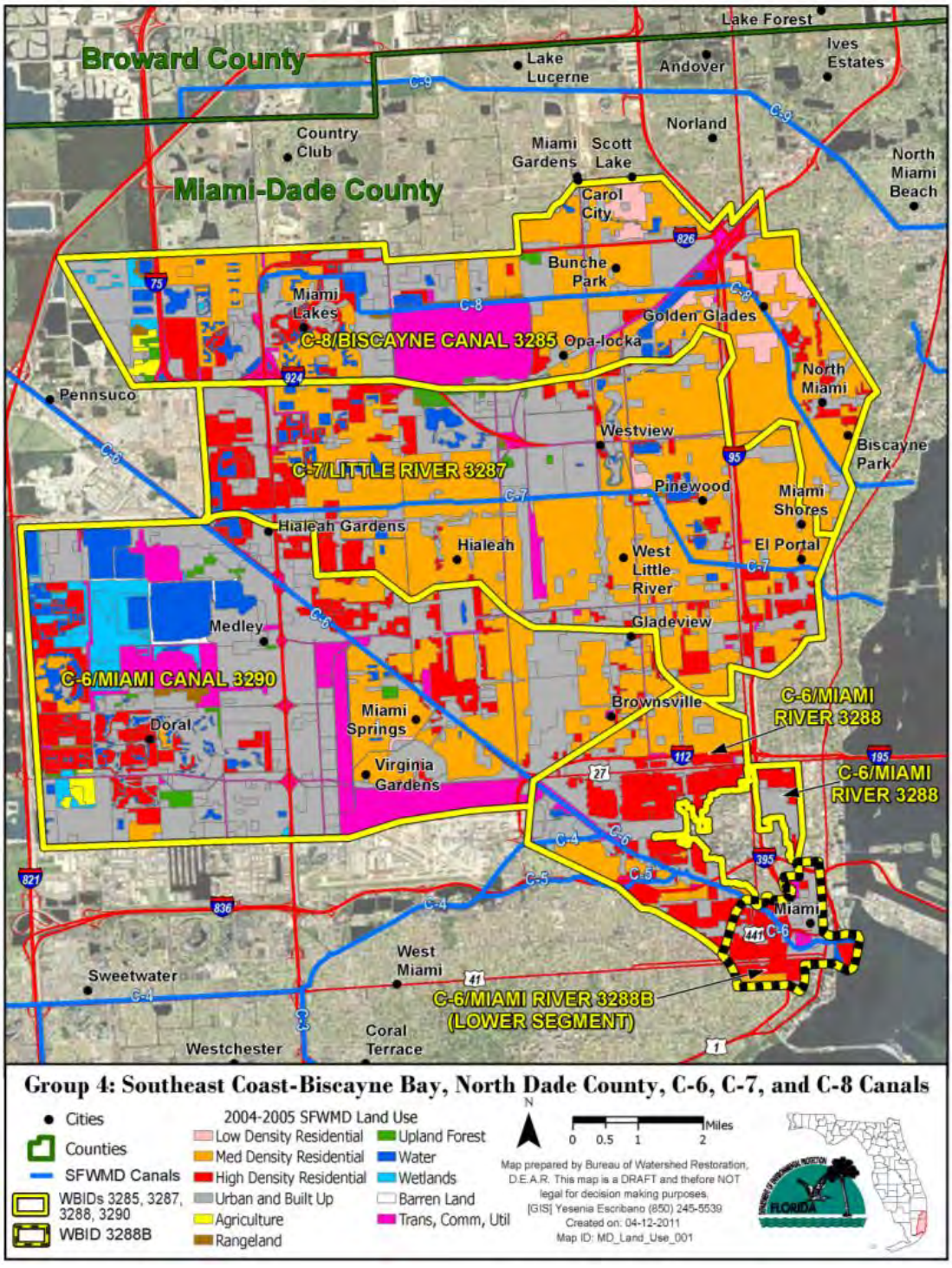

Figure 4.1. Principal Land Uses within the Boundaries of WBIDs 3285, 3287, 3288, 3288B, and 3290 in 2004–05

Chapter 5: DETERMINATION OF ASSIMILATIVE CAPACITY

5.1 Determination of Loading Capacity

When continuous flow measurements in a watershed are available, a bacteria TMDL can be developed using the load duration curve method. Developed by the Kansas Department of Health and Environment, this method provides the allowable daily bacteria load. Flow data are available for the freshwater WBIDs (3285, 3287, and 3290) addressed in this report. However, these systems are highly manipulated and regulated by water control structures; as a result, the flow measurements do not necessarily represent the hydrologic condition of the waterbody, which is what drives the transport of fecal coliform to the receiving waters. Therefore, fecal coliform TMDLs for these WBIDs were developed using the "percent reduction" approach. Given that WBIDs 3288 and 3288B are marine waterbodies and tidally influenced, the fecal coliform TMDLs for these WBIDs were also developed using the "percent reduction" approach.

Using this 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, 2003–June 30, 2010). Because bacteriological counts in water are not normally distributed, a nonparametric method is more appropriate for the analysis of fecal coliform data (Hunter 2002). The Hazen method, which uses a nonparametric formula, was used to determine the 90th percentile value. The percent reduction of fecal coliform needed to meet the applicable criterion was calculated as described in **Section 5.1.2**.

5.1.1 Data Used in the Determination of the TMDL

Data used to develop these TMDLs were collected by the Miami–Dade County Department of Environmental Resources Management (DERM) and the Department (Tallahassee and Southeast Districts). The Cycle 2 verified period includes data collected from January 1, 2003–June, 30, 2010. **Table 5.1** lists the stations where fecal coliform data were collected for WBIDs 3285, 3287, 3288, 3288B, and 3290. **Figure 5.1** shows the locations of these water quality stations.

Table 5.1. Stations where Water Quality Samples Were Collected for Fecal Coliform Data During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

This is a three-column table. Column 1 lists the WBID number, Column 2 lists the station ID, and Column 3 lists the agency collecting the data.

WBID	Station ID	Agency
3285	21FLDADEBS04	Miami–Dade County DERM
3285	21FLDADEBS10	Miami–Dade County DERM
3285	21FLGW 32983	Department (Tallahassee)
3285	21FLWPB 28040073	Department (Southeast District)
3285	21FLWPB 28040074	Department (Southeast District)
3285	21FLWPB 28040131	Department (Southeast District)
3287	21FLDADELR05	Miami–Dade County DERM
3287	21FLDADELR06	Miami–Dade County DERM
3287	21FLDADELR08	Miami–Dade County DERM
3287	21FLDADELR10	Miami–Dade County DERM
3287	21FLGW 32974	Department (Tallahassee)
3287	21FLWPB 28040062	Department (Southeast District)
3287	21FLWPB 28040387	Department (Southeast District)
3287	21FLWPB 28040391	Department (Southeast District)
3288	21FLDADECM02	Miami–Dade County DERM
3288	21FLDADEMR04	Miami–Dade County DERM
3288	21FLDADEMR05	Miami–Dade County DERM
3288	21FLDADEMR06	Miami–Dade County DERM
3288	21FLDADEMR07	Miami–Dade County DERM
3288	21FLDADETM03A	Miami–Dade County DERM
3288	21FLWPB 28040067	Department (Southeast District)
3288	21FLWPB 28040185	Department (Southeast District)
3288	21FLWPB 42009022	Department (Southeast District)
3288	21FLWPB 42009023	Department (Southeast District)
3288	21FLWPB 42009024	Department (Southeast District)
3288	21FLWPB 42009027	Department (Southeast District)
3288B	21FLDADEMR01	Miami–Dade County DERM
3288B	21FLDADEMR02	Miami–Dade County DERM
3288B	21FLDADEMR03	Miami–Dade County DERM
3288B	21FLWPB 28040024	Department (Southeast District)
3288B	21FLWPB 28040066	Department (Southeast District)
3288B	21FLWPB 42009028	Department (Southeast District)
3288B	21FLWPB 42009029	Department (Southeast District)
3288B	21FLWPB 42009030	Department (Southeast District)
3290	21FLDADEMR08	Miami–Dade County DERM
3290	21FLGW 32987	Department (Tallahassee)
3290	21FLGW 3572	Department (Tallahassee)

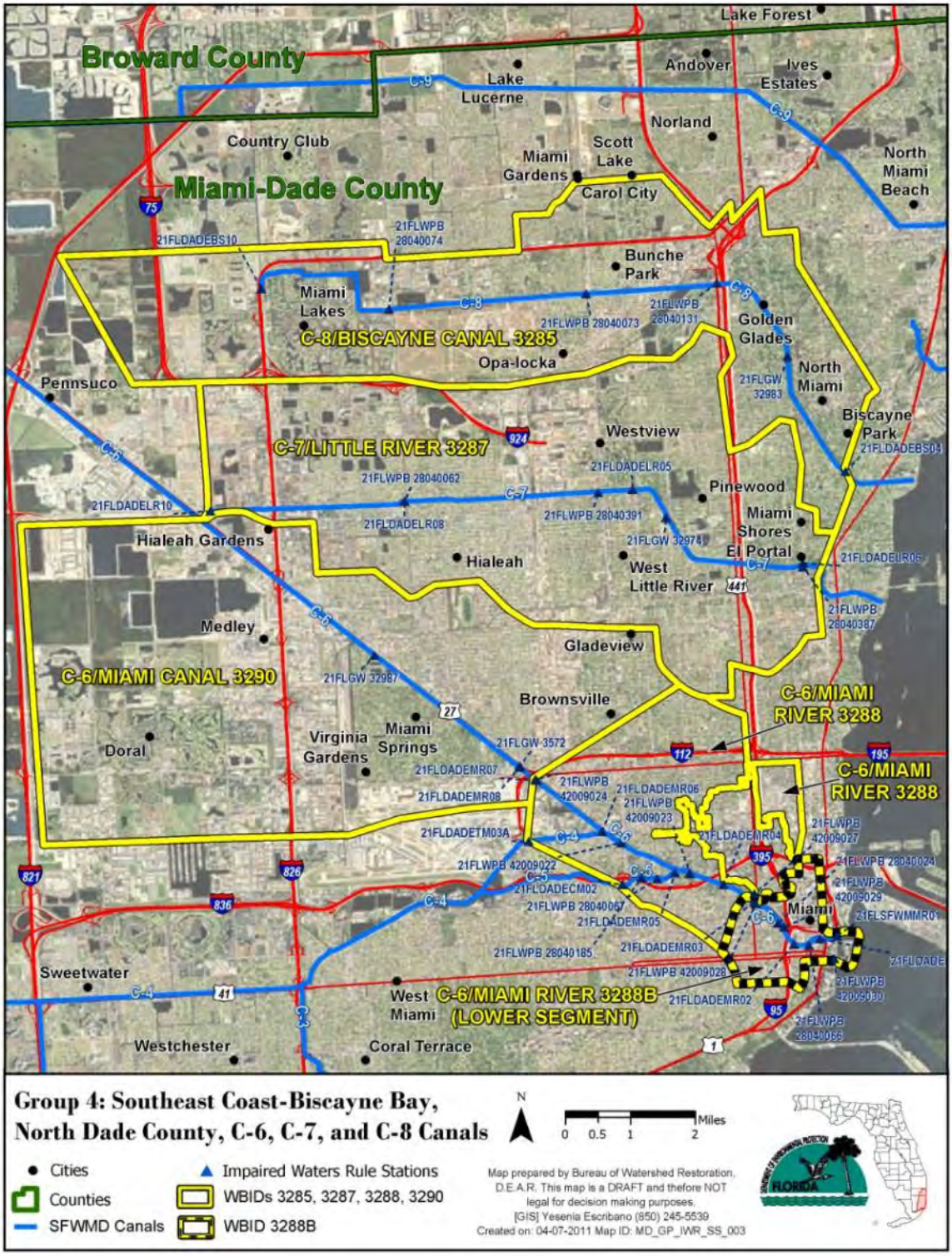

Figure 5.1. Location of Water Quality Stations with Fecal Coliform Data in WBIDs 3285, 3287, 3288, 3288B, and 3290

Table 5.2 summarizes the descriptive statistics for WBIDs 3285, 3287, 3288, 3288B, and 3290 for the Cycle 2 verified period fecal coliform results based on IWR Run 41x.

Plots of fecal coliform data by time were used to determine whether there was a significant increasing or decreasing trend for each WBID during the period of observation (January 1, 2003–June 30, 2010). No significant increasing or decreasing trends were observed in any of the WBIDs: WBID 3285 (Prob > F=0.06118), WBID 3287 (Prob > F=0.2167), WBID 3288 (Prob > F=0.8131), WBID 3288B (Prob > F=0.1465), and WBID 3290 (Prob > F=0.2106).

Figures 5.2a through **5.2e** show the fecal coliform concentration values over time during the Cycle 2 verified period (January 1, 2003–June, 30, 2010) observed in WBIDs 3285, 3287, 3288, 3288B, and 3290.

Table 5.2. Descriptive Statistics of Fecal Coliform Data for WBIDs 3285, 3287, 3288, 3288B, and 3290 During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

This is a nine-column table. Column 1 lists the WBID number, Column 2 lists the mean observation, Column 3 lists the standard deviation, Column 4 lists the median observation, Column 5 lists the highest observation, Column 6 lists the lowest observation, Column 7 lists the 25% quartile, Column 8 lists the 75% quartile, and Column 9 lists the number of samples.

[1] Coliform counts are #/100mL.

WBID	Mean Observation[1]	Standard Deviation	Median Observation[1]	Highest Observation[1]	Lowest Observation[1]	25% Quartile[1]	75% Quartile[1]	Number of Samples
3285	458	1,302.7	130	13,000	10	70	320	159
3287	640	990.2	300	10,000	10	135	680	313
3288	750	4,289.5	263	78,000	10	110	530	378
3288B	783	2,016.8	310	27,000	2	180	600	226
3290	353	810.4	138	8,000	10	73.5	250	154

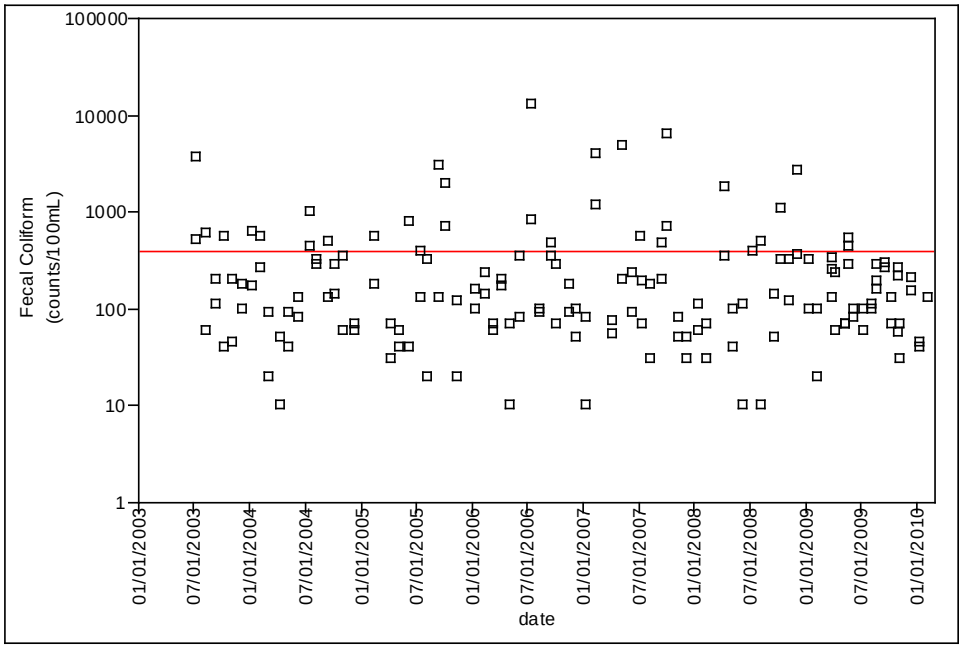

Figure 5.2a. Fecal Coliform Concentrations Over Time in the C-8 (Biscayne) Canal (WBID 3285) During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

Note: The red line indicates the target concentration (400 counts/100mL).

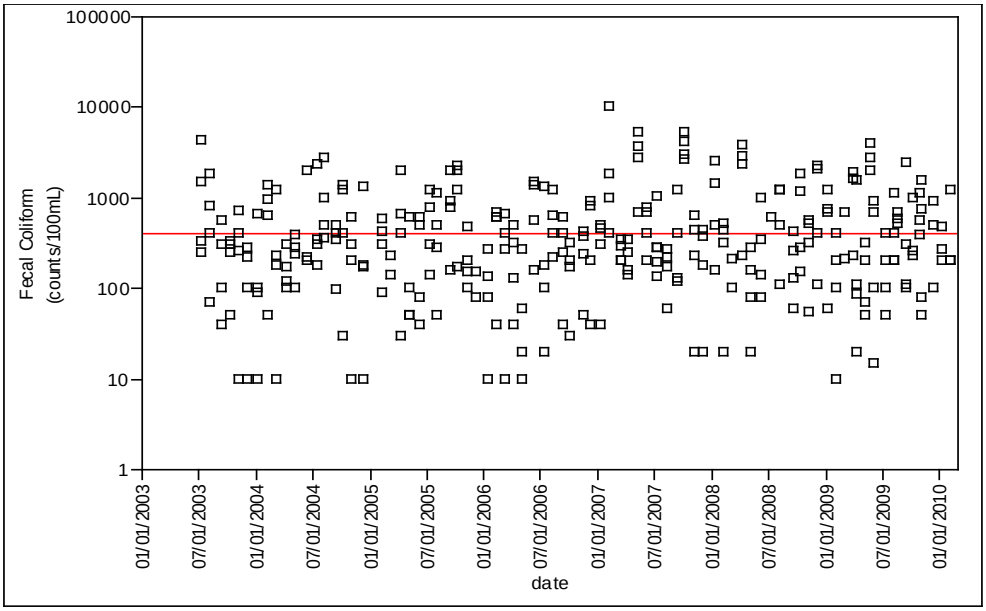

Figure 5.2b. Fecal Coliform Concentrations Over Time in the C-7 (Little River) Canal (WBID 3287) During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

Note: The red line indicates the target concentration (400 counts/100mL).

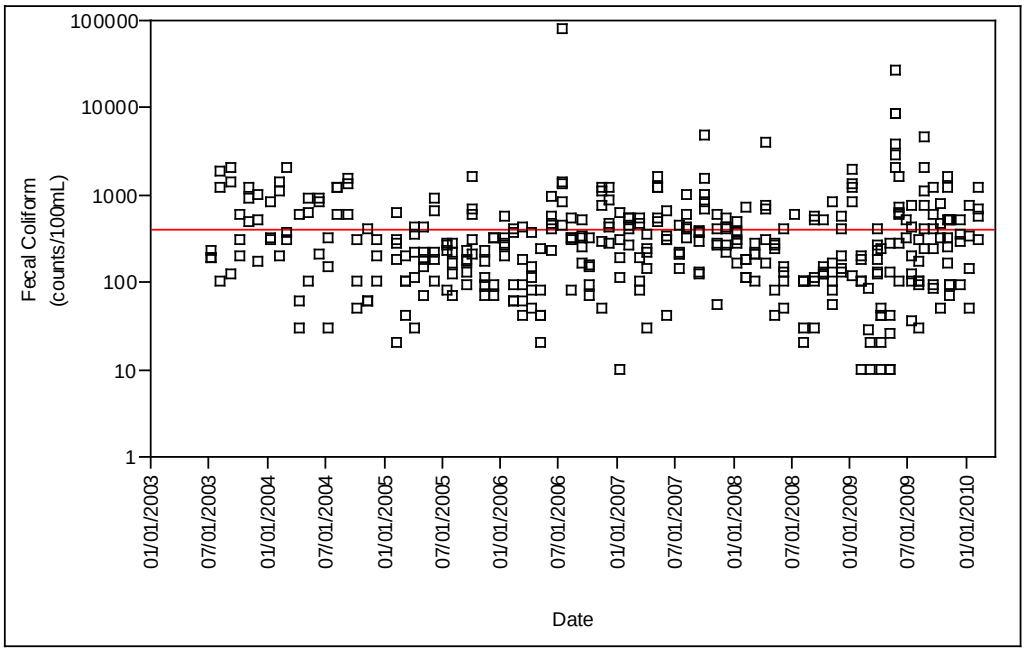

Figure 5.2c. Fecal Coliform Concentrations Over Time in the C-6 (Miami River) Canal (WBID 3288) During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

Note: The red line indicates the target concentration (400 counts/100mL).

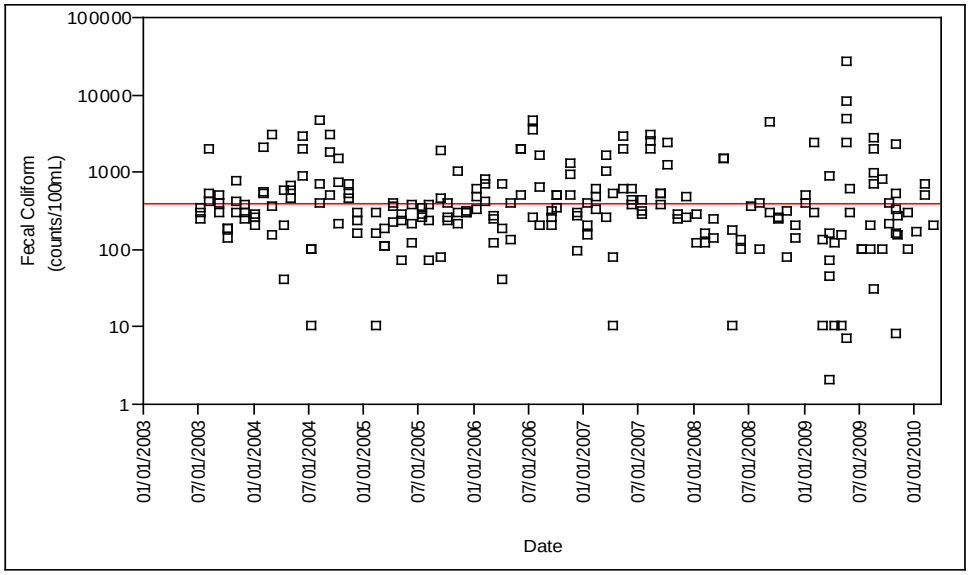

Figure 5.2d. Fecal Coliform Concentrations Over Time in the C-6 (Miami River) Lower Segment (WBID 3288B) During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

Note: The red line indicates the target concentration (400 counts/100mL).

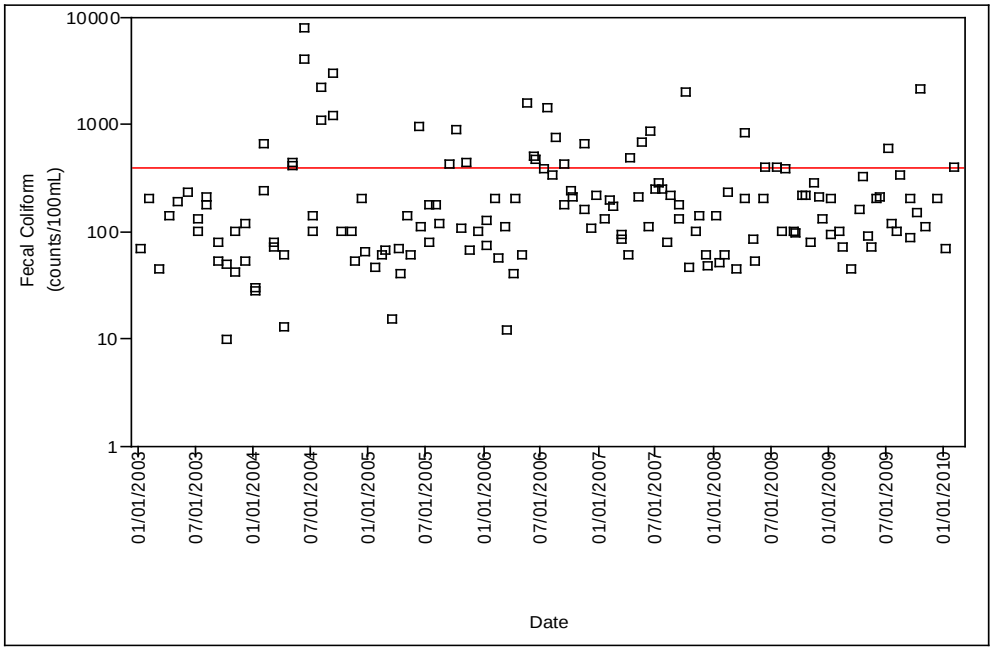

Figure 5.2e. Fecal Coliform Concentrations Over Time in the C-6 (Miami) Canal (WBID 3290) During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

Note: The red line indicates the target concentration (400 counts/100mL).

Temporal Patterns

MONTHLY AND SEASONAL TRENDS

Seasonally, in an impaired water influenced mainly by nonpoint sources, a peak in fecal coliform concentrations and exceedance rates is commonly observed during the third quarter (summer, July–September), when conditions are rainy and warm, and lower concentrations and exceedance rates are observed in the first and fourth quarters (winter, January–March; and fall, October–December), when conditions are drier and colder (**Tables 5.3a** through **5.3j**).

The WBIDs addressed in this report are located in an area characterized as a subtropical, marine environment with long, hot, wet summers and mild, dry winters (U.S. Geological Survey [USGS] 1999). The average yearly temperature is 75°F, and the average annual rainfall is 60 inches. Frequent tropical storms can flood areas in the county within minutes (Miami–Dade Water and Sewer Department [MDWASD] 2006). Seasonal variation in rainfall is distinct; about 75% of areal rainfall occurs during the 5-month wet season from June through October (Lietz 1999). Rainy and warm conditions occur throughout most of the year.

C-8 (Biscayne) Canal (WBID 3285)

The highest quarterly exceedance rate and highest quarterly average fecal coliform concentration (28.9% and 691 counts/100mL, respectively) were observed during the third quarter. Episodic exceedances in fecal coliform concentrations occurred throughout the period of observation (2003–10). Except for March and November, fecal coliform exceedances were

observed in the WBID in all the other months. The highest monthly exceedance rate and the highest monthly average fecal coliform concentration (50% and 1,538 counts/100mL, respectively) were observed in July. **Tables 5.3a** and **5.3b** summarize the monthly and seasonal fecal coliform averages and percent exceedances, respectively, for data collected for the Cycle 2 verified period in the WBID.

Table 5.3a. Summary Statistics of Fecal Coliform Data for All Stations in WBID 3285 by Month During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

This is an eight-column table. Column 1 lists the month, Column 2 lists the number of samples, Column 3 lists the minimum coliform count/100mL, Column 4 lists the maximum count, Column 5 lists the median count, Column 6 lists the mean count, Column 7 lists the number of exceedances, and Column 8 lists the percent exceedances.

[1] Coliform counts are #/100mL.
[2] Exceedances represent values above 400 counts/100mL.

Month	Number of Samples	Minimum[1]	Maximum[1]	Median[1]	Mean[1]	Number of Exceedances[2]	% Exceedances
January	12	10	630	100	152	1	8%
February	13	20	4,000	180	576	4	31%
March	7	20	330	90	136	0	0%
April	12	10	1,800	72.5	259	1	8%
May	15	10	4,900	70	464	3	20%
June	12	10	800	95	176	1	8%
July	14	60	13,000	425	1,528	7	50%
August	17	10	610	160	199	2	12%
September	14	50	3,000	230	451	4	29%
October	17	40	6,450	290	789	6	35%
November	14	20	350	85	124	0	0%
December	12	30	2,700	100	338	1	8%

Table 5.3b. Summary Statistics of Fecal Coliform Data for All Stations in WBID 3285 by Season During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

This is an eight-column table. Column 1 lists the season, Column 2 lists the number of samples, Column 3 lists the minimum coliform count/100mL, Column 4 lists the maximum count, Column 5 lists the median count, Column 6 lists the mean count, Column 7 lists the number of exceedances, and Column 8 lists the percent exceedances.

[1] Coliform counts are #/100mL.
[2] Exceedances represent values above 400 counts/100mL.

Season	Number of Samples	Minimum[1]	Maximum[1]	Median[1]	Mean[1]	Number of Exceedances[2]	% Exceedances
Q1	32	10	4,000	120	321	5	16%
Q2	39	10	4,900	80	312	5	13%
Q3	45	10	13,000	200	691	13	29%
Q4	43	20	6,450	130	447	7	16%

C-7 (Little River) Canal (WBID 3287)

Quarterly exceedance rates of 35% and greater were observed in all 4 quarters. The highest quarterly exceedance rates (42%) were observed in the first and fourth quarters, and the highest quarterly average fecal coliform concentration (725 counts/100mL) was observed during the second quarter. Episodic exceedances in fecal coliform concentrations occurred throughout the period of observation (2003–10). Exceedances were observed in all months, with the highest monthly exceedance rate (56%) observed in February, and the highest monthly average fecal coliform concentration (1,074 counts/100mL) observed in October. **Tables 5.3c** and **5.3d** summarize the monthly and seasonal fecal coliform averages and percent exceedances, respectively, for data collected for the Cycle 2 verified period in the WBID.

Table 5.3c. Summary Statistics of Fecal Coliform Data for All Stations in WBID 3287 by Month During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

This is an eight-column table. Column 1 lists the month, Column 2 lists the number of samples, Column 3 lists the minimum coliform count/100mL, Column 4 lists the maximum count, Column 5 lists the median count, Column 6 lists the mean count, Column 7 lists the number of exceedances, and Column 8 lists the percent exceedances.

[1] Coliform counts are #/100mL.
[2] Exceedances represent values above 400 counts/100mL.

Month	Number of Samples	Minimum[1]	Maximum[1]	Median[1]	Mean[1]	Number of Exceedances[2]	% Exceedances
January	23	10	2,500	270	475	10	43%
February	27	10	10,000	420	859	15	56%
March	21	10	1,900	230	443	5	24%
April	24	20	3,800	240	694	7	29%
May	27	10	5,300	240	905	8	30%
June	23	15	2,000	400	546	11	48%
July	26	20	4,400	290	650	8	31%
August	31	50	2,750	500	629	16	52%
September	28	40	2,400	300	469	10	36%
October	30	30	5,300	400	1,074	15	50%
November	28	10	1,550	278	346	11	39%
December	25	10	2,200	200	470	9	36%

Table 5.3d. Summary Statistics of Fecal Coliform Data for All Stations in WBID 3287 by Season During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

This is an eight-column table. Column 1 lists the season, Column 2 lists the number of samples, Column 3 lists the minimum coliform count/100mL, Column 4 lists the maximum count, Column 5 lists the median count, Column 6 lists the mean count, Column 7 lists the number of exceedances, and Column 8 lists the percent exceedances.

[1] Coliform counts are #/100mL.
[2] Exceedances represent values above 400 counts/100mL.

Season	Number of Samples	Minimum[1]	Maximum[1]	Median[1]	Mean[1]	Number of Exceedances[2]	% Exceedances
Q1	71	10	10,000	300	611	30	42%
Q2	74	10	5,300	260	725	26	35%
Q3	85	20	4,400	340	582	34	40%
Q4	83	10	5,300	300	647	35	42%

C-6 (Miami River) Canal (WBID 3288)

Quarterly exceedance rates of 27% and greater were observed in all four quarters. The highest quarterly exceedance rate (39%) was observed in the fourth quarter, and the highest quarterly average fecal coliform concentration (1,270 counts/100mL) was observed in the third quarter. Episodic exceedances in fecal coliform concentrations occurred throughout the period of observation (2003–10). Exceedances were observed in all months, with the highest monthly exceedance rate (42%) observed in June and October, and the highest monthly average fecal coliform concentration (3,235 counts/100mL) observed in July. **Tables 5.3e** and **5.3f** summarize the monthly and seasonal fecal coliform averages and percent exceedances, respectively, for data collected for the Cycle 2 verified period in the WBID.

Table 5.3e. Summary Statistics of Fecal Coliform Data for All Stations in WBID 3288 by Month During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

This is an eight-column table. Column 1 lists the month, Column 2 lists the number of samples, Column 3 lists the minimum coliform count/100mL, Column 4 lists the maximum count, Column 5 lists the median count, Column 6 lists the mean count, Column 7 lists the number of exceedances, and Column 8 lists the percent exceedances.

[1] Coliform counts are #/100mL.
[2] Exceedances represent values above 400 counts/100mL.

Month	Number of Samples	Minimum[1]	Maximum[1]	Median[1]	Mean[1]	Number of Exceedances[2]	% Exceedances
January	27	10	1,970	300	461	9	33%
February	34	10	1,400	230	352	11	32%
March	29	10	2,000	180	255	4	14%
April	29	10	4,000	150	339	5	17%
May	35	10	27,000	240	1,767	14	40%
June	31	40	1,600	330	443	13	42%
July	27	30	78,000	230	3,235	9	33%
August	38	20	4,500	300	562	15	39%
September	32	30	2,000	268	453	10	31%
October	36	50	4,700	305	586	15	42%
November	31	50	1,200	230	360	11	35%
December	29	70	1,200	320	372	11	38%

Table 5.3f. Summary Statistics of Fecal Coliform Data for All Stations in WBID 3288 by Season During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

This is an eight-column table. Column 1 lists the season, Column 2 lists the number of samples, Column 3 lists the minimum coliform count/100mL, Column 4 lists the maximum count, Column 5 lists the median count, Column 6 lists the mean count, Column 7 lists the number of exceedances, and Column 8 lists the percent exceedances.

[1] Coliform counts are #/100mL.
[2] Exceedances represent values above 400 counts/100mL.

Season	Number of Samples	Minimum[1]	Maximum[1]	Median[1]	Mean[1]	Number of Exceedances[2]	% Exceedances
Q1	90	10	2,000	245	354	24	27%
Q2	95	10	27,000	240	899	32	34%
Q3	97	20	78,000	260	1,270	34	35%
Q4	96	50	4,700	300	448	37	39%

C-6 (Miami River) Lower Segment (WBID 3288B)

Quarterly exceedance rates of 31% and greater were observed in all four quarters. The highest quarterly exceedance rate and the highest quarterly average fecal coliform concentration (46% and 1,364 counts/100mL, respectively) were observed during the second quarter. Episodic exceedances in fecal coliform concentrations occurred throughout the period of observation (2003–10). Exceedances were observed in all months, with exceedance rates of 50% and greater observed in 6 different months. The highest monthly exceedance rate (61%) was observed in February and the highest monthly average fecal coliform concentration (2,554 counts/100mL) in May. **Tables 5.3g** and **5.3h** summarize the monthly and seasonal fecal coliform averages and percent exceedances, respectively, for data collected for the Cycle 2 verified period for the WBID.

Table 5.3g. Summary Statistics of Fecal Coliform Data for All Stations in WBID 3288B by Month During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

This is an eight-column table. Column 1 lists the month, Column 2 lists the number of samples, Column 3 lists the minimum coliform count/100mL, Column 4 lists the maximum count, Column 5 lists the median count, Column 6 lists the mean count, Column 7 lists the number of exceedances, and Column 8 lists the percent exceedances.

[1] Coliform counts are #/100mL.
[2] Exceedances represent values above 400 counts/100mL.

Month	Number of Samples	Minimum[1]	Maximum[1]	Median[1]	Mean[1]	Number of Exceedances[2]	% Exceedances
January	14	120	600	280	312	3	21%
February	18	10	2,400	483	617	11	61%
March	22	2	3,000	170	421	4	18%
April	16	10	1,500	210	402	5	31%
May	20	7	27,000	425	2,554	10	50%
June	16	100	2,800	470	837	9	56%
July	18	10	4,500	280	649	3	17%
August	24	30	4,600	570	1,100	14	58%
September	19	80	4,400	460	879	10	53%
October	23	8	2,400	320	572	8	35%
November	18	80	1,280	360	481	9	50%
December	18	95	470	280	258	1	6%

Table 5.3h. Summary Statistics of Fecal Coliform Data for All Stations in WBID 3288B by Season During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

This is an eight-column table. Column 1 lists the season, Column 2 lists the number of samples, Column 3 lists the minimum coliform count/100mL, Column 4 lists the maximum count, Column 5 lists the median count, Column 6 lists the mean count, Column 7 lists the number of exceedances, and Column 8 lists the percent exceedances.

[1] Coliform counts are #/100mL.
[2] Exceedances represent values above 400 counts/100mL.

Season	Number of Samples	Minimum[1]	Maximum[1]	Median[1]	Mean[1]	Number of Exceedances[2]	% Exceedances
Q1	54	2	3,000	275	458	18	33%
Q2	52	7	27,000	385	1,364	24	46%
Q3	61	10	4,600	380	898	27	44%
Q4	59	8	2,400	300	448	18	31%

C-6 (Miami) Canal (WBID 3290)

Elevated quarterly exceedance rates were observed in all four quarters, with the lowest quarterly exceedance rate (3%) observed during the first quarter. The highest quarterly exceedance rate and the highest quarterly average fecal coliform concentration (30% and 579 counts/100mL, respectively) were observed during the second quarter. Episodic exceedances in fecal coliform concentrations occurred throughout the period of observation (2003–10). Except for January, March, and December, exceedances were observed in all other months. The highest monthly exceedance rate and the highest monthly average fecal coliform concentration (43% and 1,178 counts/100mL, respectively) were observed in June. **Tables 5.3i** and **5.3j** summarize the monthly and seasonal fecal coliform averages and percent exceedances, respectively, for data collected for the Cycle 2 verified period for the WBID.

Table 5.3i. Summary Statistics of Fecal Coliform Data for All Stations in WBID 3290 by Month During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

This is an eight-column table. Column 1 lists the month, Column 2 lists the number of samples, Column 3 lists the minimum coliform count/100mL, Column 4 lists the maximum count, Column 5 lists the median count, Column 6 lists the mean count, Column 7 lists the number of exceedances, and Column 8 lists the percent exceedances.

[1] Coliform counts are #/100mL.
[2] Exceedances represent values above 400 counts/100mL.

Month	Number of Samples	Minimum[1]	Maximum[1]	Median[1]	Mean[1]	Number of Exceedances[2]	% Exceedances
January	12	28	200	72	88	0	0%
February	14	56	650	184	193	1	7%
March	10	12	110	59	60	0	0%
April	13	13	830	138	202	2	15%
May	13	52	1,560	140	311	4	31%
June	14	110	8,000	325	1,178	6	43%
July	13	78	1,400	180	320	2	15%
August	14	80	2,200	215	449	3	21%
September	13	52	3,000	180	474	4	31%
October	13	10	2,100	210	489	3	23%
November	13	42	660	100	179	2	15%
December	12	48	220	114	126	0	0%

Table 5.3j. Summary Statistics of Fecal Coliform Data for All Stations in WBID 3290 by Season During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

This is an eight-column table. Column 1 lists the season, Column 2 lists the number of samples, Column 3 lists the minimum coliform count/100mL, Column 4 lists the maximum count, Column 5 lists the median count, Column 6 lists the mean count, Column 7 lists the number of exceedances, and Column 8 lists the percent exceedances.

[1] Coliform counts are #/100mL.
[2] Exceedances represent values above 400 counts/100mL.

Season	Number of Samples	Minimum[1]	Maximum[1]	Median[1]	Mean[1]	Number of Exceedances[2]	% Exceedances
Q1	36	12	650	77	121	1	3%
Q2	40	13	8,000	200	579	12	30%
Q3	40	52	3,000	180	415	9	23%
Q4	38	10	2,100	115	268	5	13%

Rainfall Patterns

Using rainfall data collected at various SFWMD rainfall stations available on the DBHYDRO database (available: http://www.sfwmd.gov/dbhydroplsql/show_dbkey_info.main_menu) (**Table 5.4**), it was possible to compare monthly rainfall with monthly fecal coliform exceedance rates, as well as average quarterly rainfall with average quarterly fecal coliform exceedance rates, at all stations (**Figures 5.3a** through **5.3j**).

Table 5.4. SFWMD Rainfall Stations Used To Determine Monthly and Quarterly Rainfall Data for Each WBID

This is a two-column table. Column 1 lists the WBID, and Column 2 lists the SFWMD rainfall station in each WBID.

WBID	SFWMD Rainfall Station
3285	S28Z_R
3287	S28Z_R
3288	S26_R
3288B	S26_R
3290	MIAMI.AP_R

C-8 (Biscayne) Canal (WBID 3285)

During the Cycle 2 verified period, monthly exceedances were recorded in WBID 3285 during low and high rainfall events (**Figure 5.3a**); however, higher quarterly exceedance rates were observed in quarters with higher rainfall (**Figure 5.3b**). The higher exceedance rates during wet seasons indicate that in WBID 3285, high rainfall negatively affects water quality in the watershed.

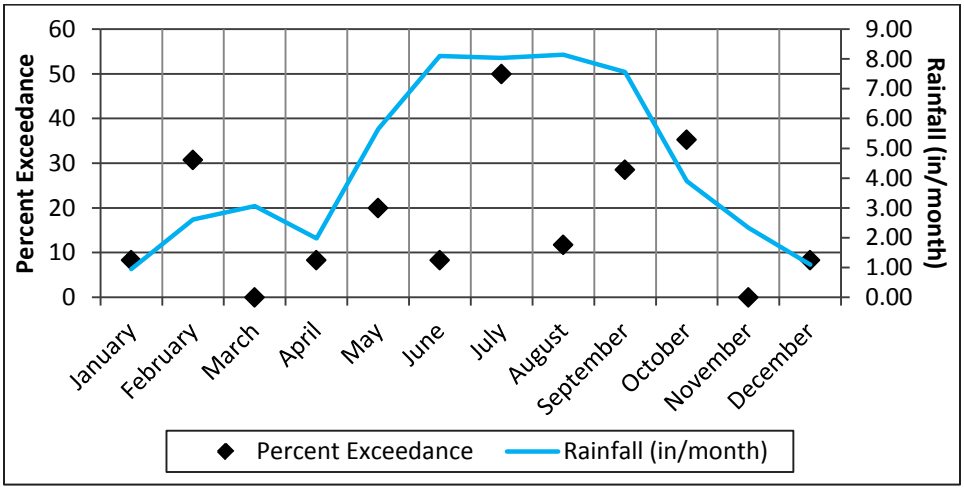

Figure 5.3a. Fecal Coliform Exceedances and Rainfall at All Stations in WBID 3285 by Month During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

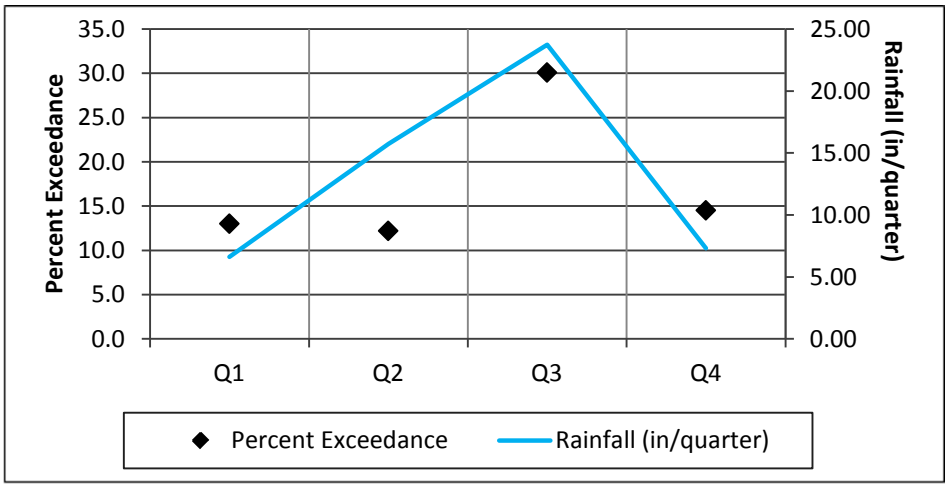

Figure 5.3b. Fecal Coliform Exceedances and Rainfall at All Stations in WBID 3285 by Quarter During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

Could not get bottom line to appear in Figure 5.3b

C-7 (Little River) Canal (WBID 3287)

The impact of rainfall on monthly and quarterly exceedances in WBID 3287 is inconclusive. During the Cycle 2 verified period, monthly exceedance rates occurred independently of rainfall, since exceedances were recorded during low and high rainfall periods (**Figure 5.3c**). A similar trend was observed for quarterly exceedance rates, which also appear not to be influenced by rainfall (**Figure 5.3d**).

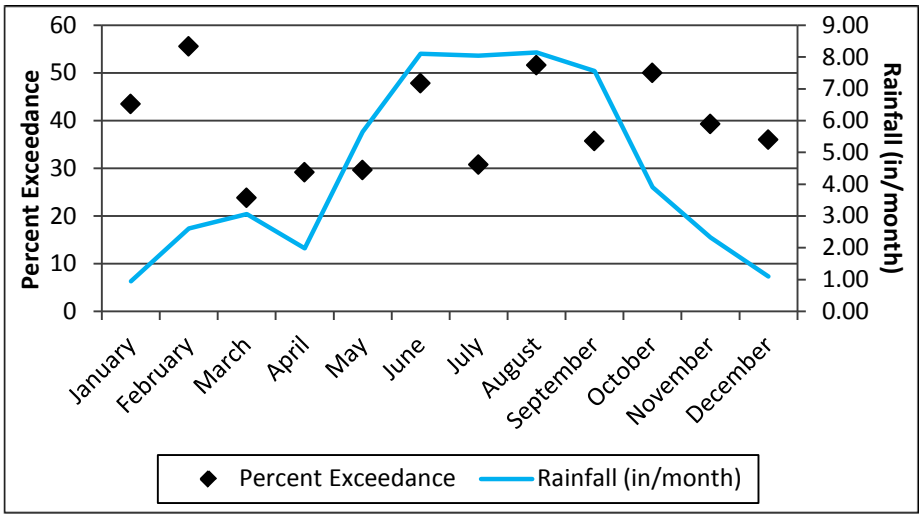

Figure 5.3c. Fecal Coliform Exceedances and Rainfall at All Stations in WBID 3287 by Month During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

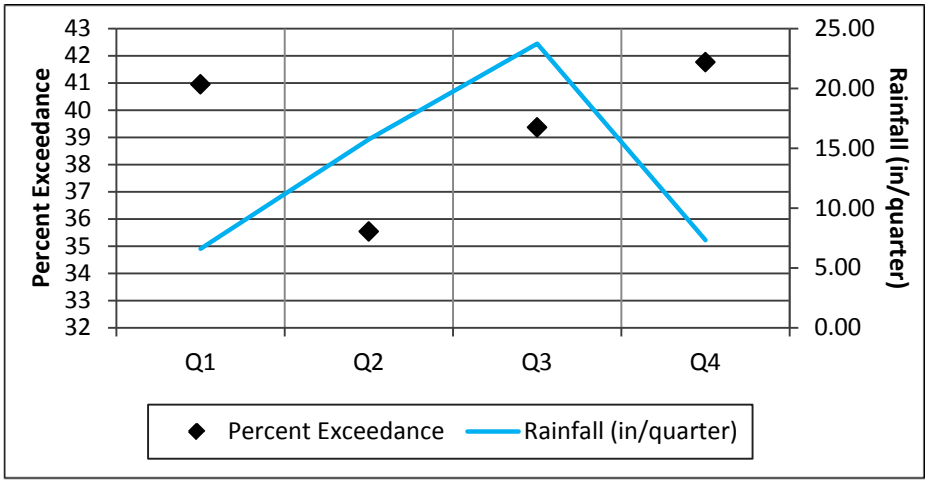

Figure 5.3d. Fecal Coliform Exceedances and Rainfall at All Stations in WBID 3287 by Quarter During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

C-6 (Miami River) (WBID 3288)

The impact of rainfall on monthly and quarterly exceedances in WBID 3288 is inconclusive. During the Cycle 2 verified period, monthly exceedance rates occurred independently of rainfall, and exceedances were recorded during low and high rainfall periods (**Figure 5.3e**). Quarterly exceedance rates also showed no correlation with rainfall amount (**Figure 5.3f**). The exceedance rates for all quarters range from 26% to 38%.

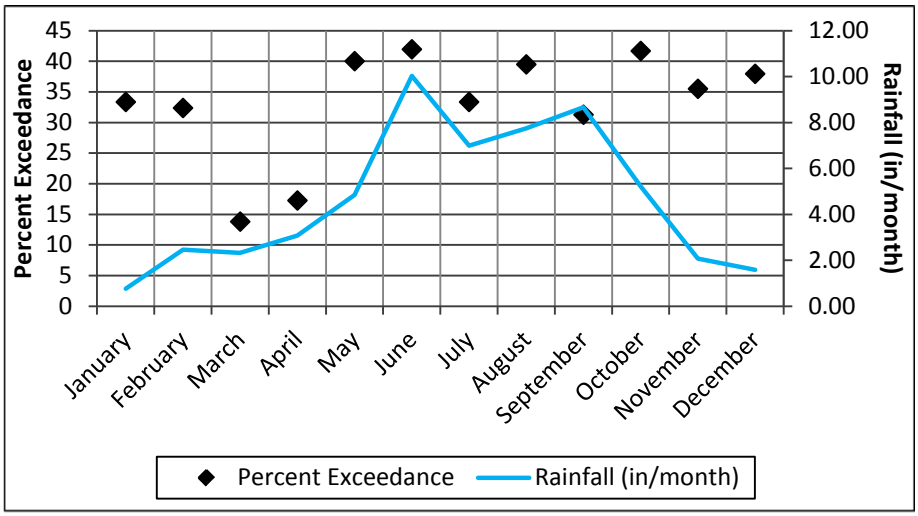

Figure 5.3e. Fecal Coliform Exceedances and Rainfall at All Stations in WBID 3288 by Month During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

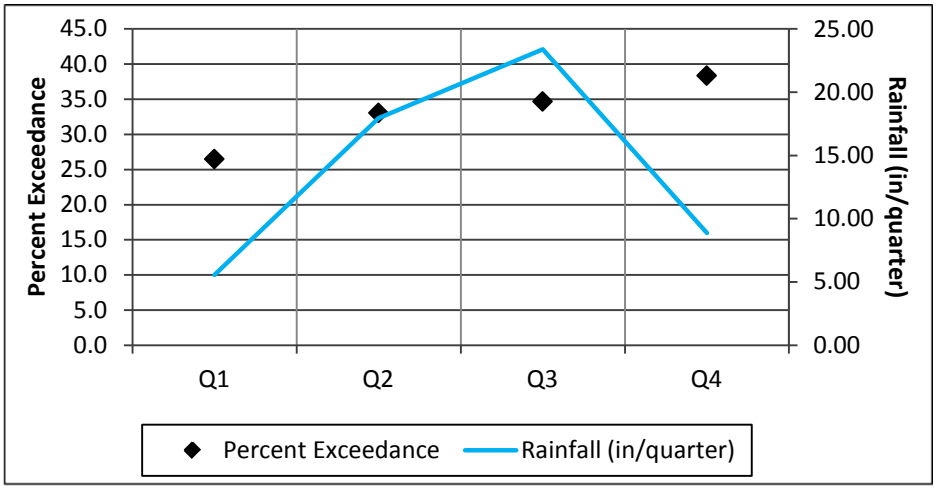

Figure 5.3f. Fecal Coliform Exceedances and Rainfall at All Stations in WBID 3288 by Quarter During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

C-6 (Miami River) Lower Segment (WBID 3288B)

The impact of rainfall on monthly and quarterly exceedances in WBID 3288B is distinct. Except for a couple of instances, during the Cycle 2 verified period, monthly exceedance rates followed the monthly rainfall pattern very well (**Figure 5.3g**). A similar exceedance rate and rainfall relationship was observed for the quarterly data (**Figure 5.3h**). The occurrence of exceedance rates during wet seasons indicates that in WBID 3288B, high rainfall negatively affects water quality in the watershed.

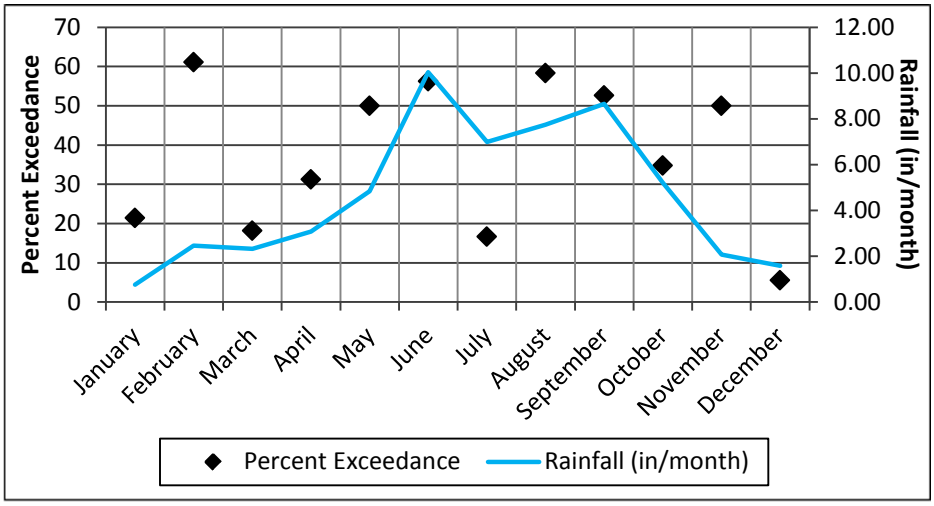

Figure 5.3g. Fecal Coliform Exceedances and Rainfall at All Stations in WBID 3288B by Month During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

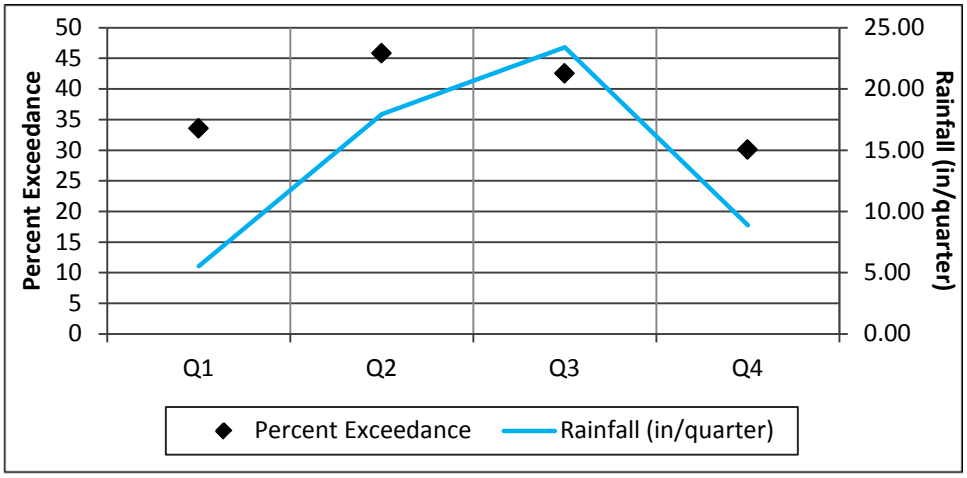

Figure 5.3h. Fecal Coliform Exceedances and Rainfall at All Stations in WBID 3288B by Quarter During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

C-6 (Miami) Canal (WBID 3290)

The impact of rainfall on monthly and quarterly exceedances in WBID 3290 is distinct. Except for a couple of instances, during the Cycle 2 verified period, the monthly exceedance rate followed the monthly rainfall pattern very well (**Figure 5.3i**). A similar exceedance rate and rainfall relationship was also observed for quarterly data (**Figure 5.3j**). The occurrence of higher exceedance rates during wet seasons indicates that in WBID 3290, high rainfall negatively affects water quality in the watershed.

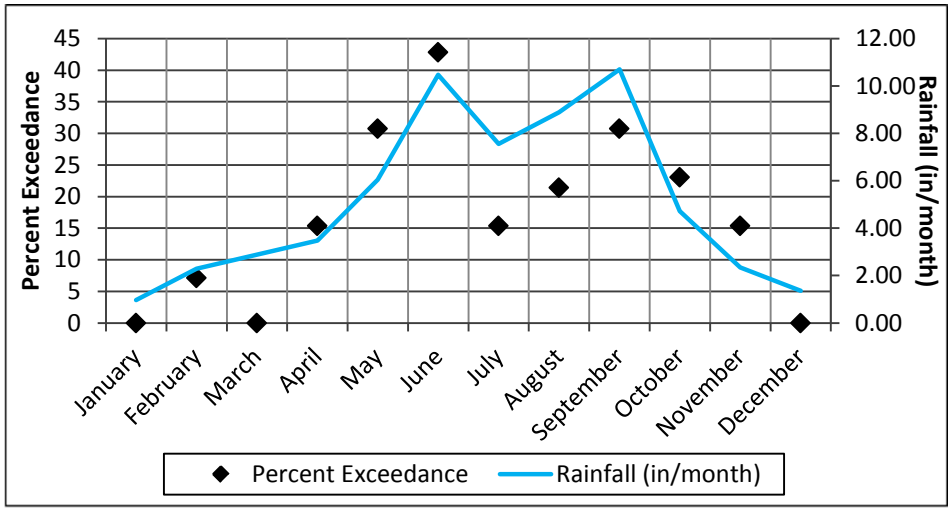

Figure 5.3i. Fecal Coliform Exceedances and Rainfall at All Stations in WBID 3290 by Month During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

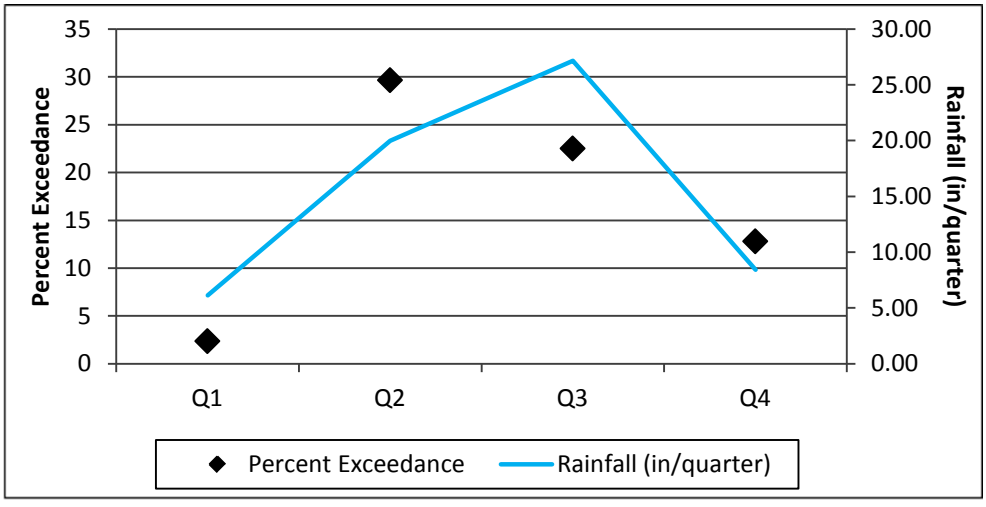

Figure 5.3j. Fecal Coliform Exceedances and Rainfall at All Stations in WBID 3276A by Quarter During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

PERIOD-OF-RECORD TREND

Plotting the entire period of record (historical) fecal coliform data by time for each WBID revealed no significant increasing or decreasing trend for WBID 3285 (Prob > F=0.5717) (**Figure 5.4a**) and WBID 3287 (Prob > F=0.8633) (**Figure 5.4b**).

Significant decreasing trends were observed in period-of-record fecal coliform data in WBID 3288 (Prob < 0.05) (**Figure 5.4c**), WBID 3288B (Prob < 0.05) (**Figure 5.4d**), and WBID 3290 (Prob < 0.05) (**Figure 5.e**). However, the trend does not eliminate the need for the TMDLs and for implementing steps to further reduce fecal coliform levels

C-6 (Miami River) Canal (WBID 3288), C-6 (Miami River) Lower Segment (WBID 3288B), and C-6 (Miami) Canal (WBID 3290)

Although no significant increasing or decreasing trends were observed in WBIDs 3288, 3288B, and 3290 during the Cycle 2 verified period, as mentioned above, a significant decreasing trend for the entire period of record in these WBIDs was observed. Miami–Dade County and the city of Miami have been steadily taking actions to improve stormwater quality through projects that should improve runoff water quality and potentially reduce fecal coliform concentrations in the C-6 Canal.

Since the mid-90s, Miami–Dade County has been implementing countywide short- and long-term improvement programs to minimize sanitary sewer overflows (SSOs) and to ensure that the wastewater treatment plants (WWTPs) in the county have the capacity to allow for continued growth in the county (MDWASD 2006).

Key accomplishments include the Pump Station Improvement Program (PSIP), which upgraded collection system pump stations and force mains and has reduced the number of SSOs; the Infiltration/Exfiltration/Inflow (I/E/I) Reduction Program, which involved extensive sewer inspections and rehabilitation; the implementation of a pump station inspection and repair program; the enactment of ordinances (e.g., the Volume Sewer Customer Ordinance, effective November 1997); the elimination of illegal stormwater connections; the implementation of a program of pump station upgrades and collection system improvements; and optimization and improvement of the three WWTPs.

In addition, the city of Miami's Stormwater Management Program includes components that should improve runoff water quality and potentially reduce fecal coliform concentrations in the C-6 Cana. These include storm sewer system maintenance, inspection and enforcement, citywide canal cleaning (removing litter from waterways and banks, vegetation management); waterway surface cleaning (citywide cleaning and oxygenation); inlet, outfall, and pipe cleaning; structure repair; pump station maintenance; drainage system retrofit; and sewer rebuilding.

In the Miami River watershed, projects have been implemented to reduce contaminants in stormwater runoff to the river by rebuilding, improving, or retrofitting the existing stormwater drainage system. A depollution vessel has been contracted to clean, oxygenate, and decontaminate the river. The vessel removes floating debris, bacteria, and viruses, and also oxygenates the water. The project has greatly reduced the amount of trash in waterways and significantly improved water quality. The Miami River maintenance dredging and environmental cleanup project has removed contaminated sediments from the river bottom (Kimley-Horn and Associates 2002).

Capital improvement projects, such as the Quality Neighborhood Improvement Program (QNIBP/QNIP), which sets aside funds for drainage improvement projects, could potentially improve water quality and lower fecal coliform concentrations in the canal.

However, although coliform bacteria concentrations in the Miami River have improved in recent years as a result of various projects related to storm and sanitary sewers, water quality, compliance and enforcement, education, and coordination, fecal coliform bacteria concentrations in the C-6 Canal still occur at levels exceeding the state criterion.

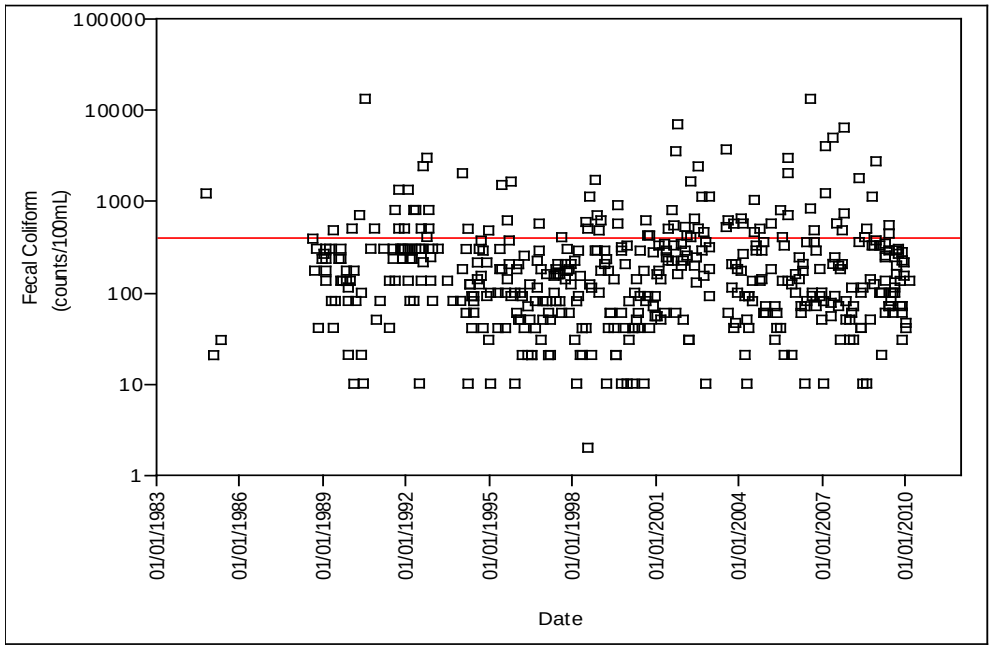

Figure 5.4a. Fecal Coliform Concentration Trends in the C-6 (Biscayne) Canal (WBID 3285) for the Entire Period of Record (1984–2010)

Note: The red line indicates the target concentration (400 counts/100mL).

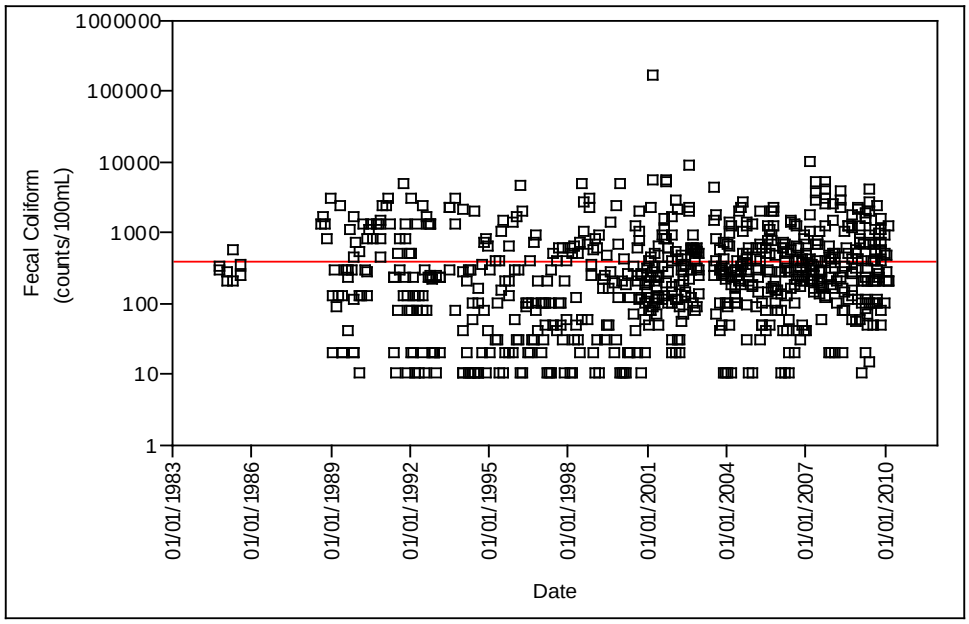

Figure 5.4b. Fecal Coliform Concentration Trends in the C-7 (Little River) Canal (WBID 3287) for the Entire Period of Record (1984–2010)

Note: The red line indicates the target concentration (400 counts/100mL).

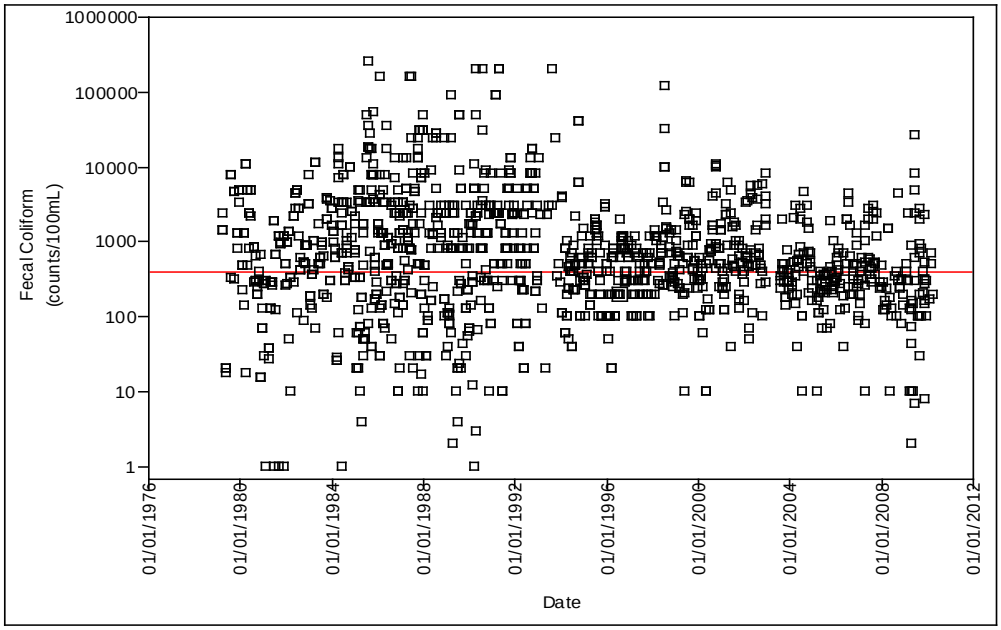

Figure 5.4c. Fecal Coliform Concentration Trends in the C-6 (Miami River) Canal (WBID 3288) for the Entire Period of Record (1984–2010)

Note: The red line indicates the target concentration (400 counts/100mL).

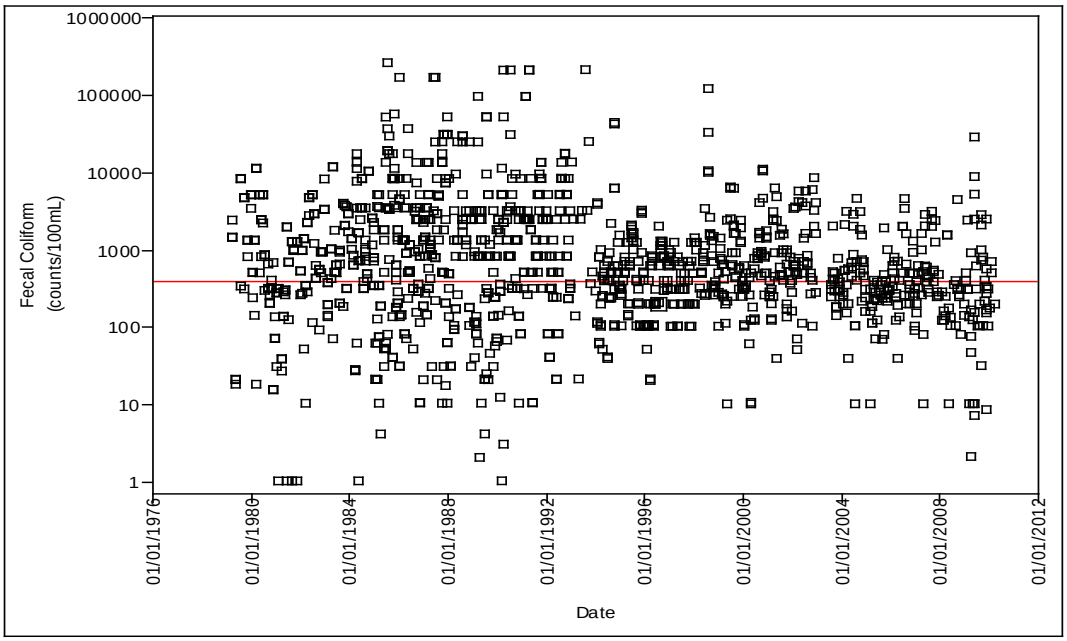

Figure 5.4d. Fecal Coliform Concentration Trends in the C-6 (Miami River) Lower Segment (WBID 3288B) for the Entire Period of Record (1979–2010)

Note: The red line indicates the target concentration (400 counts/100mL).

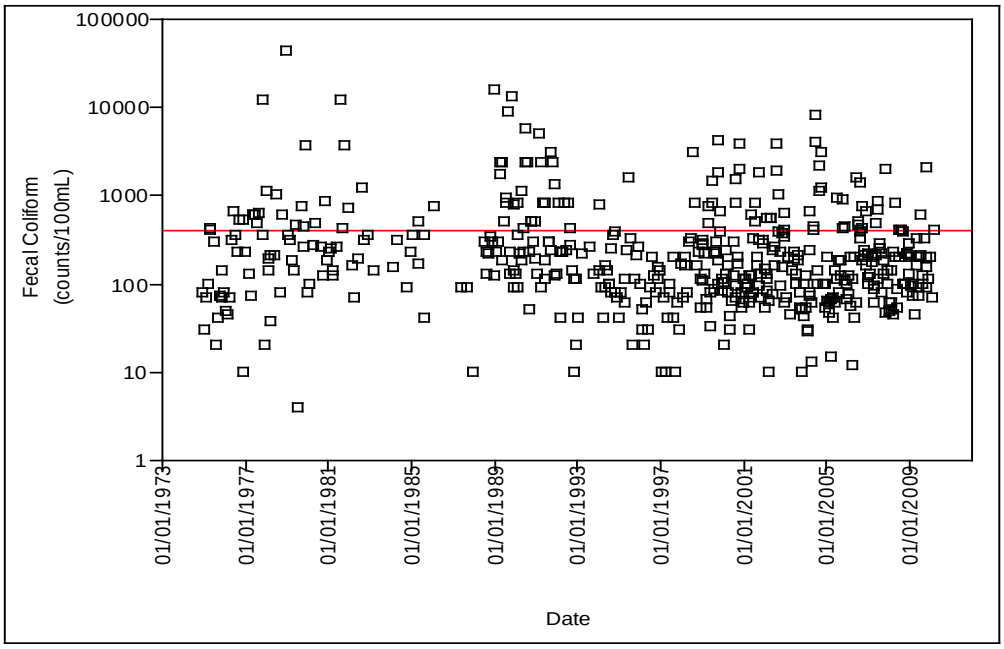

Figure 5.4e. Fecal Coliform Concentration Trends in the C-6 (Miami) Canal (WBID 3290) for the Entire Period of Record (1974–2010)

Note: The red line indicates the target concentration (400 counts/100mL).

Spatial Patterns

Fecal coliform data for each WBID from the Cycle 2 verified period (January 1, 2003–June 30, 2010) were analyzed to detect spatial trends in the data (**Figures 5.5a** through **5.5j**). Stations are displayed from west to east (from left to right). **Figure 5.6** shows the spatial distribution of the principal land uses and the locations of the water quality stations within each WBID.

C-8 (Biscayne) Canal (WBID 3285)

Fecal coliform concentrations that exceeded the state criterion were observed in 5 of the 6 sampling stations within the WBID (**Figures 5.5a** and **5.5b**). The highest concentration in the WBID (13,000 counts/100mL) was recorded at Station 21FLDADEBS10. Except for Station 21FLWPB 28040073, exceedances were recorded at all other stations. The highest exceedance rate (100%) was recorded at Station 21FLGW 32983; however, only 1 sample was collected at this station (**Table 5.5a**). Samples at only 2 of the 6 stations exceeded the single sample maximum criterion of 800 counts/100mL. All sampling stations are located on the C-8 Canal.

Except for Station 21FLWPB 28040074, which is surrounded by institutional, industrial, and transportation (airport) land uses, land use surrounding the remaining stations within the WBID is primarily medium- and high-density residential, or commercial.

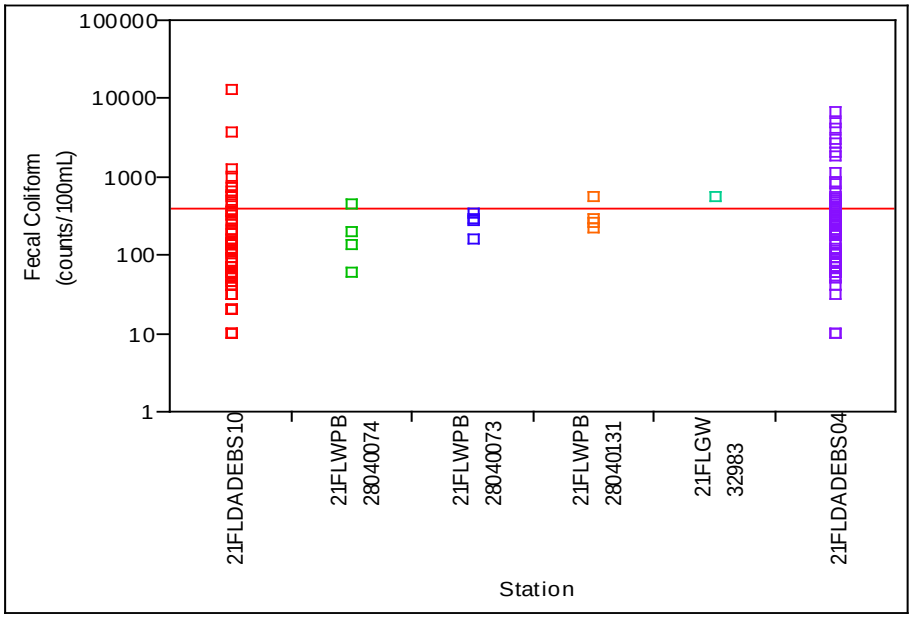

Figure 5.5a. Spatial Fecal Coliform Concentration Trends in the C-8 (Biscayne) Canal (WBID 3285) by Station During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

Note: The red line indicates the target concentration (400 counts/100mL).

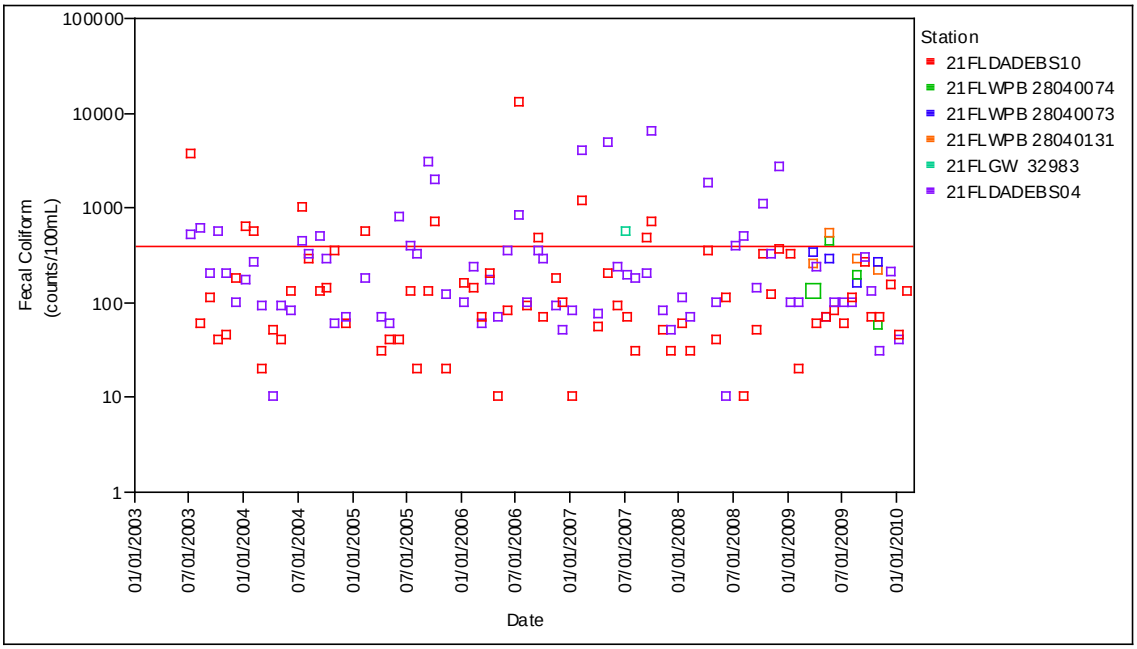

Figure 5.5b. Spatial Fecal Coliform Concentration Trends in the C-8 (Biscayne) Canal (WBID 3285) by Date During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

Note: The red line indicates the target concentration (400 counts/100mL).

Table 5.5a. Station Summary Statistics of Fecal Coliform Data for the C-8 (Biscayne) Canal (WBID 3285) During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

This is a nine-column table. Column 1 lists the station, Column 2 lists the period of observation, Column 3 lists the number of samples, Column 4 lists the minimum count/100mL, Column 5 lists the maximum count, Column 6 lists the median count, Column 7 lists the mean count, Column 8 lists the number of exceedances, and Column 9 lists the percent exceedances.

[1] Coliform counts are #/100mL.
[2] Exceedances represent values above 400 counts/100mL.

Station	Period of Observation	Number of Samples	Minimum[1]	Maximum[1]	Median[1]	Mean[1]	Number of Exceedances[2]	% Exceedances
21FLDADEBS04	2003–10	73	10	6,450	180	540	16	22%
21FLDADEBS10	2003–10	73	10	13,000	90	405	11	15%
21FLGW 32983	2007	1	550	550	550	550	1	100%
21FLWPB 28040073	2009	4	160	330	280	263	0	0%
21FLWPB 28040074	2009	4	58	440	160	205	1	25%
21FLWPB 28040131	2009	4	220	540	270	325	1	25%

C-7 (Little River) Canal (WBID 3287)

Fecal coliform concentrations that exceeded the state criterion were observed in all of the sampling stations within the WBID (**Figures 5.5c** and **5.5d**); elevated concentrations (greater than 1,000 counts/100mL) were recorded at all stations. Exceedance rates greater than 30% were recorded at all stations, except for Station 21FLDADELR10 (6%), with the highest exceedance rates (100%) recorded at Stations 21FLWPB 28040387 and 21FLWPB 28040391. The highest fecal coliform concentration in the WBID (10,000 counts/100mL) was recorded at Station 21FLDADELR08. An exceedance rate of 100% was also recorded at Station 21FLGW 32974; however, only 1 sample was collected at this station (**Table 5.5b**). All sampling stations are located on the C-7 Canal.

Land use surrounding all stations within the WBID is predominantly medium- and high-density residential, commercial, or industrial.

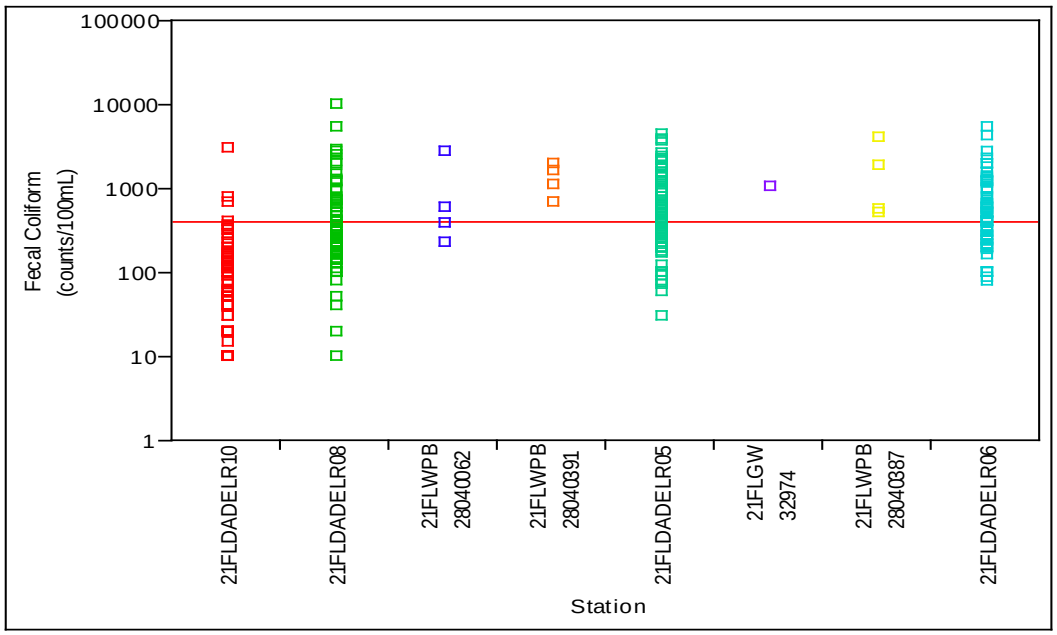

Figure 5.5c. Spatial Fecal Coliform Concentration Trends in the C-7 (Little River) Canal (WBID 3287) by Station During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

Note: The red line indicates the target concentration (400 counts/100mL).

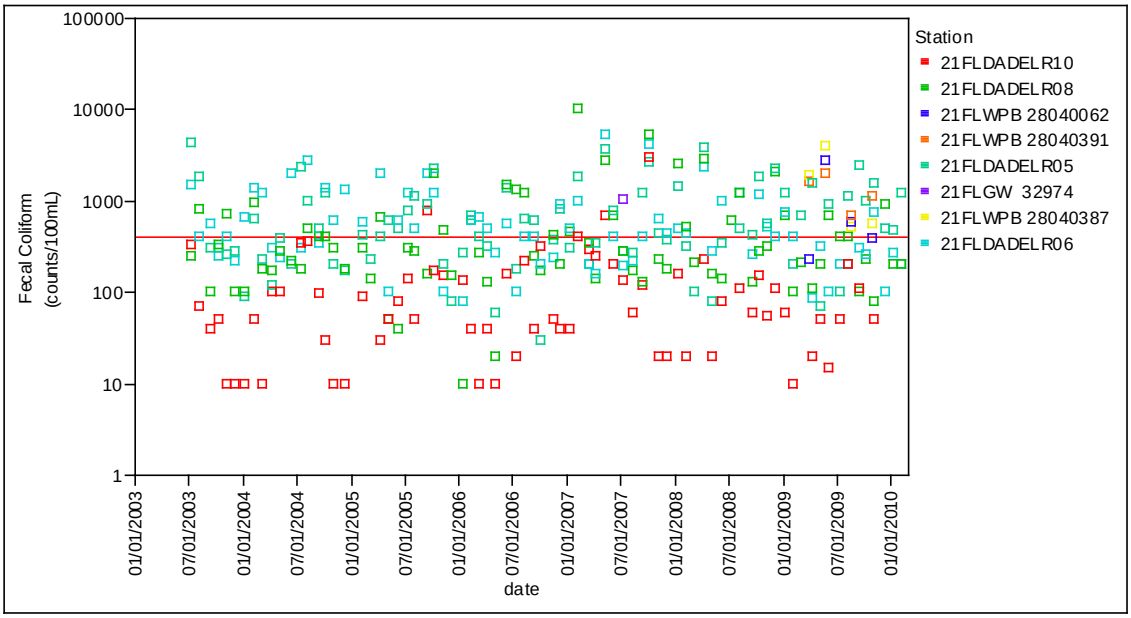

Figure 5.5d. Spatial Fecal Coliform Concentration Trends in the C-7 (Little River) Canal (WBID 3287) by Date During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

Note: The red line indicates the target concentration (400 counts/100mL).

Table 5.5b. Station Summary Statistics of Fecal Coliform Data for the C-7 (Little River) Canal (WBID 3287) During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

This is a nine-column table. Column 1 lists the station, Column 2 lists the period of observation, Column 3 lists the number of samples, Column 4 lists the minimum count/100mL, Column 5 lists the maximum count, Column 6 lists the median count, Column 7 lists the mean count, Column 8 lists the number of exceedances, and Column 9 lists the percent exceedances.

[1] Coliform counts are #/100mL.
[2] Exceedances represent values above 400 counts/100mL.

Station	Period of Observation	Number of Samples	Minimum[1]	Maximum[1]	Median[1]	Mean[1]	Number of Exceedances[2]	% Exceedances
21FLDADELR05	2003–10	78	30	4,400	485	823	43	55%
21FLDADELR06	2003–10	74	80	5,300	420	738	39	53%
21FLDADELR08	2003–10	79	10	10,000	280	672	28	35%
21FLDADELR10	2003–09	69	10	3,000	60	160	4	6%
21FLGW 32974	2007	1	1,040	1,040	1,040	1,040	1	100%
21FLWPB 28040062	2009	4	230	2,700	485	975	2	50%
21FLWPB 28040387	2009	4	510	4,000	1,230	1,743	4	100%
21FLWPB 28040391	2009	4	690	2,000	1,350	1,348	4	100%

C-6 (Miami River) (WBID 3288)

Except for Station 21FLDADETM03A, fecal coliform concentrations that exceeded the state criterion were observed at all sampling stations within the WBID (**Figures 5.5e** and **5.5f**), with elevated concentrations (greater than 1,000 counts/100mL) recorded at all stations; the highest concentration (78,000 counts/100mL) was recorded at Station 21FLDADEMR07. Exceedances were recorded at 11 of the 12 stations in the WBID, with exceedance rates ranging from 24% to 75%. The highest exceedance rate was recorded at Station 21FLWPB 42009024 (**Table 5.5c**). Stations 21FLDADEMR04, 21FLDADEMR05, 21FLDADEMR06, 21FLDADEMR07, 21FLWPB 42009022, 21FLWPB 42009023, and 21FLWPB 42009024 are located on the C-6 Canal.

Stations 21FLWPB 42009024, 21FLDADEMR07, 21FLDADETM03A, and 21FLDADEMR06 are surrounded by commercial and industrial land uses. Land use surrounding the remaining stations within the WBID is predominantly medium- and high-density residential.

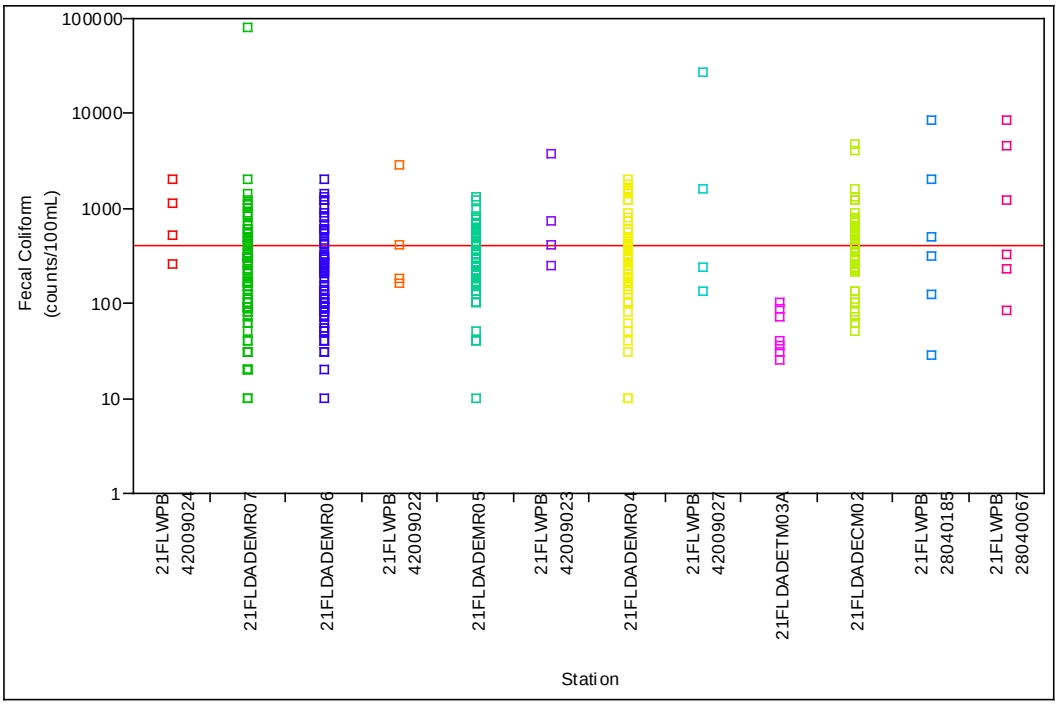

Figure 5.5e. Spatial Fecal Coliform Concentration Trends in the C-6 (Miami River) Canal (WBID 3288) by Station During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

Note: The red line indicates the target concentration (400 counts/100mL).

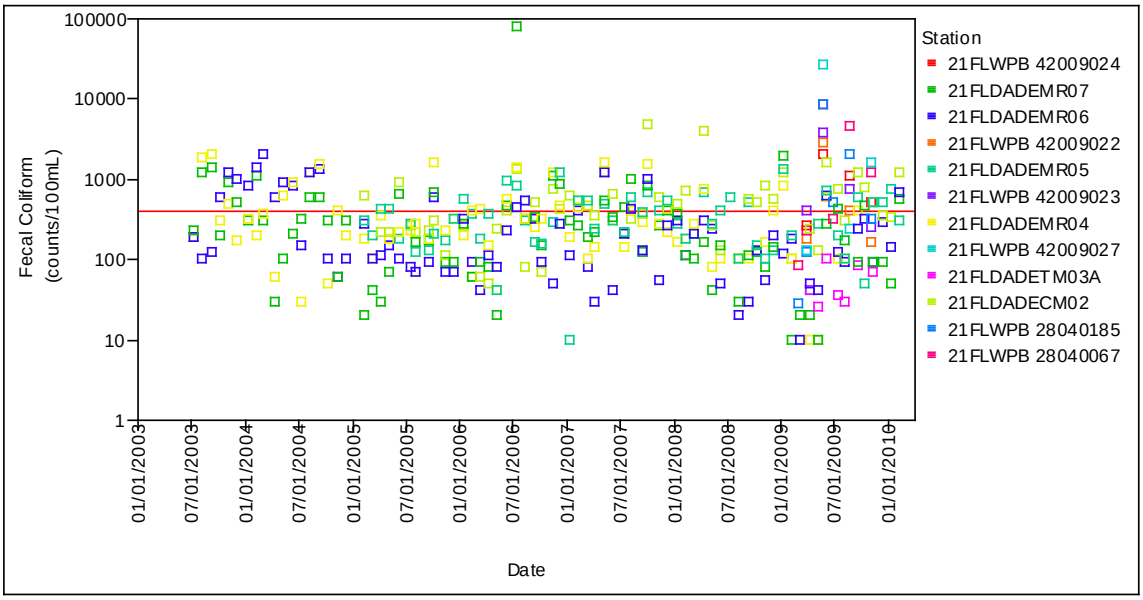

Figure 5.5f. Spatial Fecal Coliform Concentration Trends in the C-6 (Miami River) Canal (WBID 3288) by Date During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

Note: The red line indicates the target concentration (400 counts/100mL).

Table 5.5c. Station Summary Statistics of Fecal Coliform Data for the C-6 (Miami River) Canal (WBID 3288) During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

This is a nine-column table. Column 1 lists the station, Column 2 lists the period of observation, Column 3 lists the number of samples, Column 4 lists the minimum count/100mL, Column 5 lists the maximum count, Column 6 lists the median count, Column 7 lists the mean count, Column 8 lists the number of exceedances, and Column 9 lists the percent exceedances.

[1] Coliform counts are #/100mL.
[2] Exceedances represent values above 400 counts/100mL.

Station	Period of Observation	Number of Samples	Minimum[1]	Maximum[1]	Median[1]	Mean[1]	Number of Exceedances[2]	% Exceedances
21FLDADECM02	2005–10	56	50	4,700	408	616	28	50%
21FLDADEMR04	2003–09	72	10	2,000	260	423	22	31%
21FLDADEMR05	2005–10	60	10	1,300	300	369	21	35%
21FLDADEMR06	2005–10	78	10	2,000	145	326	19	24%
21FLDADEMR07	2005–10	77	10	78,000	210	1,336	22	29%
21FLDADETM03A	2009	7	25	100	40	55	0	0%
21FLWPB 28040067	2009	6	82	8,400	760	2,455	3	50%
21FLWPB 28040185	2009	6	28	8,500	405	1,910	3	50%
21FLWPB 42009022	2009	4	160	2,800	295	888	2	50%
21FLWPB 42009023	2009	4	250	3,700	570	1,273	2	50%
21FLWPB 42009024	2009	4	260	2,000	810	970	3	75%
21FLWPB 42009027	2009	4	130	27,000	920	7,243	2	50%

C-6 (Miami River) Lower Segment (WBID 3288B)

Except for Station 21FLWPB 42009030, fecal coliform concentrations that exceeded the state criterion were observed at all sampling stations within the WBID (**Figures 5.5g** and **5.5h**), with elevated concentrations (greater than 2,000 counts/100mL) recorded at all stations; the highest concentration (27,000 counts/100mL) was recorded at Station 21FLWPB 42009029. Exceedances were recorded at all 7 stations in the WBID, with exceedance rates ranging from 30% to 100%. The highest exceedance rate was recorded at Station 21FLWPB 42009029 (**Table 5.5d**). Except for Station 21FLWPB 42009030, which is located south of the C-6 Canal on the Intracoastal Waterway, all other sampling stations are located on the C-6.

Land use surrounding all stations within the WBID is predominantly commercial or corresponds to transportation, communication, or utilities use. Stations 21FLWPB 42009028, 21FLWPB 42009029, and 21FLWPB 42009030 are in the vicinity of some medium- and high-density residential areas.

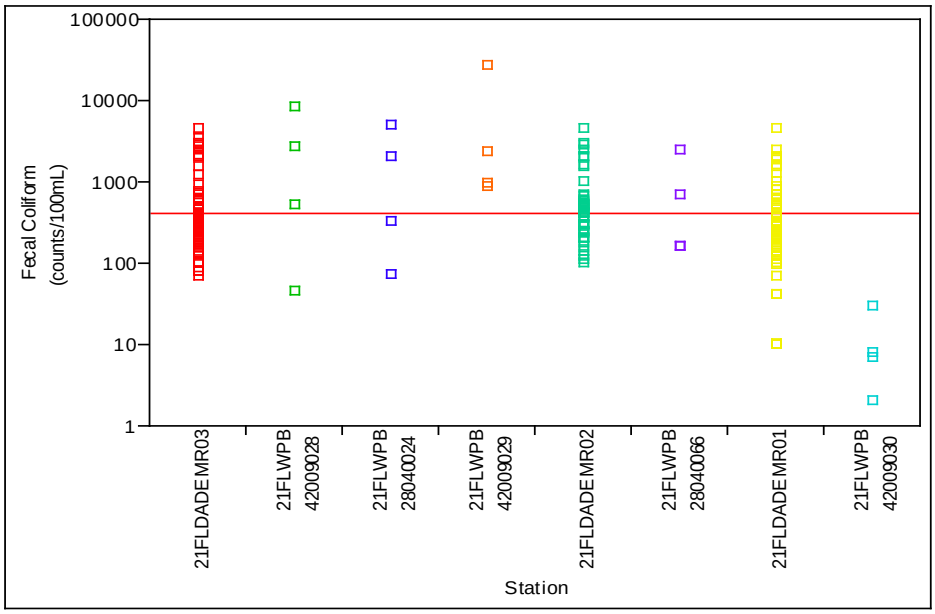

Figure 5.5g. Spatial Fecal Coliform Concentration Trends in the C-6 (Miami River) Lower Segment (WBID 3288B) by Station During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

Note: The red line indicates the target concentration (400 counts/100mL).

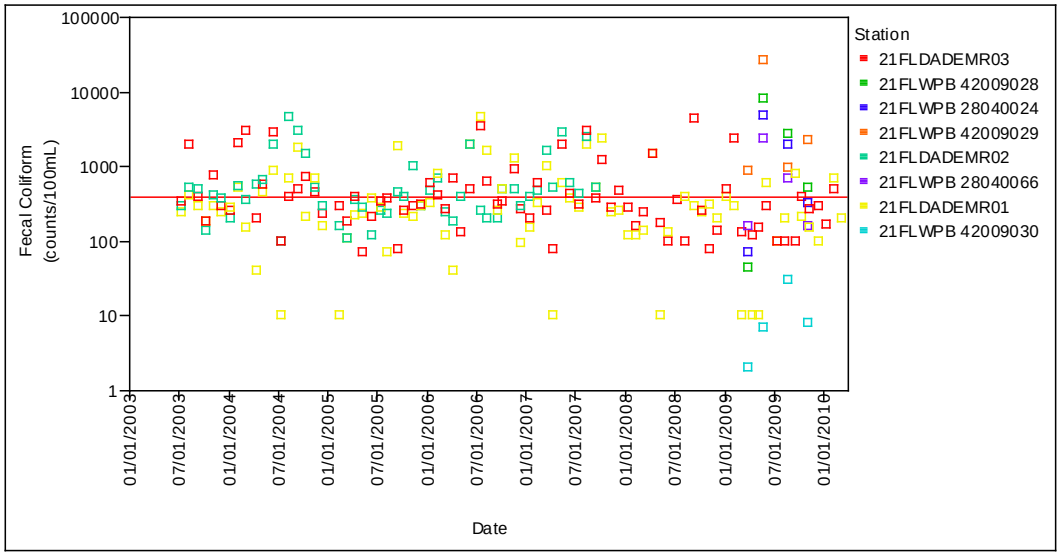

Figure 5.5h. Spatial Fecal Coliform Concentration Trends in the C-6 (Miami River) Lower Segment (WBID 3288B) by Date During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

Note: The red line indicates the target concentration (400 counts/100mL).

Table 5.5d. Station Summary Statistics of Fecal Coliform Data for the C-6 (Miami River) Lower Segment (WBID 3288B) During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

This is a nine-column table. Column 1 lists the station, Column 2 lists the period of observation, Column 3 lists the number of samples, Column 4 lists the minimum count/100mL, Column 5 lists the maximum count, Column 6 lists the median count, Column 7 lists the mean count, Column 8 lists the number of exceedances, and Column 9 lists the percent exceedances.

[1] Coliform counts are #/100mL.
[2] Exceedances represent values above 400 counts/100mL.

Station	Period of Observation	Number of Samples	Minimum[1]	Maximum[1]	Median[1]	Mean[1]	Number of Exceedances[2]	% Exceedances
21FLDADEMR01	2003–10	77	10	4,500	250	498	23	30%
21FLDADEMR02	2003–07	50	100	4,600	420	720	26	52%
21FLDADEMR03	2003–10	79	70	4,400	310	622	27	34%
21FLWPB 28040024	2009	4	72	4,900	1,160	1,823	2	50%
21FLWPB 28040066	2009	4	160	2,400	430	855	2	50%
21FLWPB 42009028	2009	4	44	8,200	1,615	2,869	3	75%
21FLWPB 42009029	2009	4	870	27,000	1,625	7,780	4	100%
21FLWPB 42009030	2009	4	2	30	8	12	0	0%

C-6 (Miami) Canal (WBID 3290)

Fecal coliform concentrations that exceeded the state criterion were observed at 2 of the 3 sampling stations within the WBID (**Figures 5.5i** and **5.5j**). The same exceedance rate (18%) was recorded at both stations. The highest fecal coliform concentration in the WBID (8,000 counts/100mL) was recorded at Station 21FLGW 3572 (**Table 5.5e**). All sampling stations are located on the C-6 Canal. Stations 21FLGW 3572 and 21FLDADEMR08 are co-located; data at these stations were collected by two different agencies (the Department's Tallahassee office and Miami–Dade DERM).

Land use surrounding all stations within the WBID is predominantly industrial and commercial, with some medium- and high-density residential areas in the vicinity.

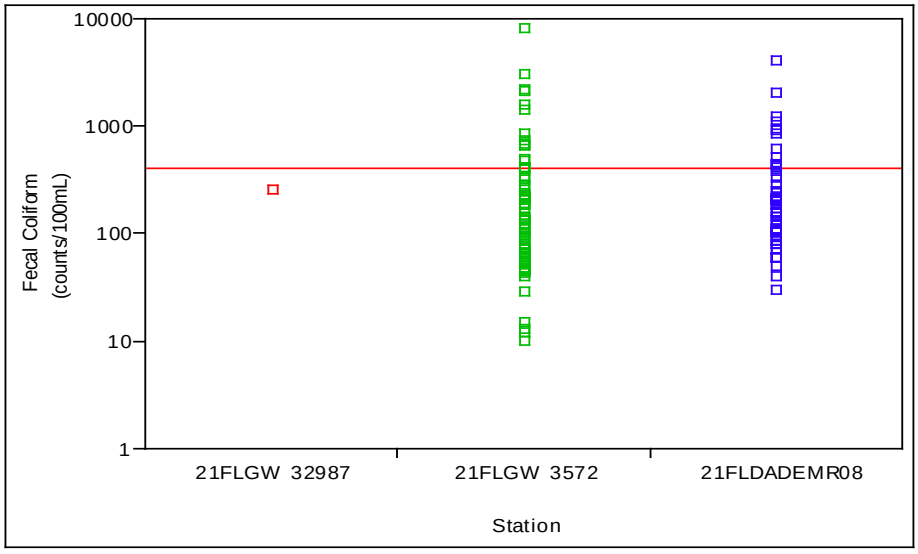

Figure 5.5i. Spatial Fecal Coliform Concentration Trends in the C-6 (Miami) Canal (WBID 3290) by Station During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

Note: The red line indicates the target concentration (400 counts/100mL).

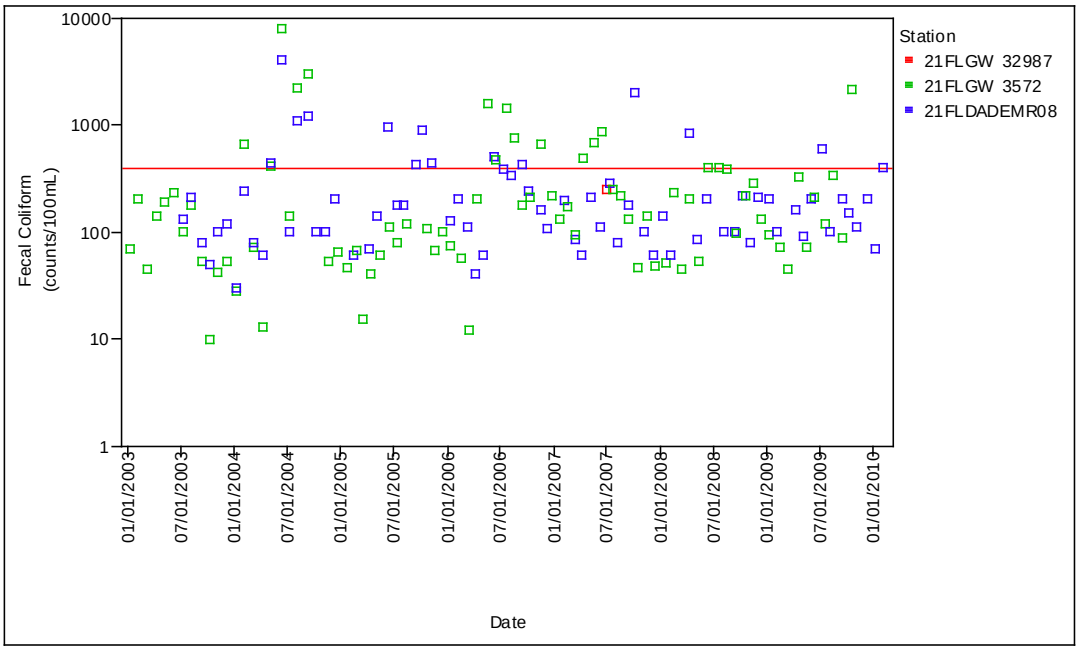

Figure 5.5j. Spatial Fecal Coliform Concentration Trends in the C-6 (Miami) Canal (WBID 3290) by Date During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

Note: The red line indicates the target concentration (400 counts/100mL).

Table 5.5e. Station Summary Statistics of Fecal Coliform Data for the C-6 (Miami) Canal (WBID 3290) During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010)

This is a nine-column table. Column 1 lists the station, Column 2 lists the period of observation, Column 3 lists the number of samples, Column 4 lists the minimum count/100mL, Column 5 lists the maximum count, Column 6 lists the median count, Column 7 lists the mean count, Column 8 lists the number of exceedances, and Column 9 lists the percent exceedances.

[1] Coliform counts are #/100mL.
[2] Exceedances represent values above 400 counts/100mL.

Station	Period of Observation	Number of Samples	Minimum[1]	Maximum[1]	Median[1]	Mean[1]	Number of Exceedances[2]	% Exceedances
21FLDADEMR08	2003–10	73	30	4,000	150	306	13	18%
21FLGW 32987	2007	1	250	250	250	250	0	0%
21FLGW 3572	2003–09	80	10	8,000	130	396	14	18%

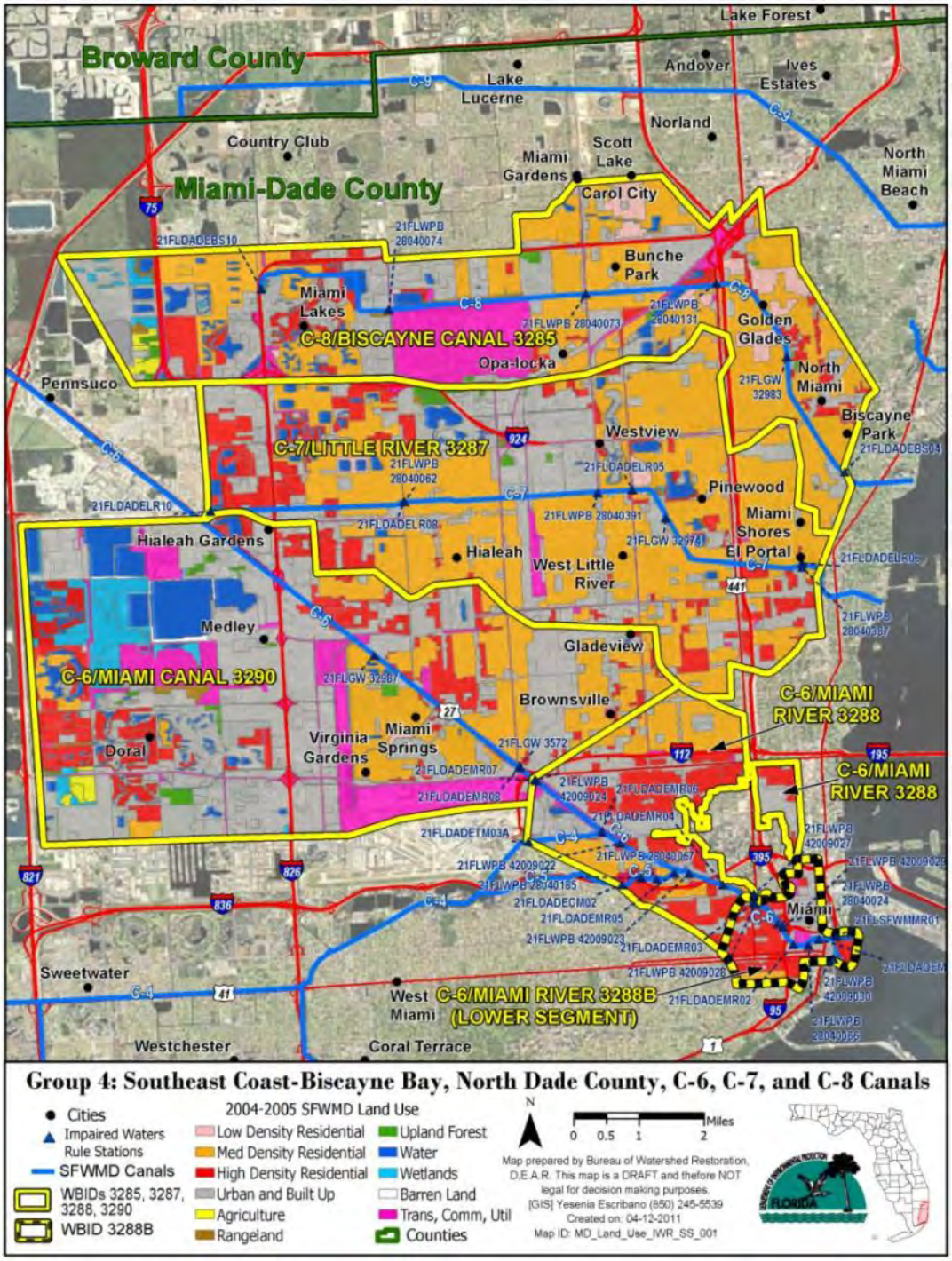

Figure 5.6. Principal Land Uses and Locations of Water Quality Stations with Fecal Coliform Data in WBIDs 3285, 3287, 3288, 3288B, and 3290

5.1.2 Critical Condition

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 with direct access to the receiving water can be more noticeable by contributing to exceedances during dry weather. The critical condition for point source loading typically occurs during periods of low stream flow, when dilution is minimized.

Even though current flow data were available for the freshwater WBIDs, the impact of their hydrologic condition on fecal coliform concentration was analyzed using rainfall data. These canals are highly manipulated and regulated, and may at times have no flow even when there are loadings driven by storm events entering the receiving waters; therefore, using rainfall data is more representative of each watershed's hydrologic conditions. A flow duration curve–type chart that would normally be applied to flow events was created using precipitation data from the SFWMD climate stations (**Table 5.4**). The charted rainfall duration interval was divided in the same manner as if flow were being analyzed, where extreme precipitation events represent the lower percentiles (0–5th percentile), followed by large precipitation events (5th–10th percentile), medium precipitation events (10th–40th percentile), small precipitation events (40th–60th percentile), and no recordable precipitation events (60th–100th percentile). Event precipitation intervals for each WBID were derived based on these percentile ranges and are presented in **Table 5.6.** Three-day (the day of and 2 days prior to sampling) precipitation accumulations were used in the analysis (**Tables 5.7a** through **5.7e** and **Figures 5.7a** through **5.7e**).

Table 5.6. Precipitation Event Ranges for Rainfall Data for WBIDs 3285, 3287, 3288, 3288B, and 3290

This is a seven-column table. Column 1 lists the WBID number, Column 2 lists the rainfall period of record, and Columns 3 through 7 list the event range (in inches).

WBID	Rainfall Period of Record	Extreme Precipitation Event (inches/ 3 days)	Large Precipitation Event (inches/ 3 days)	Medium Precipitation Event (inches/ 3 days)	Small Precipitation Event (inches/ 3 days)	None/ No Measurable Precipitation Event (inches/ 3 days)
3285	1991–2011	> 2.22"	1.42" - 2.22"	0.17" - 1.42"	0.01" - 0.17"	< 0.01"
3287	1991–2011	> 2.22"	1.42" - 2.22"	0.17" - 1.42"	0.01" - 0.17"	< 0.01"
3288	1991–2011	> 2.23"	1.52" - 2.23"	0.14" - 1.52"	0.01" - 0.14"	< 0.01"
3288B	1991–2011	> 2.23"	1.52" - 2.23"	0.14" - 1.52"	0.01" - 0.14"	< 0.01"
3290	1991–2011	> 2.49"	1.67" - 2.49"	0.21" - 1.67"	0.01" - 0.21"	< 0.01"

C-8 (Biscayne) Canal (WBID 3285)

Historical data show that fecal coliform exceedances occurred over all hydrologic conditions. The highest percentage of exceedances (36%) occurred after periods of extreme precipitation. The lowest percentage (9%) occurred after periods of no measurable precipitation.

Given that exceedance rates and exceedances in concentrations followed all of the sampled precipitation events and that other than MS4s, there are no traditional point source dischargers that would contribute to observed levels of fecal coliform bacteria within the WBID boundary, it can be assumed that various nonpoint sources are a major contributing factor to high fecal coliform concentrations in the WBID. While the lowest percentage of exceedances occurred after periods of no or little rainfall, the exceedance rate should not be considered insignificant, as this might indicate that local sources are contributing to elevated fecal coliform concentrations.

Table 5.7a and **Figure 5.7a** show fecal coliform data for the C-8 (Biscayne) Canal (WBID 3285) by hydrologic condition. As fecal coliform exceedances occurred in all the precipitation intervals—extreme, large, medium, small, and not measurable—the target fecal coliform reduction calculated in the following section and shown in **Table 5.8a** is applicable under all rainfall conditions in the C-8 (Biscayne) Canal (WBID 3285).

Table 5.7a. Summary of Fecal Coliform Data During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010) by Hydrologic Condition for the C-8 (Biscayne) Canal (WBID 3285)

This is a seven-column table. Column 1 lists the type of precipitation event, Column 2 lists the event range (in inches), Colum 3 lists the total number of samples, Column 4 lists the number of exceedances, Column 5 lists the percent exceedances, Column 6 lists the number of nonexceedances, and Column 7 lists the percent nonexceedances.

Precipitation Event	Event Range (inches/ 3 days)	Total Samples	Number of Exceedances	% Exceedances	Number of Nonexceedances	% Nonexceedances
Extreme	> 2.22"	14	5	36%	9	64%
Large	1.42" - 2.22"	17	5	29%	12	71%
Medium	0.17" - 1.42"	51	12	24%	39	76%
Small	0.01" - 0.17"	21	3	14%	18	86%
None/ Not Measurable	< 0.01"	56	5	9%	51	91%

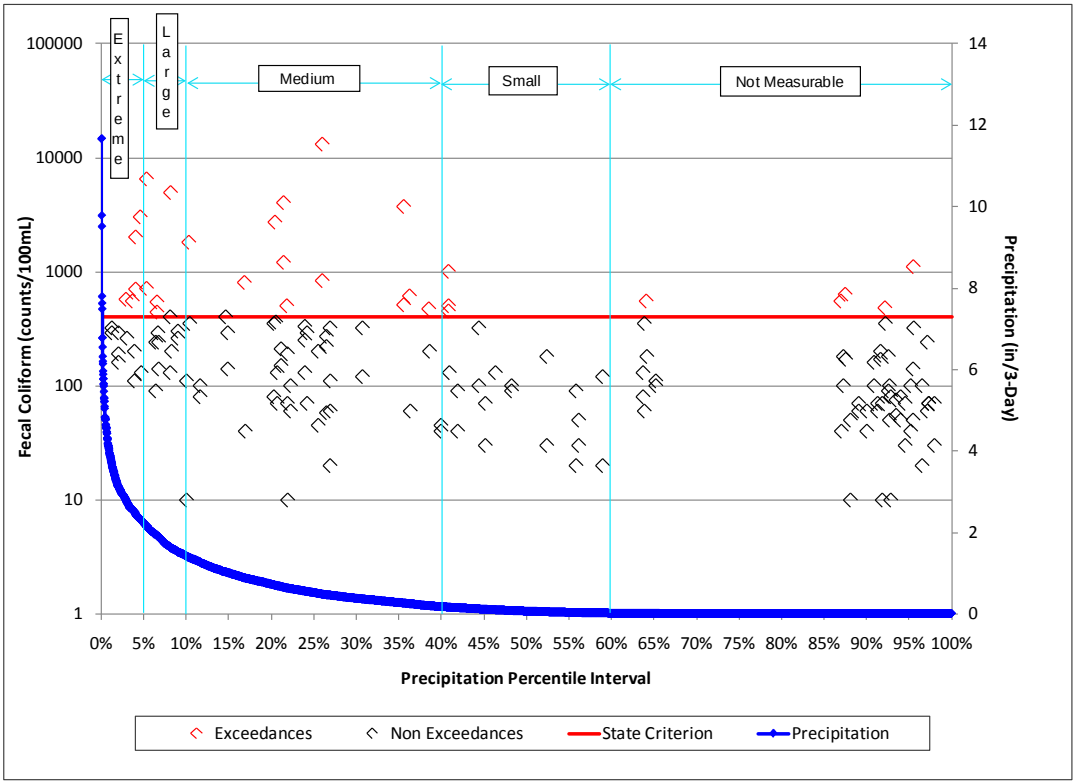

Figure 5.7a. Fecal Coliform Data During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010) by Hydrologic Condition for the C-8 (Biscayne) Canal (WBID 3285)

C-7 (Little River) Canal (WBID 3287)

Historical data show that fecal coliform exceedances occurred over all hydrologic conditions, with exceedances greater than 20% occurring after all sampled events. The highest percentage of exceedances (71%) occurred after periods of extreme precipitation. The lowest percentage (22%) occurred after periods of no measurable precipitation.

Given that exceedance rates and exceedances in concentrations followed all of the sampled precipitation events and that other than MS4s, there are no traditional point source dischargers that would contribute to observed levels of fecal coliform bacteria within the WBID boundary, it can be assumed that various nonpoint sources are a major contributing factor to high fecal coliform concentrations in the WBID. While the lowest percentage of exceedances occurred after periods of no or little rainfall, the exceedance rate should not be considered insignificant, as this might indicate that local sources are contributing to elevated fecal coliform concentrations.

Table 5.7b and **Figure 5.7b** show fecal coliform data for the C-7 (Little River) Canal (WBID 3287) by hydrologic condition. As fecal coliform exceedances occurred in all precipitation intervals—extreme, large, medium, small, and not measurable—the target fecal coliform reduction calculated in the following section and shown in **Table 5.8b** is applicable under all rainfall conditions in the C-7 (Little River) Canal (WBID 3287).

Table 5.7b. Summary of Fecal Coliform Data During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010) by Hydrologic Condition for the C-7 (Little River) Canal (WBID 3287)

This is a seven-column table. Column 1 lists the type of precipitation event, Column 2 lists the event range (in inches), Colum 3 lists the total number of samples, Column 4 lists the number of exceedances, Column 5 lists the percent exceedances, Column 6 lists the number of nonexceedances, and Column 7 lists the percent nonexceedances.

Precipitation Event	Event Range (inches/ 3 days)	Total Samples	Number of Exceedances	% Exceedances	Number of Nonexceedances	% Nonexceedances
Extreme	> 2.22"	24	17	71%	7	29%
Large	1.42" - 2.22"	31	20	65%	11	35%
Medium	0.17" - 1.42"	92	47	51%	45	49%
Small	0.01" - 0.17"	43	14	33%	29	67%
None/ Not Measurable	< 0.01"	123	27	22%	96	78%

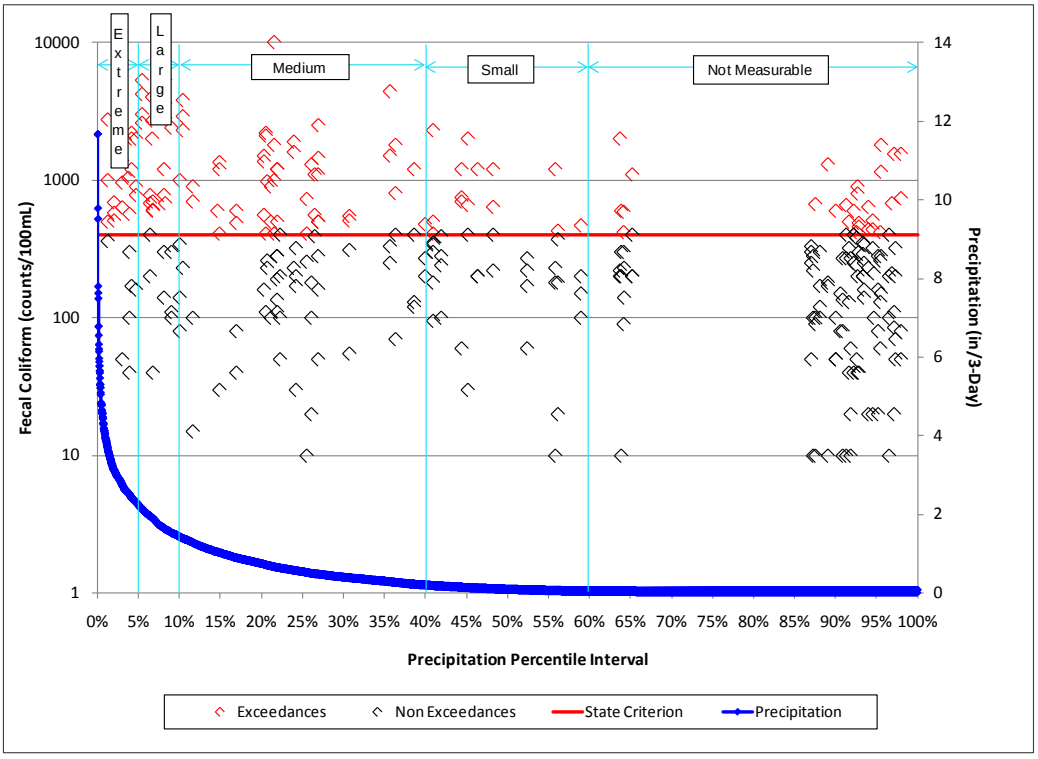

Figure 5.7b. Fecal Coliform Data During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010) by Hydrologic Condition for the C-7 (Little River) Canal (WBID 3287)

C-6 (Miami River) (WBID 3288)

Historical data show that fecal coliform exceedances occurred over all hydrologic conditions, with exceedances greater than 20% occurring after all sampled events. The highest percentage of exceedances (76%) occurred after periods of extreme precipitation. The lowest percentage (20%) occurred after periods of small precipitation.

Given that exceedance rates and exceedances in concentrations followed all of the sampled precipitation events and that other than MS4s, there are no traditional point source dischargers that would contribute to observed levels of fecal coliform bacteria within the WBID boundary, it can be assumed that various nonpoint sources are a major contributing factor to high fecal coliform concentrations in the WBID. The fact that exceedance rates occurred after all precipitation events indicates that both nonpoint sources and local sources are major contributing factors to elevated fecal coliform concentrations.

Table 5.7c and **Figure 5.7c** show fecal coliform data for the C-6 (Miami River) Canal (WBID 3288) by hydrologic condition. As fecal coliform exceedances occurred in all precipitation intervals—extreme, large, medium, small, and not measurable—the target fecal coliform reduction calculated in the following section and shown in **Table 5.8c** is applicable under all rainfall conditions in the C-6 (Miami River) Canal (WBID 3288).

Table 5.7c. Summary of Fecal Coliform Data During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010) by Hydrologic Condition for the C-6 (Miami River) Canal (WBID 3288)

This is a seven-column table. Column 1 lists the type of precipitation event, Column 2 lists the event range (in inches), Colum 3 lists the total number of samples, Column 4 lists the number of exceedances, Column 5 lists the percent exceedances, Column 6 lists the number of nonexceedances, and Column 7 lists the percent nonexceedances.

Precipitation Event	Event Range (inches/ 3 days)	Total Samples	Number of Exceedances	% Exceedances	Number of Nonexceedances	% Nonexceedances
Extreme	> 2.23"	46	35	76%	11	24%
Large	1.52" - 2.23"	11	7	64%	4	36%
Medium	0.14" - 1.52"	131	43	33%	88	67%
Small	0.01" - 0.14"	79	16	20%	63	80%
None/ Not Measurable	< 0.01"	111	26	23%	85	77%

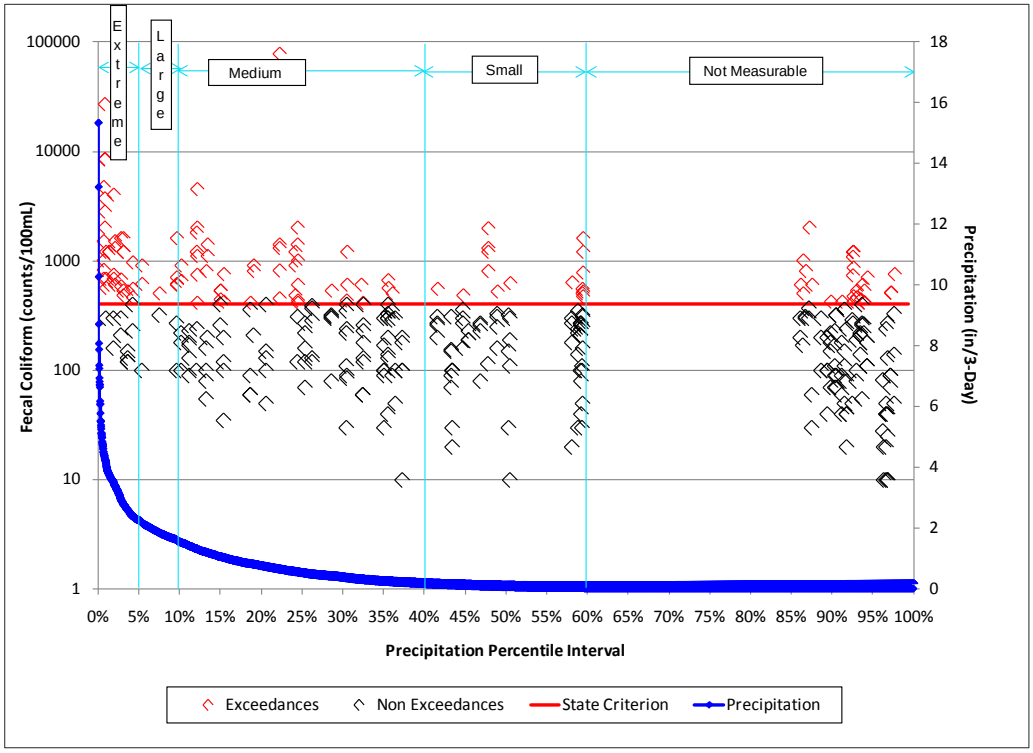

Figure 5.7c. Fecal Coliform Data During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010) by Hydrologic Condition for the C-6 (Miami River) Canal (WBID 3288)

C-6 (Miami River) Lower Segment (WBID 3288B)

Historical data show that fecal coliform exceedances occurred over all hydrologic conditions. The highest percentage of exceedances (80%) occurred after periods of large precipitation. The lowest percentage (17%) occurred after periods of no measurable precipitation.

Given that exceedance rates and exceedances in concentrations followed all of the sampled precipitation events and that other than MS4s, there are no traditional point source dischargers that would contribute to observed levels of fecal coliform bacteria within the WBID boundary, it can be assumed that various nonpoint sources are a major contributing factor to high fecal coliform concentrations in the WBID. While the lowest percentage of exceedances occurred after periods of no or little rainfall, the exceedance rate should not be considered insignificant, as this indicates that local sources are contributing to elevated fecal coliform concentrations. The fact that exceedance rates occurred after all precipitation events indicates that both nonpoint sources and local sources are major contributing factors to elevated fecal coliform concentrations.

Table 5.7d and **Figure 5.7d** show fecal coliform data for the C-6 (Miami River) Lower Segment (WBID 3288B) by hydrologic condition. As fecal coliform exceedances occurred in all precipitation intervals—extreme, large, medium, small, and not measurable—the target fecal coliform reduction calculated in the following section and shown in **Table 5.8d** is applicable under all rainfall conditions in the C-6 (Miami River) Lower Segment (WBID 3288B).

Table 5.7d. Summary of Fecal Coliform Data During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010) by Hydrologic Condition for the C-6 (Miami River) Lower Segment (WBID 3288B)

This is a seven-column table. Column 1 lists the type of precipitation event, Column 2 lists the event range (in inches), Colum 3 lists the total number of samples, Column 4 lists the number of exceedances, Column 5 lists the percent exceedances, Column 6 lists the number of nonexceedances, and Column 7 lists the percent nonexceedances.

Precipitation Event	Event Range (inches/ 3 days)	Total Samples	Number of Exceedances	% Exceedances	Number of Nonexceedances	% Nonexceedances
Extreme	> 2.23"	28	21	75%	7	25%
Large	1.52" - 2.23"	5	4	80%	1	20%
Medium	0.14" - 1.52"	82	42	51%	40	49%
Small	0.01" - 0.14"	46	9	20%	37	80%
None/ Not Measurable	< 0.01"	65	11	17%	54	83%

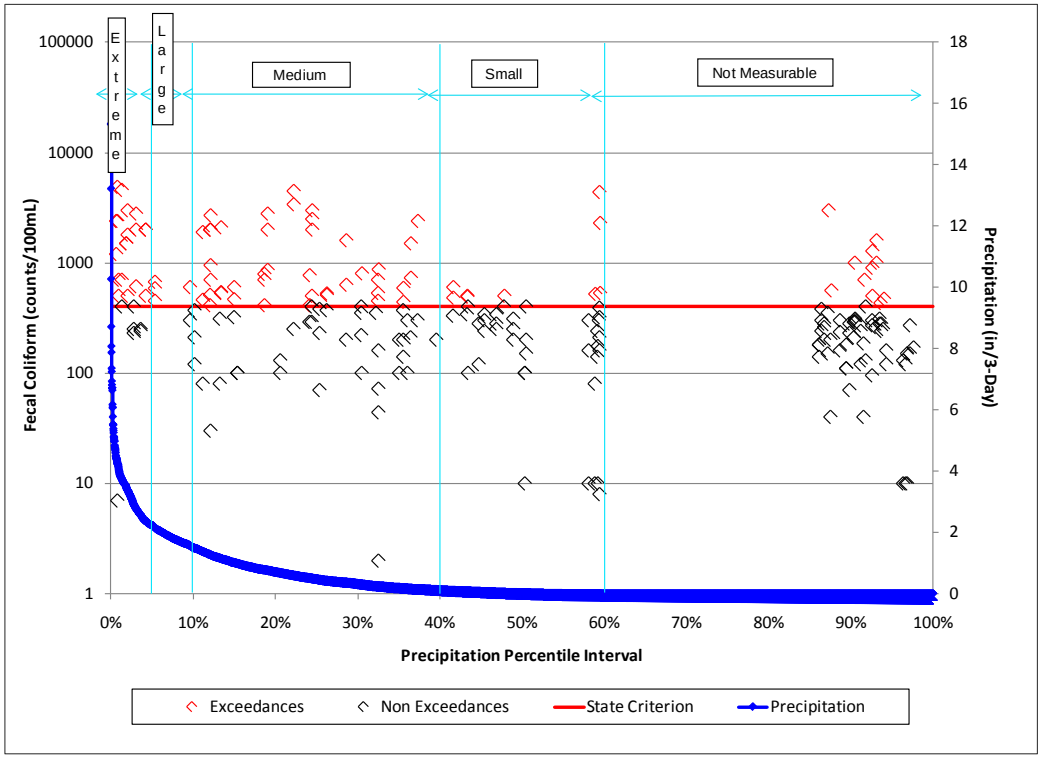

Figure 5.7d. Fecal Coliform Data During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010) by Hydrologic Condition for the C-6 (Miami River) Lower Segment (WBID 3288B)

C-6 (Miami) Canal (WBID 3290)

Historical data show that fecal coliform exceedances occurred over all hydrologic conditions. The highest percentage of exceedances (83%) occurred after periods of extreme precipitation. The lowest percentage (2%) occurred after periods of no measurable precipitation.

Given that exceedance rates and exceedances in concentrations followed all of the sampled precipitation events and that other than MS4s, there are no traditional point source dischargers that would contribute to observed levels of fecal coliform bacteria within the WBID boundary, it can be assumed that various nonpoint sources are a major contributing factor to high fecal coliform concentrations in the WBID. While the lowest percentage of exceedances occurred after periods of no or little rainfall, the exceedance rate should not be considered insignificant, as this might indicate that local sources are contributing to elevated fecal coliform concentrations. The fact that exceedance rates occurred after all precipitation events indicates that both nonpoint sources and local sources are major contributing factors to elevated fecal coliform concentrations.

Table 5.7e and **Figure 5.7e** show fecal coliform data for the C-6 (Miami) Canal (WBID 3290) by hydrologic condition. As fecal coliform exceedances occurred in all precipitation events—extreme, large, medium, small, and not measurable—the target fecal coliform reduction calculated in the following section and shown in **Table 5.8e** is applicable under all rainfall conditions in the C-6 (Miami) Canal (WBID 3290).

Table 5.7e. Summary of Fecal Coliform Data During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010) by Hydrologic Condition for the C-6 (Miami) Canal (WBID 3290)

This is a seven-column table. Column 1 lists the type of precipitation event, Column 2 lists the event range (in inches), Colum 3 lists the total number of samples, Column 4 lists the number of exceedances, Column 5 lists the percent exceedances, Column 6 lists the number of nonexceedances, and Column 7 lists the percent nonexceedances.

Precipitation Event	Event Range (inches/ 3 days)	Total Samples	Number of Exceedances	% Exceedances	Number of Nonexceedances	% Nonexceedances
Extreme	> 2.49"	12	10	83%	2	17%
Large	1.67" - 2.49"	10	6	60%	4	40%
Medium	0.21" - 1.67"	46	7	15%	39	85%
Small	0.01" - 0.21"	29	3	10%	26	90%
None/ Not Measurable	< 0.01"	57	1	2%	56	98%

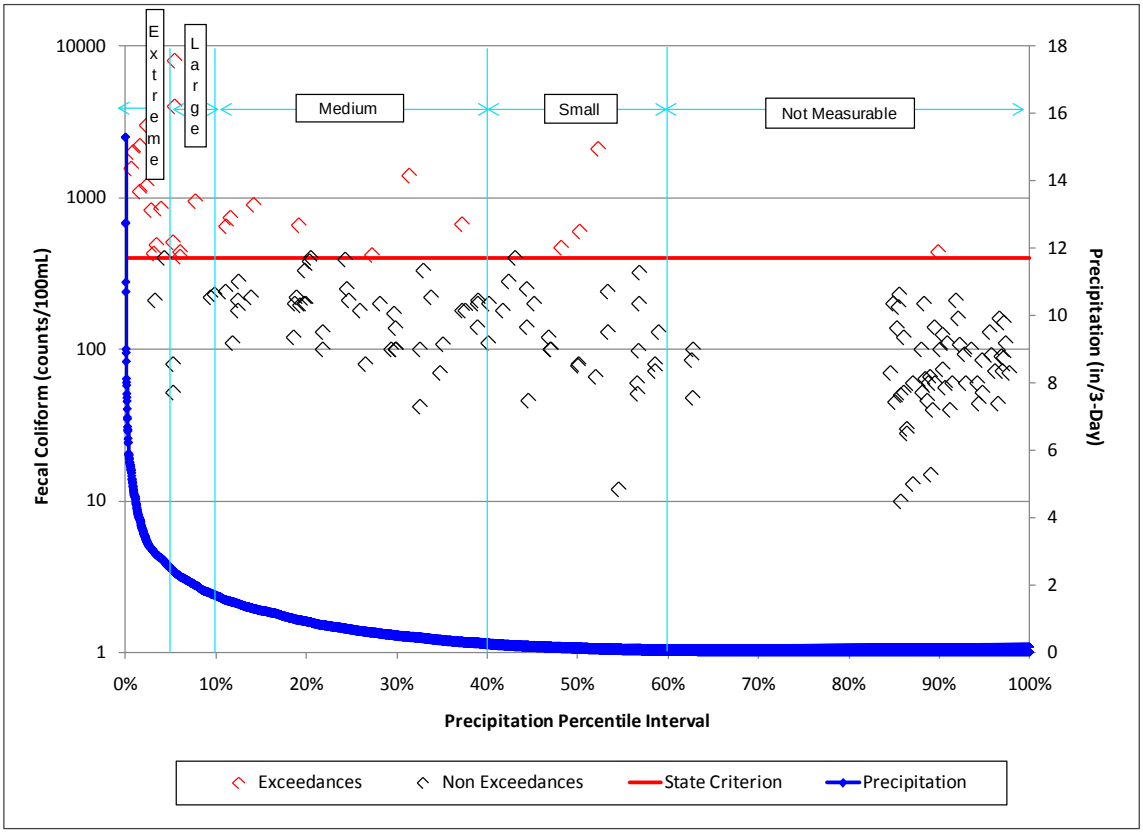

Figure 5.7e. Fecal Coliform Data During the Cycle 2 Verified Period (January 1, 2003–June 30, 2010) by Hydrologic Condition for the C-6 (Miami) Canal (WBID 3290)

5.1.3 TMDL Development Process

A simple reduction calculation was performed to determine the reduction in fecal coliform concentration necessary to achieve the concentration target (400 counts/100mL). The percent reduction needed to reduce the 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, 2003–June 30, 2010). This will result in a target condition that is consistent with the state bacteriological water quality assessment threshold for Class III waters.

In applying this method, all of the available data are ranked (ordered) from the lowest to the highest (**Tables 5.8a** through **5.8e**), 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 is 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; 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 are identified. Next, the fecal coliform concentrations corresponding to the lower and upper percentile values are identified. The fecal coliform concentration difference between the lower and higher percentiles is then calculated and divided by the unit percentile. The unit percentile difference is the difference between the lower and upper percentiles; R is then calculated as R = (fecal coliform concentration $_{upper}$ – fecal coliform concentration $_{lower)}$ / (percentile $_{upper}$ – percentile $_{lower}$).

The C_{lower}, P_{90th}, and *R,* are substituted into **Formula 3** to calculate the 90th percentile fecal coliform concentration.

In several of the WBIDs addressed in this report, more than one of the ranked values was shown to be the 90th percentile value. In these cases, the 90th percentile number (used to represent the existing condition concentration) was determined by calculating the mean value for all data points with a 90th percentile ranking, using **Formula 4:**

$$90^{th}\text{ Percentile Concentration} = (90^{th}_1 + 90^{th}_2 + 90^{th}_{3....} + 90^{th}_n) / n$$

Using **Formula 1**, the percent reductions for the period of observation (January 1, 2003–June 30, 2010) were calculated for WBIDs 3285, 3287, 3288, 3288B, and 3290, and are presented in **Tables 5.8a** through **5.8e** (e.g., for WBID 3290, % reduction needed = [(670 – 400) / 670]*100 = 40%).

Tables 5.8a through **5.8e** present the individual fecal coliform data, the ranks, the percentiles for each individual piece of data, the existing 90th percentile concentration, the allowable concentration (400 counts/100mL), and the percent reduction needed to meet the applicable water quality criterion for fecal coliform.

Table 5.8a. Calculation of Fecal Coliform Reductions for the C-8 (Biscayne) Canal (WBID 3285) TMDL Based on the Hazen Method

This is a five-column table. Column 1 lists the station, Column 2 lists the sample collection date, Column 3 lists the fecal coliform existing concentration (counts/100mL), Column 4 lists the concentration rank, and Column 5 lists the concentration percentile.

- = Empty cell/no data

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADEBS04	4/5/2004	10	1	0%
21FLDADEBS04	6/2/2008	10	2	1%
21FLDADEBS10	5/1/2006	10	3	2%
21FLDADEBS10	1/8/2007	10	4	2%
21FLDADEBS10	8/4/2008	10	5	3%
21FLDADEBS10	3/1/2004	20	6	3%
21FLDADEBS10	8/1/2005	20	7	4%
21FLDADEBS10	11/7/2005	20	8	5%
21FLDADEBS10	2/2/2009	20	9	5%
21FLDADEBS04	11/2/2009	30	10	6%
21FLDADEBS10	4/4/2005	30	11	7%
21FLDADEBS10	8/6/2007	30	12	7%
21FLDADEBS10	12/3/2007	30	13	8%
21FLDADEBS10	2/4/2008	30	14	8%
21FLDADEBS04	1/4/2010	40	15	9%
21FLDADEBS10	10/6/2003	40	16	10%
21FLDADEBS10	5/3/2004	40	17	10%
21FLDADEBS10	5/2/2005	40	18	11%
21FLDADEBS10	6/6/2005	40	19	12%
21FLDADEBS10	5/5/2008	40	20	12%
21FLDADEBS10	11/3/2003	45	21	13%
21FLDADEBS10	1/4/2010	45	22	14%
21FLDADEBS04	12/4/2006	50	23	14%
21FLDADEBS04	12/3/2007	50	24	15%
21FLDADEBS10	4/5/2004	50	25	15%
21FLDADEBS10	11/5/2007	50	26	16%
21FLDADEBS10	9/15/2008	50	27	17%
21FLDADEBS10	4/2/2007	55	28	17%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLWPB 28040074	10/27/2009	58	29	18%
21FLDADEBS04	11/1/2004	60	30	19%
21FLDADEBS04	5/2/2005	60	31	19%
21FLDADEBS04	3/6/2006	60	32	20%
21FLDADEBS10	8/4/2003	60	33	20%
21FLDADEBS10	12/6/2004	60	34	21%
21FLDADEBS10	1/7/2008	60	35	22%
21FLDADEBS10	4/6/2009	60	36	22%
21FLDADEBS10	7/6/2009	60	37	23%
21FLDADEBS04	12/6/2004	70	38	24%
21FLDADEBS04	4/4/2005	70	39	24%
21FLDADEBS04	5/1/2006	70	40	25%
21FLDADEBS04	2/4/2008	70	41	25%
21FLDADEBS04	5/4/2009	70	42	26%
21FLDADEBS10	3/6/2006	70	43	27%
21FLDADEBS10	10/2/2006	70	44	27%
21FLDADEBS10	7/9/2007	70	45	28%
21FLDADEBS10	5/4/2009	70	46	29%
21FLDADEBS10	10/5/2009	70	47	29%
21FLDADEBS10	11/2/2009	70	48	30%
21FLDADEBS04	4/2/2007	75	49	31%
21FLDADEBS04	6/7/2004	80	50	31%
21FLDADEBS04	1/8/2007	80	51	32%
21FLDADEBS04	11/5/2007	80	52	32%
21FLDADEBS10	6/5/2006	80	53	33%
21FLDADEBS10	6/1/2009	80	54	34%
21FLDADEBS04	3/1/2004	90	55	34%
21FLDADEBS04	5/3/2004	90	56	35%
21FLDADEBS04	11/13/2006	90	57	36%
21FLDADEBS10	8/7/2006	90	58	36%
21FLDADEBS10	6/4/2007	90	59	37%
21FLDADEBS04	12/1/2003	100	60	37%
21FLDADEBS04	1/9/2006	100	61	38%
21FLDADEBS04	8/7/2006	100	62	39%
21FLDADEBS04	5/5/2008	100	63	39%
21FLDADEBS04	1/5/2009	100	64	40%
21FLDADEBS04	2/2/2009	100	65	41%
21FLDADEBS04	6/1/2009	100	66	41%
21FLDADEBS04	7/6/2009	100	67	42%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADEBS04	8/3/2009	100	68	42%
21FLDADEBS10	12/4/2006	100	69	43%
21FLDADEBS04	1/7/2008	110	70	44%
21FLDADEBS10	9/8/2003	110	71	44%
21FLDADEBS10	6/2/2008	110	72	45%
21FLDADEBS10	8/3/2009	110	73	46%
21FLDADEBS04	11/7/2005	120	74	46%
21FLDADEBS10	11/3/2008	120	75	47%
21FLDADEBS04	10/5/2009	130	76	47%
21FLDADEBS10	6/7/2004	130	77	48%
21FLDADEBS10	9/13/2004	130	78	49%
21FLDADEBS10	7/11/2005	130	79	49%
21FLDADEBS10	9/12/2005	130	80	50%
21FLDADEBS10	2/1/2010	130	81	51%
21FLWPB 28040074	3/24/2009	130	82	51%
21FLDADEBS04	9/15/2008	140	83	52%
21FLDADEBS10	10/4/2004	140	84	53%
21FLDADEBS10	2/6/2006	140	85	53%
21FLDADEBS10	12/7/2009	150	86	54%
21FLDADEBS10	1/9/2006	160	87	54%
21FLWPB 28040073	8/18/2009	160	88	55%
21FLDADEBS04	1/5/2004	170	89	56%
21FLDADEBS04	4/3/2006	170	90	56%
21FLDADEBS04	2/7/2005	180	91	57%
21FLDADEBS04	8/6/2007	180	92	58%
21FLDADEBS10	12/1/2003	180	93	58%
21FLDADEBS10	11/13/2006	180	94	59%
21FLDADEBS04	7/9/2007	190	95	59%
21FLWPB 28040074	8/18/2009	190	96	60%
21FLDADEBS04	9/8/2003	200	97	61%
21FLDADEBS04	11/3/2003	200	98	61%
21FLDADEBS04	9/10/2007	200	99	62%
21FLDADEBS10	4/3/2006	200	100	63%
21FLDADEBS10	5/7/2007	200	101	63%
21FLDADEBS04	12/7/2009	210	102	64%
21FLWPB 28040131	10/27/2009	220	103	64%
21FLDADEBS04	2/6/2006	240	104	65%
21FLDADEBS04	6/4/2007	240	105	66%
21FLDADEBS04	4/6/2009	240	106	66%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLWPB 28040131	3/24/2009	250	107	67%
21FLDADEBS04	2/2/2004	260	108	68%
21FLDADEBS10	9/14/2009	260	109	68%
21FLWPB 28040073	10/27/2009	270	110	69%
21FLDADEBS04	10/4/2004	290	111	69%
21FLDADEBS04	10/2/2006	290	112	70%
21FLDADEBS10	8/2/2004	290	113	71%
21FLWPB 28040073	5/19/2009	290	114	71%
21FLWPB 28040131	8/18/2009	290	115	72%
21FLDADEBS04	9/14/2009	300	116	73%
21FLDADEBS04	8/2/2004	320	117	73%
21FLDADEBS04	8/1/2005	320	118	74%
21FLDADEBS04	11/3/2008	320	119	75%
21FLDADEBS10	10/6/2008	320	120	75%
21FLDADEBS10	1/5/2009	320	121	76%
21FLWPB 28040073	3/24/2009	330	122	76%
21FLDADEBS04	6/5/2006	350	123	77%
21FLDADEBS04	9/11/2006	350	124	78%
21FLDADEBS10	11/1/2004	350	125	78%
21FLDADEBS10	4/7/2008	350	126	79%
21FLDADEBS10	12/1/2008	360	127	80%
21FLDADEBS04	7/11/2005	400	128	80%
21FLDADEBS04	7/7/2008	400	129	81%
21FLWPB 28040074	5/19/2009	440	130	81%
21FLDADEBS04	7/12/2004	450	131	82%
21FLDADEBS10	9/10/2007	470	132	83%
21FLDADEBS10	9/11/2006	480	133	83%
21FLDADEBS04	9/13/2004	500	134	84%
21FLDADEBS04	8/4/2008	500	135	85%
21FLDADEBS04	7/7/2003	510	136	85%
21FLWPB 28040131	5/19/2009	540	137	86%
21FLDADEBS04	10/6/2003	550	138	86%
21FLDADEBS10	2/7/2005	550	139	87%
21FLGW 32983	7/5/2007	550	140	88%
21FLDADEBS10	2/2/2004	570	141	88%
21FLDADEBS04	8/4/2003	610	142	89%
21FLDADEBS10	**1/5/2004**	**630**	**143**	**90%**
21FLDADEBS10	**10/3/2005**	**700**	**144**	**90%**
21FLDADEBS10	10/1/2007	710	145	91%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADEBS04	6/6/2005	800	146	92%
21FLDADEBS04	7/10/2006	830	147	92%
21FLDADEBS10	7/12/2004	1,000	148	93%
21FLDADEBS04	10/6/2008	1,100	149	93%
21FLDADEBS10	2/5/2007	1,200	150	94%
21FLDADEBS04	4/7/2008	1,800	151	95%
21FLDADEBS04	10/3/2005	2,000	152	95%
21FLDADEBS04	12/1/2008	2,700	153	96%
21FLDADEBS04	9/12/2005	3,000	154	97%
21FLDADEBS10	7/7/2003	3,700	155	97%
21FLDADEBS04	2/5/2007	4,000	156	98%
21FLDADEBS04	5/7/2007	4,900	157	98%
21FLDADEBS04	10/1/2007	6,450	158	99%
21FLDADEBS10	7/10/2006	13,000	159	100%
-	-	-	**Existing condition concentration– 90th percentile (counts/100mL)**	**665**
-	-	-	**Allowable concentration (counts/100mL)**	**400**
-	-	-	**Final % reduction**	**40%**

Note: Boldface type indicates concentration used in percent reduction calculations

Table 5.8b. Calculation of Fecal Coliform Reductions for the C-7 (Little River) Canal (WBID 3287) TMDL Based on the Hazen Method

This is a five-column table. Column 1 lists the station, Column 2 lists the sample collection date, Column 3 lists the fecal coliform existing concentration (counts/100mL), Column 4 lists the concentration rank, and Column 5 lists the concentration percentile.

- = Empty cell/no data

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADELR08	1/9/2006	10	1	0%
21FLDADELR10	11/3/2003	10	2	0%
21FLDADELR10	12/1/2003	10	3	1%
21FLDADELR10	1/5/2004	10	4	1%
21FLDADELR10	3/1/2004	10	5	1%
21FLDADELR10	11/1/2004	10	6	2%
21FLDADELR10	12/6/2004	10	7	2%
21FLDADELR10	3/6/2006	10	8	2%
21FLDADELR10	5/1/2006	10	9	3%
21FLDADELR10	2/2/2009	10	10	3%
21FLDADELR10	6/1/2009	15	11	3%
21FLDADELR08	5/1/2006	20	12	4%
21FLDADELR10	7/10/2006	20	13	4%
21FLDADELR10	11/5/2007	20	14	4%
21FLDADELR10	12/3/2007	20	15	5%
21FLDADELR10	2/4/2008	20	16	5%
21FLDADELR10	5/5/2008	20	17	5%
21FLDADELR10	4/6/2009	20	18	6%
21FLDADELR05	10/2/2006	30	19	6%
21FLDADELR10	10/4/2004	30	20	6%
21FLDADELR10	4/4/2005	30	21	7%
21FLDADELR08	6/6/2005	40	22	7%
21FLDADELR10	9/8/2003	40	23	7%
21FLDADELR10	2/6/2006	40	24	8%
21FLDADELR10	4/3/2006	40	25	8%
21FLDADELR10	9/11/2006	40	26	8%
21FLDADELR10	12/4/2006	40	27	8%
21FLDADELR10	1/8/2007	40	28	9%
21FLDADELR08	5/2/2005	50	29	9%
21FLDADELR10	10/6/2003	50	30	9%
21FLDADELR10	2/2/2004	50	31	10%
21FLDADELR10	5/2/2005	50	32	10%
21FLDADELR10	8/1/2005	50	33	10%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADELR10	11/13/2006	50	34	11%
21FLDADELR10	5/4/2009	50	35	11%
21FLDADELR10	7/6/2009	50	36	11%
21FLDADELR10	11/2/2009	50	37	12%
21FLDADELR10	11/3/2008	55	38	12%
21FLDADELR05	5/1/2006	60	39	12%
21FLDADELR10	8/6/2007	60	40	13%
21FLDADELR10	9/15/2008	60	41	13%
21FLDADELR10	1/5/2009	60	42	13%
21FLDADELR05	5/4/2009	70	43	14%
21FLDADELR10	8/4/2003	70	44	14%
21FLDADELR05	12/5/2005	80	45	14%
21FLDADELR05	5/5/2008	80	46	15%
21FLDADELR06	1/9/2006	80	47	15%
21FLDADELR08	11/2/2009	80	48	15%
21FLDADELR10	6/6/2005	80	49	15%
21FLDADELR10	6/2/2008	80	50	16%
21FLDADELR06	4/6/2009	85	51	16%
21FLDADELR05	1/5/2004	90	52	16%
21FLDADELR10	2/7/2005	90	53	17%
21FLDADELR10	9/13/2004	95	54	17%
21FLDADELR05	3/3/2008	100	55	17%
21FLDADELR05	7/6/2009	100	56	18%
21FLDADELR06	5/2/2005	100	57	18%
21FLDADELR06	11/7/2005	100	58	18%
21FLDADELR06	7/10/2006	100	59	19%
21FLDADELR06	6/1/2009	100	60	19%
21FLDADELR06	12/7/2009	100	61	19%
21FLDADELR08	9/8/2003	100	62	20%
21FLDADELR08	12/1/2003	100	63	20%
21FLDADELR08	1/5/2004	100	64	20%
21FLDADELR08	2/2/2009	100	65	21%
21FLDADELR08	9/14/2009	100	66	21%
21FLDADELR10	4/5/2004	100	67	21%
21FLDADELR10	5/3/2004	100	68	22%
21FLDADELR08	4/6/2009	110	69	22%
21FLDADELR10	8/4/2008	110	70	22%
21FLDADELR10	12/1/2008	110	71	23%
21FLDADELR10	9/14/2009	110	72	23%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADELR05	4/5/2004	120	73	23%
21FLDADELR10	9/10/2007	120	74	23%
21FLDADELR08	4/3/2006	130	75	24%
21FLDADELR08	9/10/2007	130	76	24%
21FLDADELR08	9/15/2008	130	77	24%
21FLDADELR10	1/9/2006	135	78	25%
21FLDADELR10	7/9/2007	135	79	25%
21FLDADELR08	3/7/2005	140	80	25%
21FLDADELR08	4/2/2007	140	81	26%
21FLDADELR08	6/2/2008	140	82	26%
21FLDADELR10	7/11/2005	140	83	26%
21FLDADELR08	12/5/2005	150	84	27%
21FLDADELR10	11/7/2005	150	85	27%
21FLDADELR10	10/6/2008	150	86	27%
21FLDADELR06	4/2/2007	160	87	28%
21FLDADELR08	9/12/2005	160	88	28%
21FLDADELR08	5/5/2008	160	89	28%
21FLDADELR10	6/5/2006	160	90	29%
21FLDADELR10	1/7/2008	160	91	29%
21FLDADELR05	12/6/2004	170	92	29%
21FLDADELR08	4/5/2004	170	93	30%
21FLDADELR08	10/2/2006	170	94	30%
21FLDADELR08	8/6/2007	170	95	30%
21FLDADELR10	10/3/2005	170	96	31%
21FLDADELR05	7/10/2006	180	97	31%
21FLDADELR08	3/1/2004	180	98	31%
21FLDADELR08	7/12/2004	180	99	31%
21FLDADELR08	12/6/2004	180	100	32%
21FLDADELR08	12/3/2007	180	101	32%
21FLDADELR06	7/9/2007	190	102	32%
21FLDADELR05	6/7/2004	200	103	33%
21FLDADELR05	11/1/2004	200	104	33%
21FLDADELR05	11/7/2005	200	105	33%
21FLDADELR05	3/12/2007	200	106	34%
21FLDADELR05	2/2/2009	200	107	34%
21FLDADELR06	10/2/2006	200	108	34%
21FLDADELR06	3/12/2007	200	109	35%
21FLDADELR06	7/6/2009	200	110	35%
21FLDADELR06	8/3/2009	200	111	35%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADELR06	2/1/2010	200	112	36%
21FLDADELR08	12/4/2006	200	113	36%
21FLDADELR08	5/4/2009	200	114	36%
21FLDADELR08	1/4/2010	200	115	37%
21FLDADELR08	2/1/2010	200	116	37%
21FLDADELR10	6/4/2007	200	117	37%
21FLDADELR10	8/3/2009	200	118	38%
21FLDADELR08	3/3/2008	210	119	38%
21FLDADELR08	3/2/2009	210	120	38%
21FLDADELR06	12/1/2003	220	121	38%
21FLDADELR06	8/6/2007	220	122	39%
21FLDADELR08	6/7/2004	220	123	39%
21FLDADELR10	8/7/2006	220	124	39%
21FLDADELR05	3/1/2004	230	125	40%
21FLDADELR05	3/7/2005	230	126	40%
21FLDADELR08	11/5/2007	230	127	40%
21FLDADELR08	10/5/2009	230	128	41%
21FLDADELR10	4/7/2008	230	129	41%
21FLWPB 28040062	3/24/2009	230	130	41%
21FLDADELR06	5/3/2004	240	131	42%
21FLDADELR06	11/13/2006	240	132	42%
21FLDADELR06	10/6/2003	250	133	42%
21FLDADELR08	7/7/2003	250	134	43%
21FLDADELR08	9/11/2006	250	135	43%
21FLDADELR10	4/2/2007	250	136	43%
21FLDADELR05	11/3/2003	255	137	44%
21FLDADELR06	9/15/2008	260	138	44%
21FLDADELR06	10/5/2009	260	139	44%
21FLDADELR05	1/9/2006	270	140	45%
21FLDADELR05	8/6/2007	270	141	45%
21FLDADELR06	5/1/2006	270	142	45%
21FLDADELR06	1/4/2010	270	143	46%
21FLDADELR08	3/6/2006	270	144	46%
21FLDADELR05	12/1/2003	280	145	46%
21FLDADELR05	7/9/2007	280	146	46%
21FLDADELR06	5/5/2008	280	147	47%
21FLDADELR08	5/3/2004	280	148	47%
21FLDADELR08	8/1/2005	280	149	47%
21FLDADELR08	7/9/2007	280	150	48%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADELR08	10/6/2008	280	151	48%
21FLDADELR10	3/12/2007	290	152	48%
21FLDADELR05	9/8/2003	300	153	49%
21FLDADELR05	10/6/2003	300	154	49%
21FLDADELR05	1/8/2007	300	155	49%
21FLDADELR06	4/5/2004	300	156	50%
21FLDADELR06	7/12/2004	300	157	50%
21FLDADELR06	9/14/2009	300	158	50%
21FLDADELR08	11/1/2004	300	159	51%
21FLDADELR08	2/7/2005	300	160	51%
21FLDADELR08	7/11/2005	300	161	51%
21FLDADELR08	11/3/2008	310	162	52%
21FLDADELR05	4/3/2006	320	163	52%
21FLDADELR05	2/4/2008	320	164	52%
21FLDADELR06	5/4/2009	320	165	53%
21FLDADELR10	10/2/2006	320	166	53%
21FLDADELR08	10/6/2003	330	167	53%
21FLDADELR10	7/7/2003	330	168	54%
21FLDADELR05	4/2/2007	340	169	54%
21FLDADELR05	6/2/2008	340	170	54%
21FLDADELR10	7/12/2004	340	171	54%
21FLDADELR06	9/13/2004	350	172	55%
21FLDADELR08	3/12/2007	350	173	55%
21FLDADELR10	8/2/2004	360	174	55%
21FLDADELR05	12/3/2007	370	175	56%
21FLDADELR05	11/13/2006	380	176	56%
21FLDADELR05	5/3/2004	390	177	56%
21FLWPB 28040062	10/27/2009	390	178	57%
21FLDADELR05	4/4/2005	400	179	57%
21FLDADELR05	3/6/2006	400	180	57%
21FLDADELR06	8/4/2003	400	181	58%
21FLDADELR06	8/7/2006	400	182	58%
21FLDADELR06	9/11/2006	400	183	58%
21FLDADELR06	6/4/2007	400	184	59%
21FLDADELR06	9/10/2007	400	185	59%
21FLDADELR06	2/2/2009	400	186	59%
21FLDADELR08	7/6/2009	400	187	60%
21FLDADELR08	8/3/2009	400	188	60%
21FLDADELR06	11/3/2003	410	189	60%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADELR06	12/1/2008	410	190	61%
21FLDADELR08	9/13/2004	410	191	61%
21FLDADELR08	10/4/2004	410	192	61%
21FLDADELR10	2/5/2007	410	193	62%
21FLDADELR05	2/7/2005	420	194	62%
21FLDADELR05	9/15/2008	420	195	62%
21FLDADELR08	11/13/2006	420	196	62%
21FLDADELR06	12/3/2007	430	197	63%
21FLDADELR05	11/5/2007	440	198	63%
21FLDADELR06	2/4/2008	440	199	63%
21FLDADELR08	1/8/2007	460	200	64%
21FLDADELR08	11/7/2005	470	201	64%
21FLDADELR05	1/4/2010	480	202	64%
21FLDADELR05	6/6/2005	490	203	65%
21FLDADELR06	1/8/2007	490	204	65%
21FLDADELR05	9/13/2004	500	205	65%
21FLDADELR05	8/4/2008	500	206	66%
21FLDADELR05	12/7/2009	500	207	66%
21FLDADELR06	8/1/2005	500	208	66%
21FLDADELR06	4/3/2006	500	209	67%
21FLDADELR06	1/7/2008	500	210	67%
21FLDADELR08	8/2/2004	500	211	67%
21FLDADELR06	11/3/2008	510	212	68%
21FLDADELR08	2/4/2008	510	213	68%
21FLWPB 28040387	8/18/2009	510	214	68%
21FLDADELR05	11/3/2008	550	215	69%
21FLDADELR06	6/5/2006	560	216	69%
21FLWPB 28040387	10/27/2009	560	217	69%
21FLDADELR06	9/8/2003	570	218	69%
21FLWPB 28040062	8/18/2009	580	219	70%
21FLDADELR06	2/7/2005	590	220	70%
21FLDADELR05	5/2/2005	600	221	70%
21FLDADELR05	9/11/2006	600	222	71%
21FLDADELR06	11/1/2004	600	223	71%
21FLDADELR06	6/6/2005	600	224	71%
21FLDADELR08	2/6/2006	600	225	72%
21FLDADELR08	7/7/2008	600	226	72%
21FLDADELR06	2/6/2006	610	227	72%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADELR05	2/2/2004	635	228	73%
21FLDADELR05	8/7/2006	640	229	73%
21FLDADELR06	11/5/2007	640	230	73%
21FLDADELR06	3/6/2006	660	231	74%
21FLDADELR08	4/4/2005	660	232	74%
21FLDADELR06	1/5/2004	670	233	74%
21FLDADELR05	3/2/2009	680	234	75%
21FLDADELR08	6/4/2007	680	235	75%
21FLDADELR10	5/7/2007	680	236	75%
21FLWPB 28040391	8/18/2009	690	237	76%
21FLDADELR05	2/6/2006	700	238	76%
21FLDADELR08	1/5/2009	700	239	76%
21FLDADELR08	6/1/2009	700	240	77%
21FLDADELR08	11/3/2003	730	241	77%
21FLDADELR06	11/2/2009	740	242	77%
21FLDADELR06	1/5/2009	750	243	77%
21FLDADELR05	7/11/2005	780	244	78%
21FLDADELR05	6/4/2007	780	245	78%
21FLDADELR10	9/12/2005	780	246	78%
21FLDADELR05	12/4/2006	800	247	79%
21FLDADELR08	8/4/2003	805	248	79%
21FLDADELR05	9/12/2005	900	249	79%
21FLDADELR05	6/1/2009	900	250	80%
21FLDADELR06	12/4/2006	900	251	80%
21FLDADELR08	12/7/2009	900	252	80%
21FLDADELR08	2/2/2004	960	253	81%
21FLDADELR05	10/5/2009	980	254	81%
21FLDADELR05	8/2/2004	1,000	255	81%
21FLDADELR06	2/5/2007	1,000	256	82%
21FLDADELR06	6/2/2008	1,000	257	82%
21FLGW 32974	7/5/2007	1,040	258	82%
21FLDADELR05	8/1/2005	1,100	259	83%
21FLDADELR05	8/3/2009	1,100	260	83%
21FLWPB 28040391	10/27/2009	1,100	261	83%
21FLDADELR06	10/6/2008	1,150	262	84%
21FLDADELR05	10/4/2004	1,200	263	84%
21FLDADELR05	9/10/2007	1,200	264	84%
21FLDADELR05	1/5/2009	1,200	265	85%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADELR05	2/1/2010	1,200	266	85%
21FLDADELR06	3/1/2004	1,200	267	85%
21FLDADELR06	7/11/2005	1,200	268	85%
21FLDADELR06	10/3/2005	1,200	269	86%
21FLDADELR06	8/4/2008	1,200	270	86%
21FLDADELR08	8/7/2006	1,200	271	86%
21FLDADELR08	8/4/2008	1,200	272	87%
21FLDADELR06	12/6/2004	1,300	273	87%
21FLDADELR08	7/10/2006	1,300	274	87%
21FLDADELR06	10/4/2004	1,350	275	88%
21FLDADELR05	6/5/2006	1,365	276	88%
21FLDADELR06	2/2/2004	1,380	277	88%
21FLDADELR05	1/7/2008	1,450	278	89%
21FLDADELR08	6/5/2006	1,500	279	89%
21FLDADELR06	7/7/2003	1,505	280	89%
21FLDADELR05	**4/6/2009**	**1,550**	**281**	**90%**
21FLDADELR05	**11/2/2009**	**1,550**	**282**	**90%**
21FLWPB 28040391	**3/24/2009**	**1,600**	**283**	**90%**
21FLDADELR05	8/4/2003	1,800	284	91%
21FLDADELR05	2/5/2007	1,800	285	91%
21FLDADELR05	10/6/2008	1,800	286	91%
21FLWPB 28040387	3/24/2009	1,900	287	92%
21FLDADELR06	6/7/2004	2,000	288	92%
21FLDADELR06	4/4/2005	2,000	289	92%
21FLDADELR06	9/12/2005	2,000	290	92%
21FLDADELR08	10/3/2005	2,000	291	93%
21FLWPB 28040391	5/19/2009	2,000	292	93%
21FLDADELR08	12/1/2008	2,100	293	93%
21FLDADELR05	10/3/2005	2,200	294	94%
21FLDADELR05	12/1/2008	2,200	295	94%
21FLDADELR05	7/12/2004	2,300	296	94%
21FLDADELR06	4/7/2008	2,300	297	95%
21FLDADELR05	9/14/2009	2,400	298	95%
21FLDADELR08	1/7/2008	2,500	299	95%
21FLDADELR05	10/1/2007	2,600	300	96%
21FLWPB 28040062	5/19/2009	2,700	301	96%
21FLDADELR06	8/2/2004	2,750	302	96%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADELR08	5/7/2007	2,800	303	97%
21FLDADELR08	4/7/2008	2,900	304	97%
21FLDADELR10	10/1/2007	3,000	305	97%
21FLDADELR05	5/7/2007	3,600	306	98%
21FLDADELR05	4/7/2008	3,800	307	98%
21FLWPB 28040387	5/19/2009	4,000	308	98%
21FLDADELR06	10/1/2007	4,200	309	99%
21FLDADELR05	7/7/2003	4,400	310	99%
21FLDADELR06	5/7/2007	5,300	311	99%
21FLDADELR08	10/1/2007	5,300	312	100%
21FLDADELR08	2/5/2007	10,000	313	100%
-	-	-	**Existing condition concentration–90th percentile (counts/100mL)**	**1,567**
-	-	-	**Allowable concentration (counts/100mL)**	**400**
-	-	-	**Final % reduction**	**74%**

Note: Boldface type indicates concentration used in percent reduction calculations

Table 5.8c. Calculation of Fecal Coliform Reductions for the C-6 (Miami River) Canal (WBID 3288) TMDL Based on the Hazen Method

This is a five-column table. Column 1 lists the station, Column 2 lists the sample collection date, Column 3 lists the fecal coliform existing concentration (counts/100mL), Column 4 lists the concentration rank, and Column 5 lists the concentration percentile.

- = Empty cell/no data

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADEMR04	4/7/2009	10	1	0%
21FLDADEMR04	5/5/2009	10	2	0%
21FLDADEMR05	1/9/2007	10	3	1%
21FLDADEMR06	3/3/2009	10	4	1%
21FLDADEMR07	2/3/2009	10	5	1%
21FLDADEMR07	5/5/2009	10	6	1%
21FLDADEMR06	8/5/2008	20	7	2%
21FLDADEMR07	2/8/2005	20	8	2%
21FLDADEMR07	5/2/2006	20	9	2%
21FLDADEMR07	3/3/2009	20	10	3%
21FLDADEMR07	4/7/2009	20	11	3%
21FLDADETM03A	5/5/2009	25	12	3%
21FLWPB 28040185	2/23/2009	28	13	3%
21FLDADEMR04	7/6/2004	30	14	4%
21FLDADEMR06	4/3/2007	30	15	4%
21FLDADEMR06	9/9/2008	30	16	4%
21FLDADEMR07	4/6/2004	30	17	4%
21FLDADEMR07	4/5/2005	30	18	5%
21FLDADEMR07	8/5/2008	30	19	5%
21FLDADETM03A	8/4/2009	30	20	5%
21FLDADETM03A	7/7/2009	35	21	5%
21FLDADEMR04	5/2/2006	40	22	6%
21FLDADEMR05	5/2/2006	40	23	6%
21FLDADEMR05	4/7/2009	40	24	6%
21FLDADEMR06	3/7/2006	40	25	6%
21FLDADEMR06	6/5/2007	40	26	7%
21FLDADEMR06	5/5/2009	40	27	7%
21FLDADEMR07	3/8/2005	40	28	7%
21FLDADEMR07	5/6/2008	40	29	8%
21FLDADETM03A	4/7/2009	40	30	8%
21FLDADECM02	4/4/2006	50	31	8%
21FLDADEMR04	10/5/2004	50	32	8%
21FLDADEMR05	10/6/2009	50	33	9%
21FLDADEMR06	11/14/2006	50	34	9%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADEMR06	6/3/2008	50	35	9%
21FLDADEMR06	4/7/2009	50	36	9%
21FLDADEMR07	1/5/2010	50	37	10%
21FLDADEMR06	11/6/2007	55	38	10%
21FLDADEMR06	11/4/2008	55	39	10%
21FLDADECM02	2/7/2006	60	40	10%
21FLDADECM02	3/7/2006	60	41	11%
21FLDADEMR04	4/6/2004	60	42	11%
21FLDADEMR06	11/8/2004	60	43	11%
21FLDADEMR07	11/8/2004	60	44	12%
21FLDADEMR07	2/7/2006	60	45	12%
21FLDADECM02	10/3/2006	70	46	12%
21FLDADEMR06	8/2/2005	70	47	12%
21FLDADEMR06	11/8/2005	70	48	13%
21FLDADEMR06	12/6/2005	70	49	13%
21FLDADEMR07	5/3/2005	70	50	13%
21FLDADETM03A	11/3/2009	70	51	13%
21FLDADECM02	8/8/2006	80	52	14%
21FLDADEMR04	5/6/2008	80	53	14%
21FLDADEMR06	7/12/2005	80	54	14%
21FLDADEMR06	5/2/2006	80	55	14%
21FLDADEMR06	3/13/2007	80	56	15%
21FLDADEMR07	4/4/2006	80	57	15%
21FLDADEMR07	11/4/2008	80	58	15%
21FLWPB 28040067	2/23/2009	82	59	15%
21FLDADETM03A	9/15/2009	85	60	16%
21FLDADEMR06	9/13/2005	90	61	16%
21FLDADEMR06	2/7/2006	90	62	16%
21FLDADEMR06	10/3/2006	90	63	17%
21FLDADEMR06	8/4/2009	90	64	17%
21FLDADEMR06	11/3/2009	90	65	17%
21FLDADEMR07	11/8/2005	90	66	17%
21FLDADEMR07	12/6/2005	90	67	18%
21FLDADEMR07	3/7/2006	90	68	18%
21FLDADEMR07	9/15/2009	90	69	18%
21FLDADEMR07	11/3/2009	90	70	18%
21FLDADEMR07	12/8/2009	90	71	19%
21FLDADECM02	8/5/2008	100	72	19%
21FLDADECM02	2/3/2009	100	73	19%
21FLDADEMR04	3/8/2005	100	74	19%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADEMR04	3/13/2007	100	75	20%
21FLDADEMR04	6/3/2008	100	76	20%
21FLDADEMR04	8/5/2008	100	77	20%
21FLDADEMR04	9/9/2008	100	78	21%
21FLDADEMR04	2/3/2009	100	79	21%
21FLDADEMR04	7/7/2009	100	80	21%
21FLDADEMR04	8/4/2009	100	81	21%
21FLDADEMR05	8/5/2008	100	82	22%
21FLDADEMR05	11/4/2008	100	83	22%
21FLDADEMR05	8/4/2009	100	84	22%
21FLDADEMR06	8/5/2003	100	85	22%
21FLDADEMR06	10/5/2004	100	86	23%
21FLDADEMR06	12/7/2004	100	87	23%
21FLDADEMR06	3/8/2005	100	88	23%
21FLDADEMR06	6/7/2005	100	89	23%
21FLDADEMR07	5/4/2004	100	90	24%
21FLDADEMR07	3/4/2008	100	91	24%
21FLDADETM03A	6/2/2009	100	92	24%
21FLDADECM02	11/8/2005	110	93	24%
21FLDADEMR06	4/5/2005	110	94	25%
21FLDADEMR06	4/4/2006	110	95	25%
21FLDADEMR06	1/9/2007	110	96	25%
21FLDADEMR06	2/5/2008	110	97	26%
21FLDADEMR07	2/5/2008	110	98	26%
21FLDADEMR07	9/9/2008	110	99	26%
21FLDADEMR06	1/6/2009	115	100	26%
21FLDADEMR04	10/7/2008	120	101	27%
21FLDADEMR05	8/2/2005	120	102	27%
21FLDADEMR06	9/9/2003	120	103	27%
21FLDADEMR06	7/7/2009	120	104	27%
21FLDADEMR07	9/11/2007	120	105	28%
21FLDADEMR07	10/7/2008	120	106	28%
21FLWPB 28040185	3/25/2009	120	107	28%
21FLDADECM02	6/3/2008	130	108	28%
21FLDADECM02	5/5/2009	130	109	29%
21FLDADEMR05	9/13/2005	130	110	29%
21FLDADEMR05	12/2/2008	130	111	29%
21FLDADEMR06	9/11/2007	130	112	29%
21FLDADEMR06	10/7/2008	130	113	30%
21FLWPB 42009027	3/25/2009	130	114	30%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADEMR04	4/3/2007	140	115	30%
21FLDADEMR04	7/10/2007	140	116	31%
21FLDADEMR06	1/5/2010	140	117	31%
21FLDADEMR07	12/2/2008	140	118	31%
21FLDADEMR04	4/4/2006	150	119	31%
21FLDADEMR05	10/7/2008	150	120	32%
21FLDADEMR06	7/6/2004	150	121	32%
21FLDADEMR06	5/3/2005	150	122	32%
21FLDADEMR07	10/3/2006	150	123	32%
21FLDADEMR07	6/3/2008	150	124	33%
21FLDADEMR05	10/3/2006	155	125	33%
21FLDADEMR04	1/8/2008	160	126	33%
21FLDADEMR04	11/4/2008	160	127	33%
21FLDADEMR05	9/12/2006	160	128	34%
21FLDADEMR07	8/2/2005	160	129	34%
21FLDADEMR07	4/8/2008	160	130	34%
21FLWPB 42009022	10/28/2009	160	131	35%
21FLDADEMR04	12/2/2003	170	132	35%
21FLDADEMR05	11/8/2005	170	133	35%
21FLDADEMR07	9/13/2005	170	134	35%
21FLDADEMR07	8/4/2009	170	135	36%
21FLDADEMR04	2/8/2005	180	136	36%
21FLDADEMR04	5/3/2005	180	137	36%
21FLDADEMR04	9/13/2005	180	138	36%
21FLDADEMR04	2/5/2008	180	139	37%
21FLDADEMR05	6/7/2005	180	140	37%
21FLDADEMR05	3/7/2006	180	141	37%
21FLDADEMR05	2/5/2008	180	142	37%
21FLDADEMR06	2/3/2009	180	143	38%
21FLWPB 42009022	3/25/2009	180	144	38%
21FLDADEMR04	7/8/2003	190	145	38%
21FLDADEMR04	1/9/2007	190	146	38%
21FLDADEMR06	7/8/2003	190	147	39%
21FLDADEMR07	3/13/2007	190	148	39%
21FLDADEMR04	2/3/2004	200	149	39%
21FLDADEMR04	12/7/2004	200	150	40%
21FLDADEMR04	1/10/2006	200	151	40%
21FLDADEMR05	3/8/2005	200	152	40%
21FLDADEMR05	2/3/2009	200	153	40%
21FLDADEMR05	7/7/2009	200	154	41%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADEMR06	12/2/2008	200	155	41%
21FLDADEMR07	10/7/2003	200	156	41%
21FLDADECM02	7/10/2007	210	157	41%
21FLDADEMR05	10/4/2005	210	158	42%
21FLDADEMR05	3/4/2008	210	159	42%
21FLDADEMR06	7/10/2007	210	160	42%
21FLDADEMR06	3/4/2008	210	161	42%
21FLDADEMR07	6/8/2004	210	162	43%
21FLDADECM02	4/5/2005	220	163	43%
21FLDADECM02	5/3/2005	220	164	43%
21FLDADECM02	8/2/2005	220	165	44%
21FLDADEMR04	6/7/2005	220	166	44%
21FLDADEMR04	12/4/2007	220	167	44%
21FLDADEMR05	7/10/2007	220	168	44%
21FLDADEMR07	4/3/2007	220	169	45%
21FLDADECM02	9/13/2005	230	170	45%
21FLDADEMR04	7/12/2005	230	171	45%
21FLDADEMR04	11/8/2005	230	172	45%
21FLDADEMR06	6/6/2006	230	173	46%
21FLDADEMR07	7/8/2003	230	174	46%
21FLWPB 28040067	3/25/2009	230	175	46%
21FLDADECM02	5/2/2006	240	176	46%
21FLDADECM02	4/7/2009	240	177	47%
21FLDADEMR05	4/3/2007	240	178	47%
21FLDADEMR06	5/6/2008	240	179	47%
21FLDADEMR06	9/15/2009	240	180	47%
21FLWPB 42009027	8/19/2009	240	181	48%
21FLDADEMR04	9/12/2006	250	182	48%
21FLWPB 42009023	10/28/2009	250	183	48%
21FLDADECM02	7/12/2005	260	184	49%
21FLDADECM02	1/10/2006	260	185	49%
21FLDADECM02	5/6/2008	260	186	49%
21FLDADEMR07	2/6/2007	260	187	49%
21FLDADEMR07	11/6/2007	260	188	50%
21FLWPB 42009024	3/25/2009	260	189	50%
21FLDADEMR06	12/4/2007	265	190	50%
21FLDADEMR04	8/2/2005	270	191	50%
21FLDADEMR04	11/6/2007	270	192	51%
21FLDADEMR04	3/4/2008	270	193	51%
21FLDADEMR05	7/12/2005	270	194	51%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADEMR05	1/8/2008	270	195	51%
21FLDADEMR05	5/6/2008	270	196	52%
21FLDADEMR05	5/5/2009	270	197	52%
21FLDADEMR06	2/8/2005	270	198	52%
21FLDADEMR06	12/5/2006	270	199	53%
21FLDADEMR07	1/10/2006	270	200	53%
21FLDADEMR07	6/2/2009	270	201	53%
21FLDADEMR04	9/11/2007	285	202	53%
21FLDADEMR05	11/14/2006	290	203	54%
21FLDADEMR06	12/8/2009	290	204	54%
21FLDADECM02	10/4/2005	300	205	54%
21FLDADECM02	8/4/2009	300	206	54%
21FLDADEMR04	10/7/2003	300	207	55%
21FLDADEMR04	6/5/2007	300	208	55%
21FLDADEMR05	2/8/2005	300	209	55%
21FLDADEMR05	8/8/2006	300	210	55%
21FLDADEMR05	6/5/2007	300	211	56%
21FLDADEMR05	2/2/2010	300	212	56%
21FLDADEMR06	1/8/2008	300	213	56%
21FLDADEMR06	4/8/2008	300	214	56%
21FLDADEMR07	1/6/2004	300	215	57%
21FLDADEMR07	3/2/2004	300	216	57%
21FLDADEMR07	10/5/2004	300	217	57%
21FLDADEMR07	12/7/2004	300	218	58%
21FLDADEMR07	1/9/2007	300	219	58%
21FLDADECM02	8/7/2007	310	220	58%
21FLDADEMR04	1/6/2004	310	221	58%
21FLDADEMR04	10/3/2006	310	222	59%
21FLDADEMR06	1/10/2006	310	223	59%
21FLDADEMR06	9/12/2006	310	224	59%
21FLDADEMR07	8/8/2006	310	225	59%
21FLWPB 28040185	10/28/2009	310	226	60%
21FLDADEMR04	12/6/2005	320	227	60%
21FLDADEMR04	8/8/2006	320	228	60%
21FLDADEMR05	12/6/2005	320	229	60%
21FLDADEMR06	10/6/2009	320	230	61%
21FLDADEMR07	7/6/2004	320	231	61%
21FLWPB 28040067	6/22/2009	320	232	61%
21FLDADECM02	1/5/2010	330	233	62%
21FLDADEMR07	9/12/2006	330	234	62%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADEMR07	6/5/2007	330	235	62%
21FLDADECM02	4/3/2007	350	236	62%
21FLDADECM02	12/8/2009	350	237	63%
21FLDADEMR04	4/5/2005	350	238	63%
21FLDADEMR05	2/7/2006	360	239	63%
21FLDADEMR05	4/4/2006	360	240	63%
21FLDADEMR07	1/8/2008	360	241	64%
21FLDADECM02	9/11/2007	370	242	64%
21FLDADEMR04	3/2/2004	370	243	64%
21FLDADEMR05	9/11/2007	390	244	64%
21FLDADECM02	6/6/2006	400	245	65%
21FLDADEMR04	12/2/2008	400	246	65%
21FLDADEMR04	9/15/2009	400	247	65%
21FLDADEMR05	11/6/2007	400	248	65%
21FLDADEMR05	6/3/2008	400	249	66%
21FLDADEMR06	2/6/2007	400	250	66%
21FLWPB 42009023	3/25/2009	400	251	66%
21FLDADEMR04	11/8/2004	410	252	67%
21FLDADEMR04	2/7/2006	410	253	67%
21FLDADEMR04	8/7/2007	410	254	67%
21FLDADEMR07	12/4/2007	410	255	67%
21FLWPB 42009022	8/19/2009	410	256	68%
21FLDADECM02	12/4/2007	415	257	68%
21FLDADECM02	12/5/2006	420	258	68%
21FLDADEMR04	3/7/2006	420	259	68%
21FLDADEMR05	5/3/2005	420	260	69%
21FLDADEMR07	7/7/2009	420	261	69%
21FLDADEMR05	4/5/2005	430	262	69%
21FLDADEMR06	8/7/2007	430	263	69%
21FLDADEMR04	2/6/2007	440	264	70%
21FLDADEMR07	7/10/2007	440	265	70%
21FLDADEMR06	7/11/2006	450	266	70%
21FLDADECM02	3/13/2007	460	267	71%
21FLDADEMR07	6/6/2006	460	268	71%
21FLDADEMR04	12/5/2006	470	269	71%
21FLDADEMR07	10/6/2009	470	270	71%
21FLDADECM02	1/8/2008	480	271	72%
21FLDADEMR04	11/4/2003	480	272	72%
21FLDADEMR05	5/8/2007	480	273	72%
21FLDADEMR05	9/9/2008	500	274	72%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADEMR05	12/8/2009	500	275	73%
21FLDADEMR07	12/2/2003	500	276	73%
21FLWPB 28040185	6/22/2009	500	277	73%
21FLDADECM02	11/3/2009	505	278	73%
21FLDADEMR05	11/3/2009	510	279	74%
21FLDADECM02	9/12/2006	520	280	74%
21FLDADECM02	10/7/2008	520	281	74%
21FLWPB 42009024	10/28/2009	520	282	74%
21FLDADECM02	2/6/2007	530	283	75%
21FLDADEMR05	2/6/2007	530	284	75%
21FLDADEMR05	3/13/2007	530	285	75%
21FLDADEMR05	12/4/2007	530	286	76%
21FLDADEMR06	8/8/2006	530	287	76%
21FLDADEMR07	5/8/2007	530	288	76%
21FLDADECM02	9/9/2008	550	289	76%
21FLDADEMR04	6/6/2006	550	290	77%
21FLDADEMR05	1/10/2006	550	291	77%
21FLDADECM02	12/2/2008	560	292	77%
21FLDADEMR07	2/2/2010	560	293	77%
21FLDADEMR06	10/4/2005	580	294	78%
21FLDADECM02	11/6/2007	600	295	78%
21FLDADEMR04	6/2/2009	600	296	78%
21FLDADEMR05	8/7/2007	600	297	78%
21FLDADEMR05	7/8/2008	600	298	79%
21FLDADEMR05	9/15/2009	600	299	79%
21FLDADEMR06	10/7/2003	600	300	79%
21FLDADEMR06	4/6/2004	600	301	79%
21FLDADEMR07	8/3/2004	600	302	80%
21FLDADEMR07	9/7/2004	600	303	80%
21FLDADEMR04	5/4/2004	610	304	80%
21FLDADEMR06	6/2/2009	610	305	81%
21FLDADECM02	1/9/2007	620	306	81%
21FLDADECM02	2/8/2005	630	307	81%
21FLDADEMR07	6/7/2005	650	308	81%
21FLDADECM02	6/5/2007	660	309	82%
21FLDADEMR07	10/4/2005	670	310	82%
21FLDADEMR05	10/2/2007	680	311	82%
21FLDADEMR05	4/8/2008	680	312	82%
21FLDADEMR06	2/2/2010	680	313	83%
21FLDADECM02	2/5/2008	700	314	83%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADEMR05	6/2/2009	700	315	83%
21FLDADECM02	11/14/2006	730	316	83%
21FLDADEMR04	4/8/2008	740	317	84%
21FLWPB 42009023	8/19/2009	740	318	84%
21FLDADECM02	7/7/2009	750	319	84%
21FLDADEMR05	1/5/2010	750	320	85%
21FLDADECM02	10/6/2009	775	321	85%
21FLDADECM02	11/4/2008	800	322	85%
21FLDADEMR04	1/6/2009	800	323	85%
21FLDADEMR06	1/6/2004	800	324	86%
21FLDADEMR06	6/8/2004	800	325	86%
21FLDADEMR05	7/11/2006	810	326	86%
21FLDADEMR07	10/2/2007	820	327	86%
21FLDADEMR07	12/5/2006	860	328	87%
21FLDADECM02	6/7/2005	900	329	87%
21FLDADEMR04	6/8/2004	900	330	87%
21FLDADEMR06	5/4/2004	900	331	87%
21FLDADEMR07	11/4/2003	900	332	88%
21FLDADEMR05	6/6/2006	960	333	88%
21FLDADEMR06	12/2/2003	1,000	334	88%
21FLDADEMR06	10/2/2007	1,000	335	88%
21FLDADEMR07	8/7/2007	1,000	336	89%
21FLDADEMR07	11/14/2006	1,080	337	89%
21FLDADEMR07	2/3/2004	1,100	338	89%
21FLWPB 42009024	**8/19/2009**	**1,100**	**339**	**90%**
21FLDADEMR04	**11/14/2006**	**1,195**	**340**	**90%**
21FLDADECM02	**5/8/2007**	**1,200**	**341**	**90%**
21FLDADECM02	**1/6/2009**	**1,200**	**342**	**90%**
21FLDADECM02	9/15/2009	1,200	343	91%
21FLDADECM02	2/2/2010	1,200	344	91%
21FLDADEMR04	8/3/2004	1,200	345	91%
21FLDADEMR05	12/5/2006	1,200	346	91%
21FLDADEMR06	11/4/2003	1,200	347	92%
21FLDADEMR06	8/3/2004	1,200	348	92%
21FLDADEMR06	5/8/2007	1200	349	92%
21FLDADEMR07	8/5/2003	1,200	350	92%
21FLWPB 28040067	10/28/2009	1,200	351	93%
21FLDADECM02	7/11/2006	1,300	352	93%
21FLDADEMR05	1/6/2009	1,300	353	93%
21FLDADEMR06	9/7/2004	1,300	354	94%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADEMR04	7/11/2006	1,400	355	94%
21FLDADEMR06	2/3/2004	1,400	356	94%
21FLDADEMR07	9/9/2003	1,400	357	94%
21FLDADEMR04	9/7/2004	1,500	358	95%
21FLDADEMR04	10/2/2007	1,500	359	95%
21FLDADECM02	6/2/2009	1,600	360	95%
21FLDADEMR04	10/4/2005	1,600	361	95%
21FLDADEMR04	5/8/2007	1,600	362	96%
21FLWPB 42009027	10/28/2009	1,600	363	96%
21FLDADEMR04	8/5/2003	1,800	364	96%
21FLDADEMR07	1/6/2009	1,970	365	96%
21FLDADEMR04	9/9/2003	2,000	366	97%
21FLDADEMR06	3/2/2004	2,000	367	97%
21FLWPB 28040185	8/19/2009	2,000	368	97%
21FLWPB 42009024	5/20/2009	2,000	369	97%
21FLWPB 42009022	5/20/2009	2,800	370	98%
21FLWPB 42009023	5/20/2009	3,700	371	98%
21FLDADECM02	4/8/2008	4,000	372	98%
21FLWPB 28040067	8/19/2009	4,500	373	99%
21FLDADECM02	10/2/2007	4,700	374	99%
21FLWPB 28040067	5/20/2009	8,400	375	99%
21FLWPB 28040185	5/20/2009	8,500	376	99%
21FLWPB 42009027	5/20/2009	27,000	377	100%
21FLDADEMR07	7/11/2006	78,000	378	100%
-	-	-	**Existing condition concentration– 90th percentile (counts/100mL)**	**1,174**
-	-	-	**Allowable concentration (counts/100mL)**	**400**
-	-	-	**Final % reduction**	**66%**

Note: Boldface type indicates concentration used in percent reduction calculations

Table 5.8d. Calculation of Fecal Coliform Reductions for the C-6 (Miami River) Lower Segment (WBID 3288B) TMDL Based on the Hazen Method

This is a five-column table. Column 1 lists the station, Column 2 lists the sample collection date, Column 3 lists the fecal coliform existing concentration (counts/100mL), Column 4 lists the concentration rank, and Column 5 lists the concentration percentile.

- = Empty cell/no data

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLWPB 42009030	3/25/2009	2	1	0%
21FLWPB 42009030	5/20/2009	7	2	1%
21FLWPB 42009030	10/28/2009	8	3	1%
21FLDADEMR01	7/6/2004	10	4	2%
21FLDADEMR01	2/8/2005	10	5	2%
21FLDADEMR01	4/3/2007	10	6	2%
21FLDADEMR01	5/6/2008	10	7	3%
21FLDADEMR01	3/3/2009	10	8	3%
21FLDADEMR01	4/7/2009	10	9	4%
21FLDADEMR01	5/5/2009	10	10	4%
21FLWPB 42009030	8/19/2009	30	11	5%
21FLDADEMR01	4/6/2004	40	12	5%
21FLDADEMR01	4/4/2006	40	13	6%
21FLWPB 42009028	3/25/2009	44	14	6%
21FLDADEMR01	8/2/2005	70	15	6%
21FLDADEMR03	5/3/2005	70	16	7%
21FLWPB 28040024	3/25/2009	72	17	7%
21FLDADEMR03	9/13/2005	80	18	8%
21FLDADEMR03	4/3/2007	80	19	8%
21FLDADEMR03	11/4/2008	80	20	9%
21FLDADEMR01	12/5/2006	95	21	9%
21FLDADEMR02	7/6/2004	100	22	10%
21FLDADEMR03	7/6/2004	100	23	10%
21FLDADEMR03	6/3/2008	100	24	10%
21FLDADEMR03	8/5/2008	100	25	11%
21FLDADEMR01	7/7/2009	100	26	11%
21FLDADEMR01	12/8/2009	100	27	12%
21FLDADEMR03	7/7/2009	100	28	12%
21FLDADEMR03	8/4/2009	100	29	13%
21FLDADEMR03	9/15/2009	100	30	13%
21FLDADEMR01	3/8/2005	110	31	13%
21FLDADEMR02	3/8/2005	110	32	14%
21FLDADEMR02	6/7/2005	120	33	14%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADEMR01	3/7/2006	120	34	15%
21FLDADEMR01	1/8/2008	120	35	15%
21FLDADEMR01	2/5/2008	120	36	16%
21FLDADEMR03	4/7/2009	120	37	16%
21FLDADEMR03	5/2/2006	130	38	17%
21FLDADEMR01	6/3/2008	130	39	17%
21FLDADEMR03	3/3/2009	130	40	17%
21FLDADEMR02	10/7/2003	140	41	18%
21FLDADEMR01	3/4/2008	140	42	18%
21FLDADEMR03	12/2/2008	140	43	19%
21FLDADEMR01	3/2/2004	150	44	19%
21FLDADEMR01	1/9/2007	150	45	20%
21FLDADEMR01	11/3/2009	150	46	20%
21FLDADEMR03	5/5/2009	150	47	21%
21FLDADEMR01	12/7/2004	160	48	21%
21FLDADEMR02	2/8/2005	160	49	21%
21FLDADEMR03	2/5/2008	160	50	22%
21FLWPB 28040066	3/25/2009	160	51	22%
21FLWPB 28040066	10/28/2009	160	52	23%
21FLDADEMR03	1/5/2010	170	53	23%
21FLDADEMR03	5/6/2008	175	54	24%
21FLDADEMR01	10/7/2003	180	55	24%
21FLDADEMR03	10/7/2003	180	56	25%
21FLDADEMR03	3/8/2005	180	57	25%
21FLDADEMR02	4/4/2006	185	58	25%
21FLDADEMR02	1/6/2004	200	59	26%
21FLDADEMR03	4/6/2004	200	60	26%
21FLDADEMR02	8/8/2006	200	61	27%
21FLDADEMR02	9/12/2006	200	62	27%
21FLDADEMR03	1/9/2007	200	63	28%
21FLDADEMR01	12/2/2008	200	64	28%
21FLDADEMR01	8/4/2009	200	65	29%
21FLDADEMR01	3/2/2010	200	66	29%
21FLDADEMR01	10/5/2004	210	67	29%
21FLDADEMR01	11/8/2005	210	68	30%
21FLDADEMR03	6/7/2005	210	69	30%
21FLDADEMR01	10/6/2009	210	70	31%
21FLDADEMR01	4/5/2005	220	71	31%
21FLDADEMR01	5/3/2005	230	72	32%
21FLDADEMR01	10/4/2005	230	73	32%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADEMR02	8/2/2005	230	74	33%
21FLDADEMR03	12/7/2004	235	75	33%
21FLDADEMR01	7/8/2003	240	76	33%
21FLDADEMR01	12/2/2003	240	77	34%
21FLDADEMR02	3/7/2006	240	78	34%
21FLDADEMR01	11/6/2007	240	79	35%
21FLDADEMR01	10/7/2008	240	80	35%
21FLDADEMR03	3/4/2008	240	81	36%
21FLDADEMR02	7/12/2005	250	82	36%
21FLDADEMR03	10/4/2005	250	83	37%
21FLDADEMR01	9/12/2006	250	84	37%
21FLDADEMR02	7/11/2006	250	85	37%
21FLDADEMR01	12/4/2007	250	86	38%
21FLDADEMR03	10/7/2008	250	87	38%
21FLDADEMR03	1/6/2004	260	88	39%
21FLDADEMR03	3/13/2007	260	89	39%
21FLDADEMR03	3/7/2006	270	90	40%
21FLDADEMR03	12/5/2006	270	91	40%
21FLDADEMR03	11/3/2009	270	92	40%
21FLDADEMR01	1/6/2004	280	93	41%
21FLDADEMR01	7/12/2005	280	94	41%
21FLDADEMR02	5/3/2005	280	95	42%
21FLDADEMR01	7/10/2007	280	96	42%
21FLDADEMR03	11/6/2007	280	97	43%
21FLDADEMR03	1/8/2008	280	98	43%
21FLDADEMR01	9/9/2003	290	99	44%
21FLDADEMR01	11/4/2003	290	100	44%
21FLDADEMR02	12/6/2005	290	101	44%
21FLDADEMR03	11/8/2005	290	102	45%
21FLDADEMR02	7/8/2003	300	103	45%
21FLDADEMR03	12/2/2003	300	104	46%
21FLDADEMR02	12/7/2004	300	105	46%
21FLDADEMR01	12/6/2005	300	106	47%
21FLDADEMR03	2/8/2005	300	107	47%
21FLDADEMR02	12/5/2006	300	108	48%
21FLDADEMR01	9/9/2008	300	109	48%
21FLDADEMR01	2/3/2009	300	110	48%
21FLDADEMR03	6/2/2009	300	111	49%
21FLDADEMR03	12/8/2009	300	112	49%
21FLDADEMR03	12/6/2005	310	113	50%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADEMR03	9/12/2006	310	114	50%
21FLDADEMR03	7/10/2007	310	115	51%
21FLDADEMR01	11/4/2008	310	116	51%
21FLDADEMR01	2/6/2007	320	117	52%
21FLWPB 28040024	10/28/2009	320	118	52%
21FLDADEMR01	1/10/2006	330	119	52%
21FLDADEMR03	7/8/2003	340	120	53%
21FLDADEMR03	7/12/2005	340	121	53%
21FLDADEMR03	10/3/2006	340	122	54%
21FLDADEMR02	3/2/2004	350	123	54%
21FLDADEMR02	4/5/2005	350	124	55%
21FLDADEMR03	7/8/2008	350	125	55%
21FLDADEMR01	6/7/2005	370	126	56%
21FLDADEMR01	6/5/2007	370	127	56%
21FLDADEMR03	9/11/2007	370	128	56%
21FLDADEMR02	12/2/2003	380	129	57%
21FLDADEMR03	8/2/2005	380	130	57%
21FLDADEMR03	10/6/2009	390	131	58%
21FLDADEMR03	9/9/2003	400	132	58%
21FLDADEMR03	8/3/2004	400	133	59%
21FLDADEMR02	10/4/2005	400	134	59%
21FLDADEMR03	4/5/2005	400	135	60%
21FLDADEMR02	5/2/2006	400	136	60%
21FLDADEMR02	1/9/2007	400	137	60%
21FLDADEMR01	8/5/2008	400	138	61%
21FLDADEMR01	1/6/2009	400	139	61%
21FLDADEMR01	8/5/2003	410	140	62%
21FLDADEMR02	11/4/2003	410	141	62%
21FLDADEMR03	2/7/2006	410	142	63%
21FLDADEMR02	7/10/2007	430	143	63%
21FLDADEMR03	6/5/2007	440	144	63%
21FLDADEMR01	5/4/2004	450	145	64%
21FLDADEMR03	11/8/2004	450	146	64%
21FLDADEMR02	9/13/2005	460	147	65%
21FLDADEMR02	2/6/2007	465	148	65%
21FLDADEMR03	12/4/2007	470	149	66%
21FLDADEMR02	1/10/2006	480	150	66%
21FLDADEMR02	10/3/2006	490	151	67%
21FLDADEMR02	9/9/2003	500	152	67%
21FLDADEMR03	9/7/2004	500	153	67%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADEMR01	10/3/2006	500	154	68%
21FLDADEMR02	11/14/2006	500	155	68%
21FLDADEMR03	6/6/2006	500	156	69%
21FLDADEMR03	1/6/2009	500	157	69%
21FLDADEMR03	2/2/2010	500	158	70%
21FLDADEMR02	8/5/2003	510	159	70%
21FLDADEMR01	9/11/2007	510	160	71%
21FLDADEMR02	4/3/2007	520	161	71%
21FLDADEMR02	9/11/2007	525	162	71%
21FLDADEMR01	2/3/2004	530	163	72%
21FLDADEMR02	11/8/2004	530	164	72%
21FLWPB 42009028	10/28/2009	530	165	73%
21FLDADEMR02	2/3/2004	540	166	73%
21FLDADEMR02	4/6/2004	560	167	74%
21FLDADEMR03	5/4/2004	585	168	74%
21FLDADEMR02	6/5/2007	590	169	75%
21FLDADEMR03	1/10/2006	600	170	75%
21FLDADEMR03	2/6/2007	600	171	75%
21FLDADEMR01	6/2/2009	600	172	76%
21FLDADEMR01	5/8/2007	610	173	76%
21FLDADEMR03	8/8/2006	630	174	77%
21FLDADEMR02	5/4/2004	670	175	77%
21FLDADEMR01	8/3/2004	700	176	78%
21FLDADEMR01	11/8/2004	700	177	78%
21FLDADEMR02	2/7/2006	700	178	79%
21FLDADEMR03	4/4/2006	700	179	79%
21FLWPB 28040066	8/19/2009	700	180	79%
21FLDADEMR01	2/2/2010	700	181	80%
21FLDADEMR03	10/5/2004	730	182	80%
21FLDADEMR03	11/4/2003	770	183	81%
21FLDADEMR01	2/7/2006	790	184	81%
21FLDADEMR01	9/15/2009	800	185	82%
21FLDADEMR01	6/8/2004	860	186	82%
21FLWPB 42009029	3/25/2009	870	187	83%
21FLDADEMR03	11/14/2006	900	188	83%
21FLWPB 42009029	8/19/2009	950	189	83%
21FLDADEMR02	11/8/2005	1,000	190	84%
21FLDADEMR01	3/13/2007	1,000	191	84%
21FLDADEMR03	10/2/2007	1,200	192	85%
21FLDADEMR01	11/14/2006	1,280	193	85%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADEMR02	10/5/2004	1,500	194	86%
21FLDADEMR01	4/8/2008	1,500	195	86%
21FLDADEMR03	4/8/2008	1,500	196	87%
21FLDADEMR01	8/8/2006	1,600	197	87%
21FLDADEMR02	3/13/2007	1,600	198	87%
21FLDADEMR01	9/7/2004	1,800	199	88%
21FLDADEMR01	9/13/2005	1,900	200	88%
21FLDADEMR03	8/5/2003	2,000	201	89%
21FLDADEMR02	6/8/2004	2,000	202	89%
21FLDADEMR01	**6/6/2006**	**2,000**	**203**	**90%**
21FLDADEMR02	**6/6/2006**	**2000**	**204**	**90%**
21FLDADEMR01	**8/7/2007**	**2,000**	**205**	**90%**
21FLDADEMR03	5/8/2007	2,000	206	91%
21FLWPB 28040024	8/19/2009	2,000	207	91%
21FLDADEMR03	2/3/2004	2,100	208	92%
21FLWPB 42009029	10/28/2009	2,300	209	92%
21FLDADEMR01	10/2/2007	2,400	210	93%
21FLDADEMR03	2/3/2009	2,400	211	93%
21FLWPB 28040066	5/20/2009	2,400	212	94%
21FLDADEMR02	8/7/2007	2,500	213	94%
21FLWPB 42009028	8/19/2009	2,700	214	94%
21FLDADEMR03	6/8/2004	2,800	215	95%
21FLDADEMR02	5/8/2007	2,800	216	95%
21FLDADEMR02	9/7/2004	3,000	217	96%
21FLDADEMR03	3/2/2004	3,000	218	96%
21FLDADEMR03	8/7/2007	3,000	219	97%
21FLDADEMR03	7/11/2006	3,400	220	97%
21FLDADEMR03	9/9/2008	4,400	221	98%
21FLDADEMR01	7/11/2006	4,500	222	98%
21FLDADEMR02	8/3/2004	4,600	223	98%
21FLWPB 28040024	5/20/2009	4,900	224	99%
21FLWPB 42009028	5/20/2009	8,200	225	99%
21FLWPB 42009029	5/20/2009	27,000	226	100%
-	**-**	**-**	**Existing condition concentration–90th percentile (counts/100mL)**	**2,000**
-	**-**	**-**	**Allowable concentration (counts/100mL)**	**400**
-	**-**	**-**	**Final % reduction**	**80%**

Note: Boldface type indicates concentration used in percent reduction calculations

Table 5.8e. Calculation of Fecal Coliform Reductions for the C-6 (Miami River) Canal (WBID 3290) TMDL Based on the Hazen Method

This is a five-column table. Column 1 lists the station, Column 2 lists the sample collection date, Column 3 lists the fecal coliform existing concentration (counts/100mL), Column 4 lists the concentration rank, and Column 5 lists the concentration percentile.

- = Empty cell/no data

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLGW 3572	10/7/2003	10	1	0%
21FLGW 3572	3/15/2006	12	2	1%
21FLGW 3572	4/6/2004	13	3	2%
21FLGW 3572	3/15/2005	15	4	2%
21FLGW 3572	1/6/2004	28	5	3%
21FLDADEMR08	1/6/2004	30	6	4%
21FLDADEMR08	4/4/2006	40	7	4%
21FLGW 3572	4/12/2005	40	8	5%
21FLGW 3572	11/4/2003	42	9	6%
21FLGW 3572	3/12/2008	44	10	6%
21FLGW 3572	3/12/2009	44	11	7%
21FLGW 3572	3/4/2003	45	12	7%
21FLGW 3572	1/19/2005	46	13	8%
21FLGW 3572	10/16/2007	46	14	9%
21FLGW 3572	12/13/2007	48	15	9%
21FLDADEMR08	10/7/2003	50	16	10%
21FLGW 3572	1/16/2008	51	17	11%
21FLGW 3572	9/9/2003	52	18	11%
21FLGW 3572	12/2/2003	52	19	12%
21FLGW 3572	11/18/2004	52	20	13%
21FLGW 3572	5/8/2008	52	21	13%
21FLGW 3572	2/15/2006	56	22	14%
21FLDADEMR08	4/6/2004	60	23	15%
21FLDADEMR08	2/8/2005	60	24	15%
21FLDADEMR08	5/2/2006	60	25	16%
21FLDADEMR08	4/3/2007	60	26	17%
21FLDADEMR08	12/4/2007	60	27	17%
21FLDADEMR08	2/5/2008	60	28	18%
21FLGW 3572	5/11/2005	60	29	19%
21FLGW 3572	12/20/2004	64	30	19%
21FLGW 3572	2/22/2005	66	31	20%
21FLGW 3572	11/16/2005	66	32	20%
21FLDADEMR08	4/5/2005	70	33	21%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADEMR08	1/5/2010	70	34	22%
21FLGW 3572	1/7/2003	70	35	22%
21FLGW 3572	3/2/2004	72	36	23%
21FLGW 3572	2/12/2009	72	37	24%
21FLGW 3572	5/14/2009	72	38	24%
21FLGW 3572	1/11/2006	74	39	25%
21FLGW 3572	7/13/2005	78	40	26%
21FLDADEMR08	9/9/2003	80	41	26%
21FLDADEMR08	3/2/2004	80	42	27%
21FLDADEMR08	8/7/2007	80	43	28%
21FLDADEMR08	11/4/2008	80	44	28%
21FLDADEMR08	3/13/2007	85	45	29%
21FLDADEMR08	5/6/2008	85	46	30%
21FLGW 3572	9/17/2009	88	47	30%
21FLDADEMR08	5/5/2009	90	48	31%
21FLGW 3572	1/8/2009	92	49	31%
21FLGW 3572	3/15/2007	93	50	32%
21FLGW 3572	9/18/2008	98	51	33%
21FLDADEMR08	11/4/2003	100	52	33%
21FLDADEMR08	7/6/2004	100	53	34%
21FLDADEMR08	10/5/2004	100	54	35%
21FLDADEMR08	11/8/2004	100	55	35%
21FLDADEMR08	11/6/2007	100	56	36%
21FLDADEMR08	8/5/2008	100	57	37%
21FLDADEMR08	9/9/2008	100	58	37%
21FLDADEMR08	2/3/2009	100	59	38%
21FLDADEMR08	8/4/2009	100	60	39%
21FLGW 3572	7/8/2003	100	61	39%
21FLGW 3572	12/14/2005	100	62	40%
21FLDADEMR08	12/5/2006	107.5	63	41%
21FLGW 3572	10/19/2005	108	64	41%
21FLDADEMR08	3/7/2006	110	65	42%
21FLDADEMR08	6/5/2007	110	66	43%
21FLDADEMR08	11/3/2009	110	67	43%
21FLGW 3572	6/14/2005	110	68	44%
21FLDADEMR08	12/2/2003	120	69	44%
21FLGW 3572	8/10/2005	120	70	45%
21FLGW 3572	7/16/2009	120	71	46%
21FLDADEMR08	1/10/2006	125	72	46%
21FLDADEMR08	7/8/2003	130	73	47%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLGW 3572	1/18/2007	130	74	48%
21FLGW 3572	9/12/2007	130	75	48%
21FLGW 3572	12/11/2008	130	76	49%
21FLGW 3572	4/8/2003	138	77	50%
21FLGW 3572	7/6/2004	138	78	50%
21FLDADEMR08	5/3/2005	140	79	51%
21FLDADEMR08	1/8/2008	140	80	52%
21FLGW 3572	11/15/2007	140	81	52%
21FLDADEMR08	10/6/2009	150	82	53%
21FLDADEMR08	11/14/2006	160	83	54%
21FLDADEMR08	4/7/2009	160	84	54%
21FLGW 3572	2/13/2007	172	85	55%
21FLDADEMR08	7/12/2005	180	86	56%
21FLDADEMR08	8/2/2005	180	87	56%
21FLDADEMR08	9/11/2007	180	88	57%
21FLGW 3572	8/5/2003	180	89	57%
21FLGW 3572	9/13/2006	180	90	58%
21FLGW 3572	5/6/2003	190	91	59%
21FLDADEMR08	2/6/2007	195	92	59%
21FLDADEMR08	12/7/2004	200	93	60%
21FLDADEMR08	2/7/2006	200	94	61%
21FLDADEMR08	6/3/2008	200	95	61%
21FLDADEMR08	1/6/2009	200	96	62%
21FLDADEMR08	6/2/2009	200	97	63%
21FLDADEMR08	9/15/2009	200	98	63%
21FLDADEMR08	12/8/2009	200	99	64%
21FLGW 3572	2/4/2003	200	100	65%
21FLGW 3572	4/12/2006	200	101	65%
21FLGW 3572	4/10/2008	200	102	66%
21FLDADEMR08	8/5/2003	210	103	67%
21FLDADEMR08	5/8/2007	210	104	67%
21FLDADEMR08	12/2/2008	210	105	68%
21FLGW 3572	10/11/2006	210	106	69%
21FLGW 3572	6/11/2009	210	107	69%
21FLDADEMR08	10/7/2008	220	108	70%
21FLGW 3572	12/21/2006	220	109	70%
21FLGW 3572	8/16/2007	220	110	71%
21FLGW 3572	10/16/2008	220	111	72%
21FLGW 3572	6/3/2003	230	112	72%
21FLGW 3572	2/14/2008	230	113	73%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLDADEMR08	2/3/2004	240	114	74%
21FLDADEMR08	10/3/2006	240	115	74%
21FLGW 32987	6/28/2007	250	116	75%
21FLGW 3572	7/19/2007	250	117	76%
21FLDADEMR08	7/10/2007	280	118	76%
21FLGW 3572	11/13/2008	280	119	77%
21FLGW 3572	4/16/2009	320	120	78%
21FLDADEMR08	8/8/2006	330	121	78%
21FLGW 3572	8/13/2009	330	122	79%
21FLDADEMR08	7/11/2006	380	123	80%
21FLGW 3572	8/14/2008	390	124	80%
21FLDADEMR08	2/2/2010	400	125	81%
21FLGW 3572	6/12/2008	400	126	81%
21FLGW 3572	7/16/2008	400	127	82%
21FLGW 3572	5/4/2004	410	128	83%
21FLDADEMR08	9/12/2006	420	129	83%
21FLDADEMR08	9/13/2005	430	130	84%
21FLDADEMR08	5/4/2004	440	131	85%
21FLDADEMR08	11/8/2005	440	132	85%
21FLGW 3572	6/14/2006	470	133	86%
21FLGW 3572	4/11/2007	490	134	87%
21FLDADEMR08	6/6/2006	510	135	87%
21FLDADEMR08	7/7/2009	600	136	88%
21FLGW 3572	2/3/2004	650	137	89%
21FLGW 3572	11/16/2006	660	138	89%
21FLGW 3572	**5/17/2007**	**670**	**139**	**90%**
21FLGW 3572	8/16/2006	740	140	91%
21FLDADEMR08	4/8/2008	830	141	91%
21FLGW 3572	6/14/2007	850	142	92%
21FLDADEMR08	10/4/2005	900	143	93%
21FLDADEMR08	6/7/2005	950	144	93%
21FLDADEMR08	8/3/2004	1,100	145	94%
21FLDADEMR08	9/7/2004	1,200	146	94%
21FLGW 3572	7/19/2006	1,400	147	95%
21FLGW 3572	5/17/2006	1,560	148	96%
21FLDADEMR08	10/2/2007	2,000	149	96%
21FLGW 3572	10/15/2009	2,100	150	97%
21FLGW 3572	8/3/2004	2,200	151	98%
21FLGW 3572	9/7/2004	3,000	152	98%
21FLDADEMR08	6/8/2004	4,000	153	99%

Station	Date	Fecal Coliform Concentration (MPN/100mL)	Rank	Percentile by Hazen Method
21FLGW 3572	6/8/2004	8,000	154	100%
-	**-**	**-**	**Existing condition concentration–90th percentile (counts/100mL)**	**670**
-	**-**	**-**	**Allowable concentration (counts/100mL)**	**400**
-	**-**	**-**	**Final % reduction**	**40%**

Note: Boldface type indicates concentration used in percent reduction calculations

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:

$$\mathbf{TMDL = \sum WLAs + \sum LAs + MOS}$$

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

$$\mathbf{TMDL \cong \sum WLAs_{wastewater} + \sum WLAs_{NPDES\ Stormwater} + \sum LAs + MOS}$$

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 best management practices (BMPs).

This approach is consistent with federal regulations (40 CFR § 130.2[I]), which state that TMDLs can be expressed in terms of mass per time (e.g., pounds per day), toxicity, or other appropriate measure. The TMDLs for WBIDs 3285, 3287, 3288, 3288B, and 3290 are expressed as a percent reduction, and represent the maximum daily fecal coliform load the streams can assimilate without exceeding the fecal coliform criterion (**Table 6.1**).

6.2 Load Allocation

Based on a percent reduction approach, the LA for percent reduction in fecal coliform from nonpoint sources for each WBID is presented in **Table 6.1**. 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**).

Table 6.1. TMDL Components for Fecal Coliform in WBIDs 3285, 3287, 3288, 3288B, and 3290

This is an eight-column table. Column 1 lists the WBID number, Column 2 lists the waterbody name, Column 3 lists the parameter, Column 4 lists the TMDL (counts/100mL), Column 5 lists the WLA for wastewater (counts/100mL), Column 6 lists the WLA for NPDES stormwater (percent reduction), Column 7 lists the LA (percent reduction), and Column 8 lists the MOS.

* N/A = The WLA for wastewater is not applicable, as no NPDES-permitted facilities in these WBIDs are considered major fecal coliform contributors.

WBID	Waterbody Name	Parameter	TMDL (counts/100mL)	WLA for Wastewater (counts/100mL)*	WLA for NPDES Stormwater (% reduction)	LA (% reduction)	MOS
3285	C-8 (Biscayne) Canal	Fecal coliform	400	N/A	40%	40%	Implicit
3287	C-7 (Little River) Canal	Fecal coliform	400	N/A	74%	74%	Implicit
3288	C-6 (Miami River) Canal	Fecal coliform	400	N/A	66%	66%	Implicit
3288B	C-6 (Miami River) Lower Segment	Fecal coliform	400	N/A	80%	80%	Implicit
3290	C-6 (Miami) Canal	Fecal coliform	400	N/A	40%	40%	Implicit

6.3 Wasteload Allocation

6.3.1 NPDES Wastewater Discharges

Six NPDES-permitted facilities were identified within the WBIDs' boundaries (see **Table 4.1**); all of them are concrete batch plants, and were therefore not considered to contribute to the observed levels of fecal coliform bacteria.

It should be noted that the state requires all NPDES-permitted wastewater 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. Any future point sources that may discharge in the WBIDs in the future will also be required to meet end-of-pipe standards for coliform bacteria.

6.3.2 NPDES Stormwater Discharges

Table 6.1 lists the WLA for stormwater discharges with an MS4 permit percent reduction in current fecal coliform loading for each WBID.

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

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

- *Water quality goals (based directly on the TMDL);*
- *Refined source identification;*
- *Load reduction requirements for stakeholders (quantitative detailed allocations, if technically feasible);*
- *A description of the load reduction activities to be undertaken, including structural projects, nonstructural BMPs, and public education and outreach;*
- *A description of further research, data collection, or source identification needed in order to achieve the TMDL;*
- *Timetables for implementation;*
- *Implementation funding mechanisms;*
- *An evaluation of future increases in pollutant loading due to population growth;*
- *Implementation milestones, project tracking, water quality monitoring, and adaptive management procedures; and*
- *Stakeholder statements of commitment (typically a local government resolution).*

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

7.2 Other TMDL Implementation Tools

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

Many assessment tools are available to assist local governments and interested stakeholders in this detective work. The tools range from the simple (such as Walk the WBIDs and GIS mapping) to the complex (such as bacteria source tracking). Department staff will provide technical assistance, guidance, and oversight of local efforts to identify and minimize fecal coliform sources of pollution. Based on work in the Lower St Johns River Tributaries and 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, F.A.C., 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, they have been established for Tampa Bay, Lake Thonotosassa, the Winter Haven Chain of Lakes, the Everglades, Lake Okeechobee, and Lake Apopka.

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

An important difference between the federal NPDES and the state's Stormwater/Environmental Resource 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: Municipalities Located within Each WBID Boundary

Table B.1 lists all municipalities and NPDES MS4 permits covering WBIDs 3285, 3287, 3288, 3288B, and 3290. **Figures B.1a** through **B.1e** show all municipalities located within each WBID boundary.

Table B.1. Municipalities and MS4 Permittees by WBID

This is a four-column table. Column 1 lists the WBID number, Column 2 lists the permit number, Column 3 lists the municipality/permittee, and Column 4 lists the permit name.

WBID	Permit ID	Municipality/Permittee	Permit Name
3285	FLS000003	City of Opa-Locka	Miami–Dade County and Co-permittees
3285	FLS000003	Town of Miami Lakes	Miami–Dade County and Co-permittees
3285	FLS000023	City of Hialeah	City of Hialeah
3285	FLR04E098	Village of Biscayne Park	Village of Biscayne Park
3285	FLS000003	Village of Miami Shores	Miami–Dade County and Co-permittees
3285	FLS000003	City of Hialeah Gardens	Miami–Dade County and Co-permittees
3285	FLS000003	City of North Miami	Miami–Dade County and Co-permittees
3285	FLS000003	City of North Miami Beach	Miami–Dade County and Co-permittees
3285	FLS000003	Dade County	Miami–Dade County and Co-permittees
3285	FLS000003	City of Miami Gardens	Miami–Dade County and Co-permittees
3287	FLS000003	City of Opa-Locka	Miami–Dade County and Co-permittees
3287	FLS000023	City of Hialeah	City of Hialeah
3287	FLS000003	Village of Miami Shores	Miami–Dade County and Co-permittees
3287	FLS000003	Village of El Portal	Miami–Dade County and Co-permittees
3287	FLS000003	City of Hialeah Gardens	Miami–Dade County and Co-permittees
3287	FLS000003	City of North Miami	Miami–Dade County and Co-permittees
3287	FLS000003	Dade County	Miami–Dade County and Co-permittees
3287	FLS000002	City of Miami	City of Miami
3288	FLS000023	City of Hialeah	City of Hialeah
3288	FLS000003	Dade County	Miami–Dade County and Co-permittees
3288	FLS000003	City of Miami Springs	Miami–Dade County and Co-permittees
3288	FLS000002	City of Miami	City of Miami
3288B	FLS000002	City of Miami	City of Miami
3290	FLS000023	City of Hialeah	City of Hialeah
3290	FLS000003	City of Hialeah Gardens	Miami–Dade County and Co-permittees
3290	FLR04E093	Village of Virginia Gardens	Village of Virginia Gardens
3290	FLS000003	Dade County	Miami–Dade County and Co-permittees
3290	FLS000003	City of Miami Springs	Miami–Dade County and Co-permittees
3290	FLS000003	Town of Medley	Miami–Dade County and Co-permittees
3290	FLS000003	City of Doral	Miami–Dade County and Co-permittees
3290	FLR04E090	City of Sweetwater	City of Sweetwater
3290	FLS000002	City of Miami	City of Miami

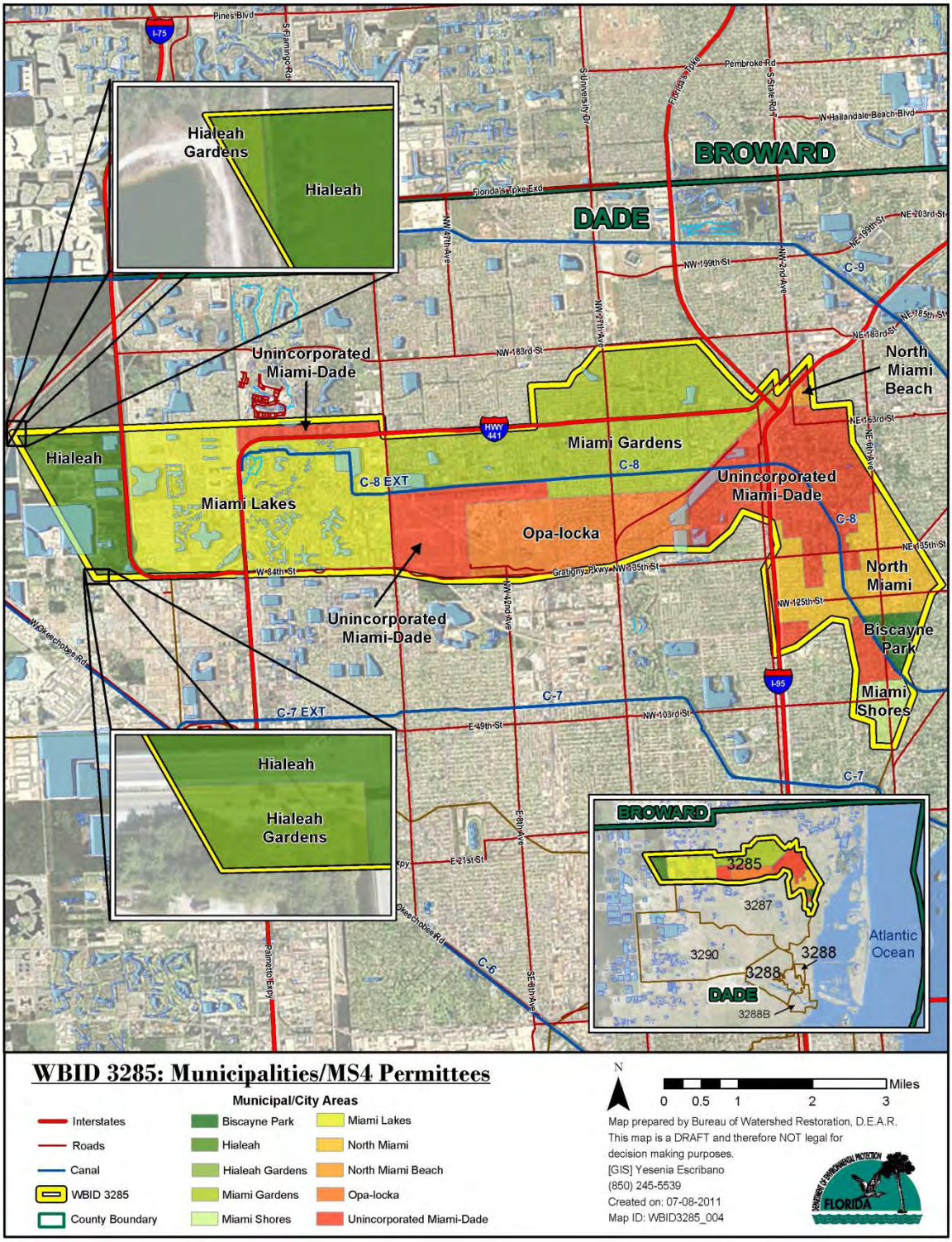

Figure B.1a. Municipalities/Permittees within the C-8 (Biscayne) Canal (WBID 3285) Boundary

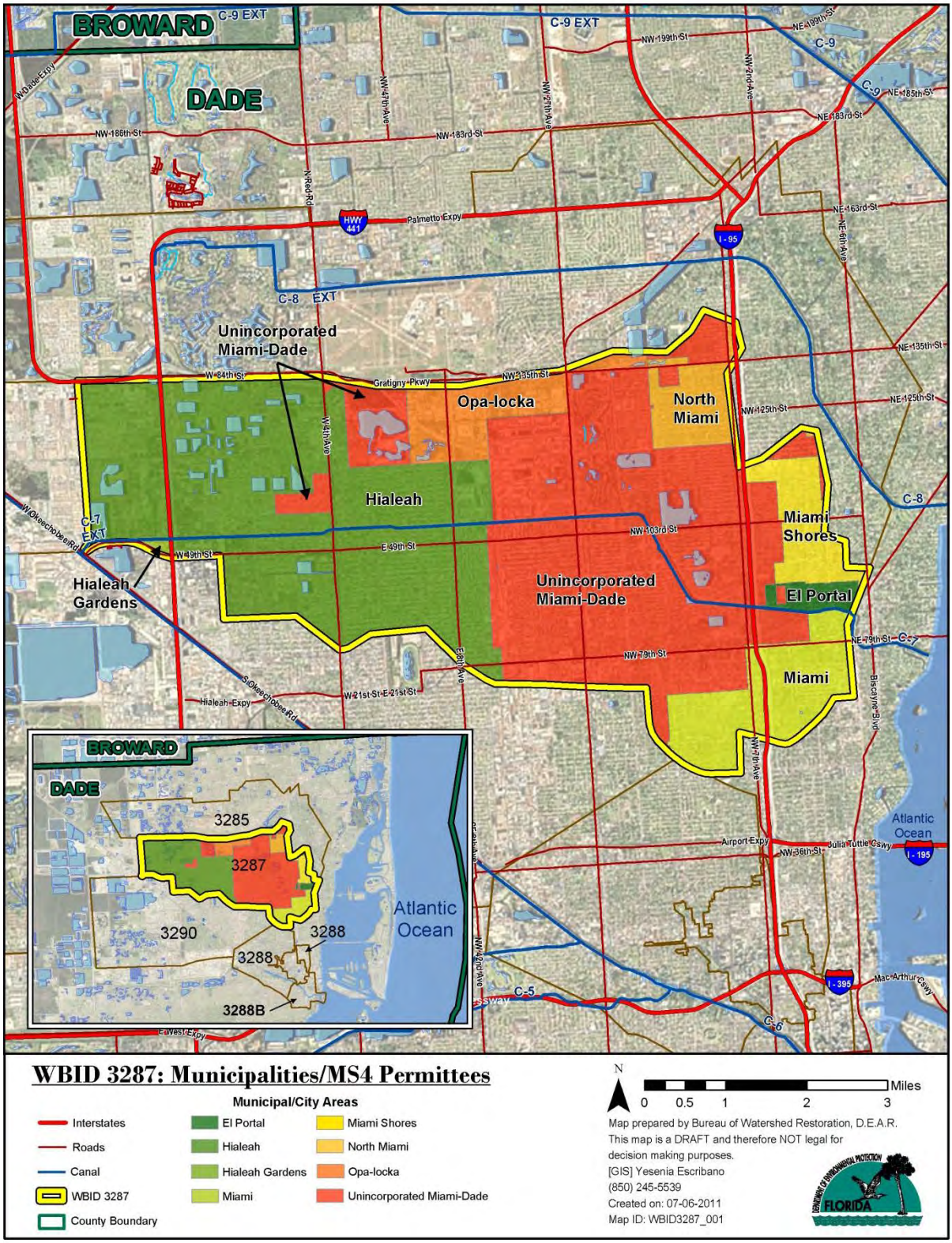

Figure B.1b. Municipalities/Permittees within the C-7 (Little River) Canal (WBID 3287) Boundary

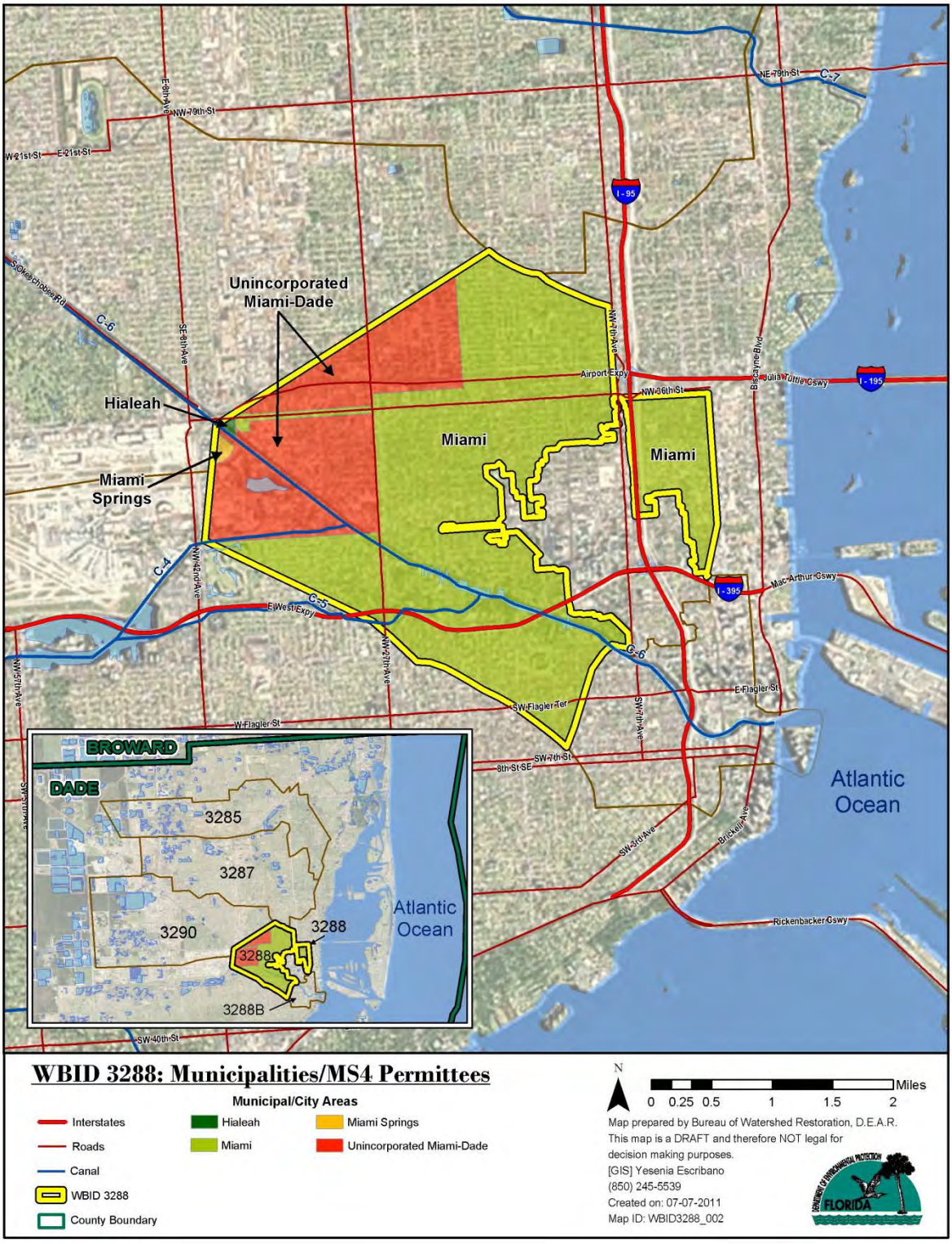

Figure B.1c. Municipalities/Permittees within the C-6 (Miami River) Canal (WBID 3288) Boundary

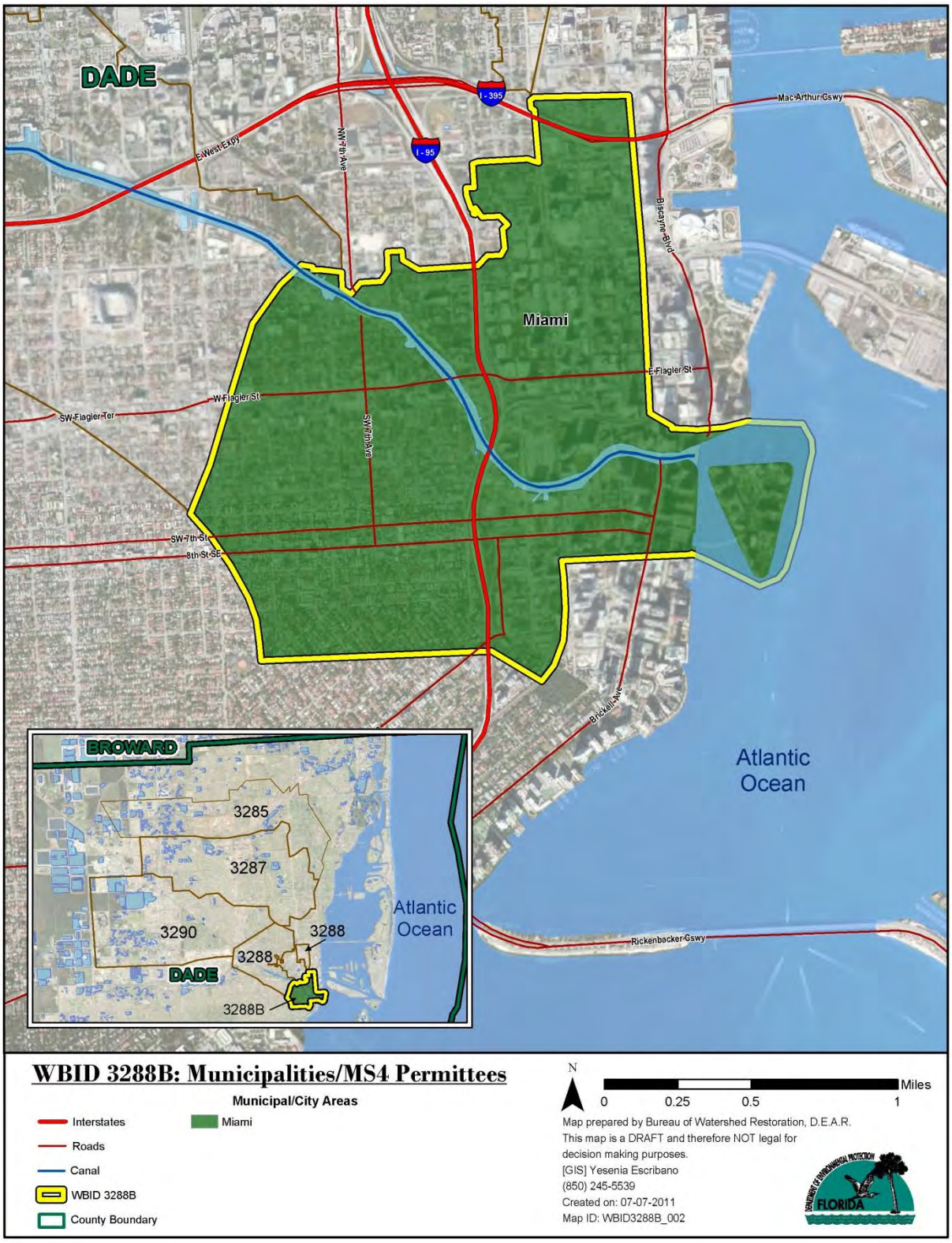

Figure B.1d. Municipalities/Permittees within the C-6 (Miami River) Lower Segment (WBID 3288B) Boundary

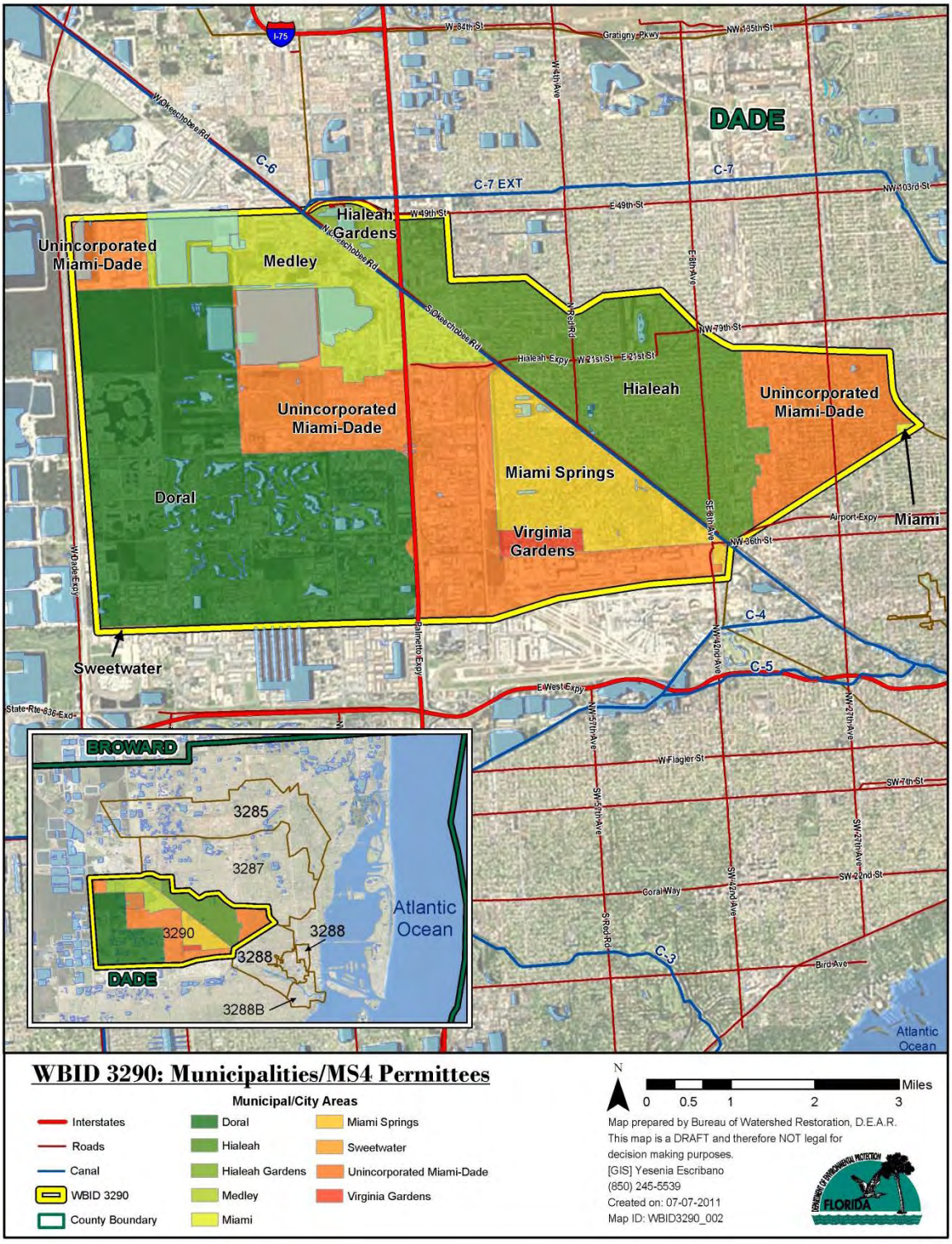

Figure B.1e. Municipalities/Permittees within the C-6 (Miami) Canal (WBID 3290) Boundary

Appendix C: Estimates of Fecal Coliform Loadings from Potential Sources

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

Pets

Pets (especially dogs) could be a significant source of coliform pollution through surface runoff within the WBID boundaries. 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 2.2 million 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 WBID boundaries is unknown. Therefore, the statistics produced by APPMA were used in this analysis to estimate the possible fecal coliform loads contributed by dogs.

Using information from the Florida Department of Revenue's (DOR) 2010 cadastral tax parcel and ownership coverage contained in the Department's GIS library, residential parcels were identified using DOR's residential land use codes. The final number of households within each WBID boundary was calculated by adding the number of residential units on the parcels for all improved residential land use codes. **Table C.1** lists the estimated number of households within each of the WBID boundaries.

The table also shows the estimated number of dogs within each WBID boundary, assuming that 40% of the households in these areas have 1 dog; the total waste produced (grams/day) by dogs and left on the land surface in residential areas in the WBIDs, assuming that 40% of dog owners do not pick up their dogs' feces; and the total load of fecal coliform produced by dogs (counts/day) within each WBID boundary.

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

Table C.2 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).

Table C.1. Estimated Number of Households and Dogs, Waste Produced (grams/day) by Dogs Left on the Land Surface, and Total Load of Fecal Coliform (counts/day) Produced by Dogs within Each WBID Boundary

This is a five-column table. Column 1 lists the WBID number, Column 2 lists the number of households in each WBID, Column 3 lists the number of dogs, Column 4 lists the waste produced left on land, and Column 5 lists the fecal coliform loading.

WBID	Number of Households	Number of Dogs	Waste Produced Left on Land Surface (grams/day)	Loading (counts/day)
3285	37,116	14,846	2,672,352	$5.88x10^{12}$
3287	64,135	25,654	4,617,720	$1.02x10^{13}$
3288	26,173	10,469	1,884,456	$4.15x10^{12}$
3288B	11,700	4,680	842,400	$1.85x10^{12}$
3290	39,666	15,866	2,855,952	$6.28x10^{12}$

Table C.2. Dog Population Density, Wasteload, and Fecal Coliform Density Based on the Literature (Weiskel *et al.* 1996)

This is a four-column table. Column 1 lists the animal type (dog), Column 2 lists the population density, Column 3 lists the wasteload per dog per day, and Column 4 lists the fecal coliform density per gram of dog feces.

* Number from APPMA

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

Sanitary Sewer Overflows

SSOs can also be a potential source of fecal bacteria pollution. Human sewage can be introduced into surface waters even when storm and sanitary sewers are separated. Leaks and overflows are common in many older sanitary sewers where capacity is exceeded, high rates of infiltration and inflow occur (i.e., outside water gets into pipes, reducing capacity), frequent blockages occur, or sewers are simply falling apart due to poor joints or pipe materials. Power failures at pumping stations are also a common cause of SSOs. The greatest risk of an SSO occurs during storm events; however, few comprehensive data are available to quantify SSO frequency and bacteria loads in most watersheds. Therefore, in this report, the possible fecal coliform load contributed by sewer line leakage was estimated based on an empirical leakage rate of 0.5% of the total raw sewage (Culver *et al.* 2002) created within each WBID by the households connected to the sewer system.

The estimated number of properties connected to the sewer system was based on data obtained from the Florida Department of Health's (FDOH) ongoing inventory of wastewater treatment and disposal method for developed properties. Using information from DOR's 2010 cadastral tax parcel and ownership coverage, residential parcels were identified using DOR's

land use codes. The final number of households within the WBID boundary was calculated by adding the number of residential units on the parcels for all improved residential land use codes (see **Table C.1**). **Table C.3** lists the estimated number of households *(N)* within the WBID boundaries served by sewer systems (**Figure C.1**).

Fecal coliform loading from sewer line leakage can be calculated based on the number of people in each watershed, typical per household generation rates, and typical fecal coliform concentrations in domestic sewage, assuming a leakage rate of 0.5% (Culver *et al.* 2002). Based on this assumption, a rough estimate of fecal coliform loads from leaks and SSOs within the WBID boundaries can be made using **Equation C.1:**

L = 37.85* N * Q * C * F **Equation C.1**

Where:

L is the fecal coliform daily load (counts/day);
N is the number of households using sanitary sewer in the WBID;
Q is the discharge rate for each household (gallons/day);
C is the fecal coliform concentration for domestic wastewater (counts/100mL);
F is the sewer line leakage rate; and
37.85 is a conversion factor (100mL/gallon).

The discharge rate through sewers from each household (*Q*) was calculated by multiplying the average household size for Miami–Dade County (2.84) (U.S. Census Bureau 2000) by the per capita wastewater production rate per day (70 gallons/day/person). The commonly cited concentration (*C*) for domestic wastewater is $1x10^6$ counts/100 mL for fecal coliform (EPA 2001). The contribution of fecal coliform through sewer line leakage was assumed to be 0.5% of the total sewage loading created from the population not on septic tanks (Culver *et al.* 2002). Based on **Equation C.1**, the approximate fecal coliform loading from sewer line leakage in each WBID is summarized in **Table C.3.**

Table C.3. Estimated Number of Households Served by Sanitary Sewers and Estimated Fecal Coliform Loading from Sewer Line Leakage within Each WBID Boundary

This is a three-column table. Column 1 lists the WBID number, Column 2 lists the number of households served by sanitary sewers in each WBID, and Column 3 lists the loading from SSOs.

WBID	Number of Households Served by Sanitary Sewers	Loading (counts/day)
3285	34,843	$1.31x10^{12}$
3287	60,514	$2.28x10^{12}$
3288	26,173	$9.85x10^{11}$
3288B	11,700	$4.40x10^{11}$
3290	39,378	$1.48x10^{12}$

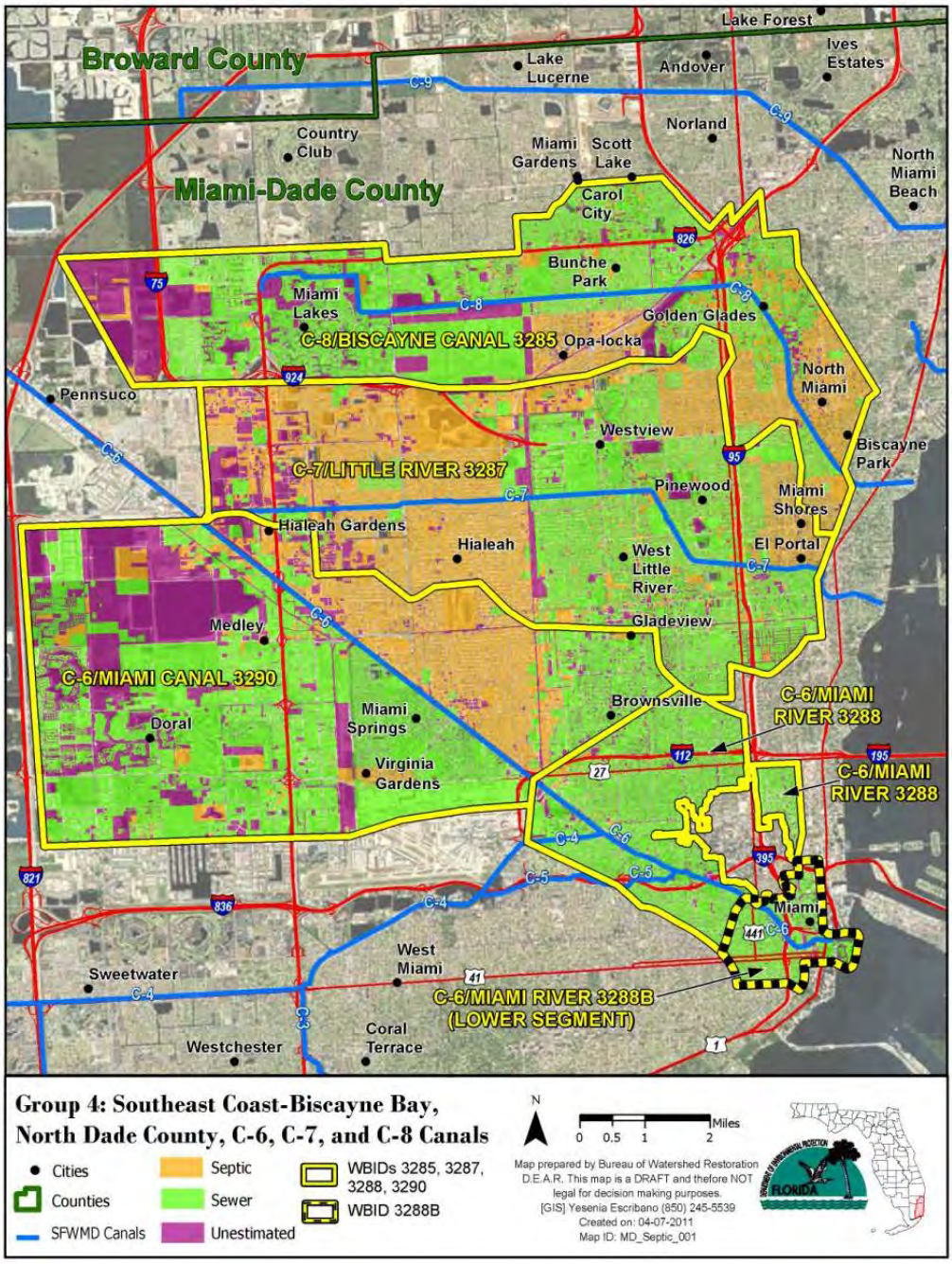

Figure C.1. Distribution of Onsite Sewage Disposal Systems (Septic Tanks) within the Boundaries of WBIDs 3285, 3287, 3288, 3288B, and 3290

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 the ground water (USGS 2010). 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 2010).

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 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.

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 WBID boundaries can be made using **Equation C.2**:

L = 37.85* N * Q * C * F **Equation C.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 (100mL/gallon).

Based on the estimated total number of households within each WBID (**Table C.2**) and the estimated number of households connected to the sewer system (**Table C.3**), the number of housing units *(N)* within each WBID boundary thought to be using septic tanks to treat their domestic wastewater is shown in **Table C.4** (**Figure C.1**).

The discharge rate from each septic tank (*Q*) was calculated by multiplying the average household size by the per capita wastewater production rate per day. Based on the information published by the Census Bureau, the average household size for Miami–Dade County is about 2.84 people/household. The same population densities were assumed within each 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 $1x10^6$ counts/100mL for fecal coliform (EPA 2001).

No measured septic tank failure rate data were available for the WBIDs when these TMDLs were developed. Therefore, the failure rate for each WBID was derived from the number of septic tanks in Miami–Dade County based on FDOH's septic tank inventory and the number of septic tank repair permits issued in the county as published by FDOH (available: http://www.doh.state.fl.us/environment/OSTDS/statistics/ostdsstatistics.htm).

The cumulative number of septic tanks in Miami–Dade 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 2009–10 inventory, assuming that none of the installed septic tanks will be removed after being installed (**Table C.5**). 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 (**Table C.5**). The average annual septic tank failure discovery rate for Miami–Dade County is approximately 0.37%. 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 1.86% for Miami–Dade County. **Table C.4** shows the estimated fecal coliform loading from failed septic tanks within each WBID boundary based on **Equation C.2.**

Table C.4. Estimated Number of Households Using Septic Tanks and Estimated Septic Tank Loading within each WBID Boundary

This is a three-column table. Column 1 lists the WBID number, Column 2 lists the number of households with a septic tank in each WBID, and Column 3 lists the septic tank loading.

* N/A = Not applicable. It is assumed that all households in the WBID are connected to the sewer system.

WBID	Number of Households Using Septic Tanks	Loading (counts/day)*
3285	2,273	$3.19x10^{11}$
3287	3,621	$5.08x10^{11}$
3288	0	NA
3288B	0	NA
3290	288	$4.04x10^{10}$

Table C.5. Estimated Number of Septic Tanks and Septic Tank Failure Rates for Miami–Dade County (1998–2009)

This is a six-column table. Column 1 lists the year, Columns 2 lists the number of septic tanks newly installed in each year in each WBID, Column 3 lists the accumulated number of septic tanks for each year, Column 4 lists the number of septic tank repair permits issued, Column 5 lists the failed septic tank discovery rates, and Column 6 lists the final failure rates.

Year	New Installations	Accumulated Installations	Repair Permits	Failure Discovery Rate (%)	Failure Rate (%)
1998	112	206,679	398	0.19%	0.96%
1999	269	206,791	1,255	0.61%	3.03%
2000	435	207,060	911	0.44%	2.20%
2001	674	207,495	974	0.47%	2.35%
2002	769	208,169	1,051	0.50%	2.52%
2003	783	208,938	961	0.46%	2.30%
2004	636	209,721	663	0.32%	1.58%
2005	699	210,357	736	0.35%	1.75%
2006	887	211,056	691	0.33%	1.64%
2007	765	211,943	549	0.26%	1.30%
2008	555	212,708	547	0.26%	1.29%
2009	417	213,263	624	0.29%	1.46%
Average	**583.42**	**209,515**	**780**	**0.37%**	**1.86%**

Wildlife

Wildlife (iguanas, birds, raccoons) is another possible source of fecal coliform bacteria within the WBID boundaries. However, as they represent natural inputs, no reductions are assigned to these sources by the TMDLs.

Appendix D: TMDL Public Comments for Fecal Coliform TMDLs

June 28, 2011

Mr. Rick Renna, P.E.
State Drainage Engineer
Florida Department of Transportation
605 Suwannee Street
Tallahassee, FL 32399-0450

Re: FDOT Comments on Newly Released Draft TMDLs

Dear Mr. Renna:

Thank you very much for your letter dated June 6, 2011, regarding our recently proposed Total Maximum Daily Load (TMDL) reports for fecal coliforms in Southeast Florida. The Department appreciates the time and effort you put into reviewing these draft TMDLs. It has been the Department's policy that, when reducing pollutant loads to impaired receiving waters, stakeholders should only be responsible for reducing pollutant sources within their jurisdictional authority. We concur that FDOT's construction, operation, and maintenance activities are likely not a significant source of fecal coliforms. In addition, we fully agree that all local stakeholders should work together closely to identify and eliminate illicit discharges. In implementing these TMDLs, this should be considered a shared responsibility by all affected stakeholders.

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

Sincerely,

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

MR/wet/jm

ec: N. Bailey

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