FINAL

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Water Resource Management, Bureau of Watershed Management

SOUTHWEST DISTRICT • TAMPA BAY TRIBUTARIES BASIN

TMDL Report

Total and Fecal Coliform TMDLs for Hillsborough River, WBID 1443E

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Acknowledgments

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STORET Program

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http://www.dep.state.fl.us/water/docs/2002_305b.pdf

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Basin Status Report for the Tampa Bay Tributaries Basin

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Chapter 1: INTRODUCTION

1.1 Purpose of Report

This report presents the Total Maximum Daily Loads (TMDLs) for both total and fecal coliform for a segment of the Hillsborough River in the Tampa Bay Tributaries Basin. The river segment was verified as impaired for total and fecal coliform, and was included on the Verified List of impaired waters for the Tampa Bay Tributaries Basin that was adopted by Secretarial Order in May 2004. The TMDL establishes the allowable loadings of total and fecal coliform to WBID 1443E of the Hillsborough River that would restore the waterbody so that it meets the applicable water quality criteria.

1.2 Identification of Waterbody

The Hillsborough River, located in the Hillsborough River Planning Unit, extends over parts of three counties, including much of the northeastern quarter of Hillsborough County, a large area of central Pasco County, and a small portion of northwestern Polk County. It is bounded to the north by the Withlacoochee River watershed, to the east by the Peace River watershed, to the south by the Alafia River watershed, and to the west by the north coastal and Tampa Bay watersheds (Southwest Florida Water Management District, 1999) **(Figure 1.1).**

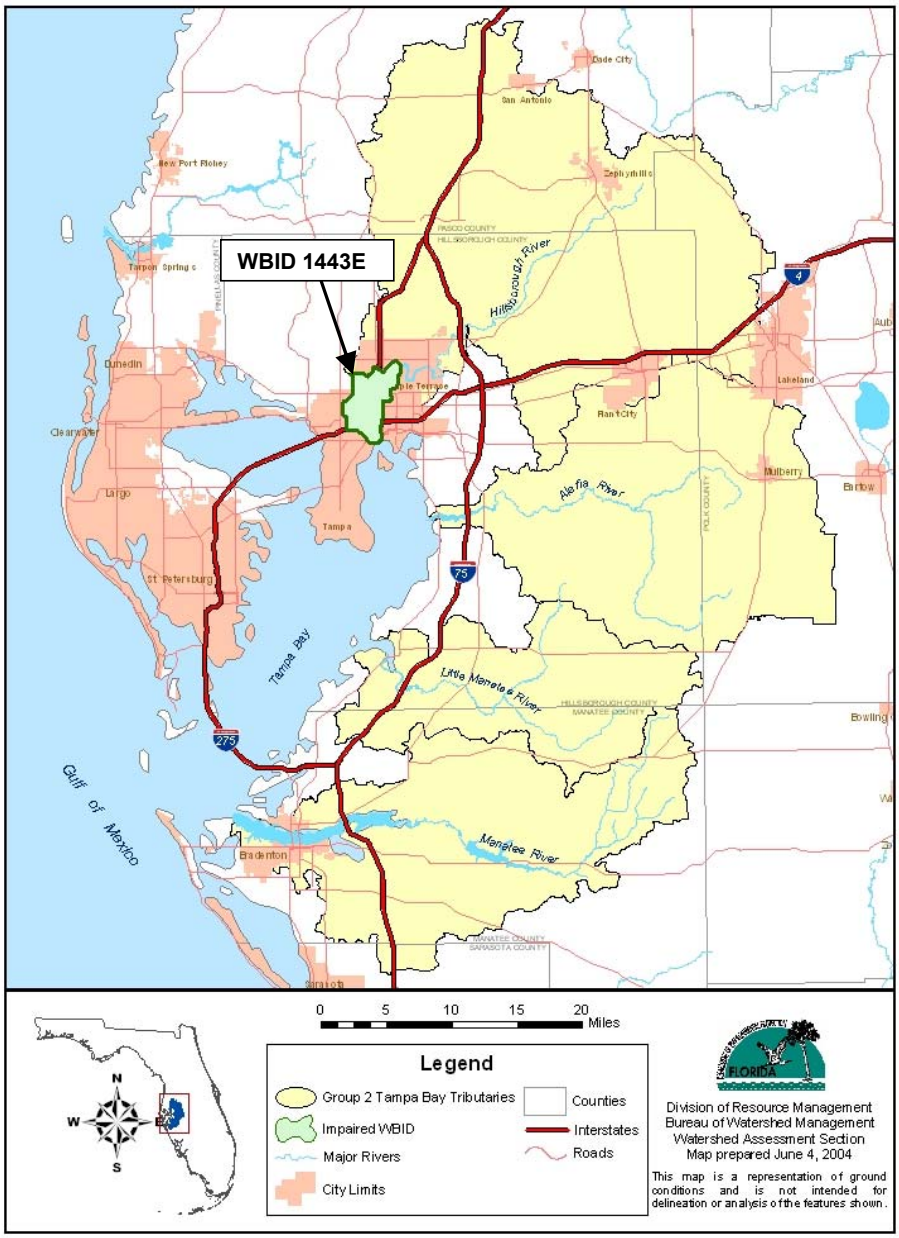
The Hillsborough River Basin **(Figure 1.2)** begins east-northeast of Zephyrhills in southeastern Pasco and northwestern Polk Counties. Its headwaters originate in the southwestern portion of the Green Swamp, where it also receives overflow from the Withlacoochee River. The river channel is not clearly defined until the river leaves the swamp. From there, it flows southwesterly 54 miles to upper Hillsborough Bay and drains more than 690 square miles.

Perennially flowing tributaries to the Hillsborough River are Big Ditch and Flint Creek. Intermittent streams are Indian Creek, New River, Two Hole Branch, Basset Branch, Hollomans Branch, Clay Gully, Trout Creek, Blackwater Creek, and Cypress Creek. High floodwaters are diverted from the Hillsborough River at the confluence of Trout Creek and upstream of the Tampa Reservoir Dam through the Tampa Bypass Canal to McKay Bay. Channelization has extended Sixmile Creek west and north to intersect the Hillsborough River at two points, at the confluence of Trout Creek and near the midpoint of Tampa Reservoir, which supplies drinking water to the city of Tampa. The modified Sixmile Creek was then renamed the Tampa Bypass Canal, which comprises two canals. The Harney Canal (C-136) runs from the Tampa Reservoir to join the second and longer canal, C-135, which connects the Hillsborough River at Trout Creek and Palm River. Both canals control flooding in the city of Tampa.

Urban and built-up areas dominate the landscape in the southern quarter of the planning unit, which includes the urban and suburban areas of Tampa, Plant City, and Lakeland. In the upper half of the planning unit, urban and suburban areas appear as an east-west band encompassing Zephyrhills, Wesley Chapel, and Land O' Lakes. Together, urban and built-up lands comprise 25 percent of the total area. Within the region characterized by expanding population growth and land development, large areas of swamps and forested uplands remain undeveloped along

portions of the Hillsborough River and its principal tributaries. Other undeveloped lands and natural lands (uplands and wetlands) comprise 39 percent of the planning unit.

Figure 1.1. Florida Department of Environmental Protection's Southwest District Basin Groups: Hillsborough River in Group 2

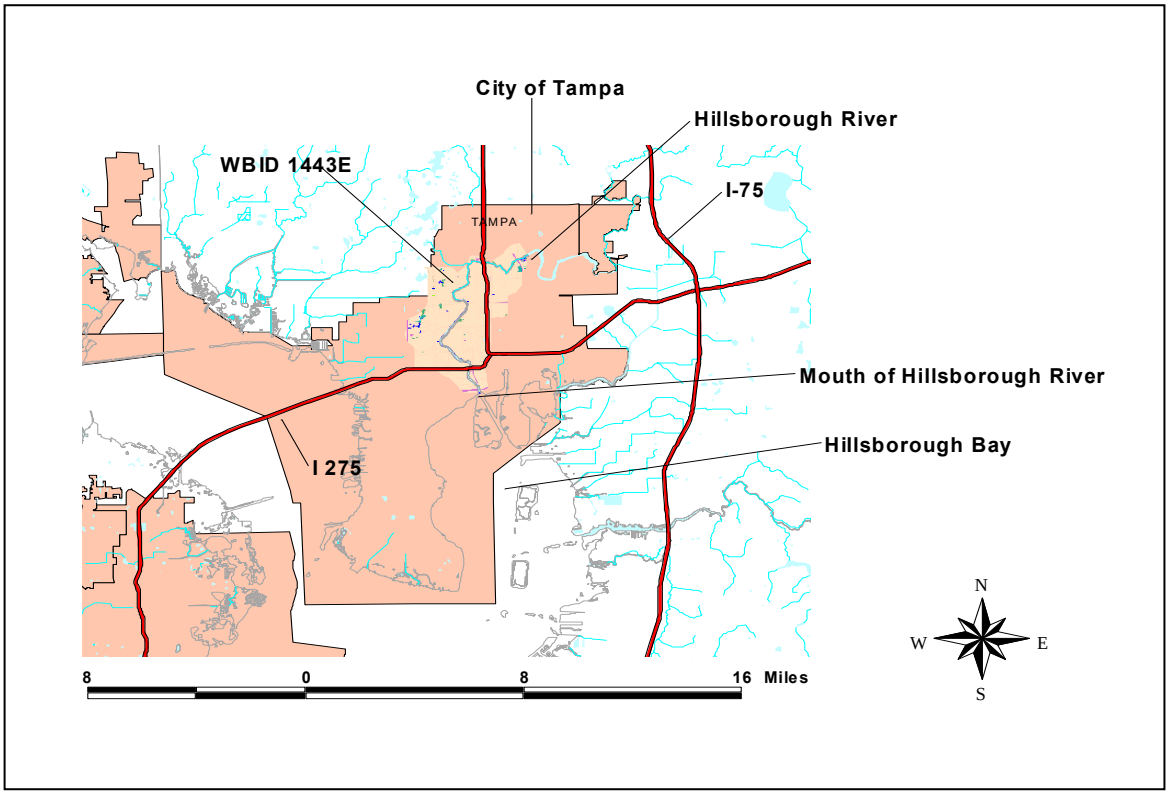


Throughout most of the rest of the planning unit, particularly in the upper reaches of its tributaries, land uses are primarily rangeland, pasture, and agriculture, including citrus groves and row crops. The greatest acreages of citrus are around Land O' Lakes, the Plant City/Dover/Seffner area south and east of Lake Thonotosassa, in the area around Lakeland, and in a wide area north of Zephyrhills. Generally, the northern and central portions of the watershed are rural, while the southern portions are mainly urban and industrial. However, suburban development radiating from major urban areas such as Tampa is spreading into rural areas.

Additional information about the river's hydrology and geology are available in the Basin Status Report for the Tampa Bay Tributaries Basin (Florida Department of Environmental Protection, 2003).

For assessment purposes, the Florida Department of Environmental Protection (Department) has divided the Tampa Bay Tributaries Basin into water assessment polygons with a unique **w**ater**b**ody **id**entification (WBID) number for each watershed or stream reach. The Hillsborough River has been divided into WBIDs or segments, and these TMDLs address WBID 1443E **(Figure 1.2).**

Figure 1.2. Location of WBID 1443E and Major Geopolitical Features in the Hillsborough River Watershed



1.3 Background

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

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

This TMDL Report will be followed by the development and implementation of a Basin Management Action Plan, or BMAP, to reduce the amount of total and fecal coliform that caused the verified impairment of WBID 1443E of the Hillsborough River. These activities will depend heavily on the active participation of the Southwest Florida Water Management District (SWFEMD), 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.

Chapter 2: DESCRIPTION OF WATER QUALITY PROBLEM

2.1 Statutory Requirements and Rulemaking History

Section 303(d) of the federal Clean Water Act requires states to submit to the U.S. Environmental Protection Agency (EPA) a list of surface waters that do not meet applicable water quality standards (impaired waters) and establish a TMDL for each pollutant source in each of these impaired 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.]). However, the FWRA (Section 403.067, F.S.) stated that all previous Florida 303(d) lists were for planning purposes only and directed the Department to develop, and adopt by rule, a new science-based methodology to identify impaired waters. After a long rule-making process, the Environmental Regulation Commission adopted the new methodology as Chapter 62-303, Florida Administrative Code (F.A.C.) (Identification of Impaired Surface Waters Rule, or IWR), in April 2001.

2.2 Information on Verified Impairment

The Department used the IWR to assess water quality impairments in the Tampa Bay Tributaries Basin and has verified the impairment for total and fecal coliform in WBID 1443E. **Table 2.1** summarizes the assessment results for total and fecal coliform. The assessment period for total coliform was January 1996 through December 2001. For fecal coliform, the period of data was January 1996 through December 2002. As shown in **Table 2.1,** fecal coliform results ranged above 5,000 colony forming units (CFU). Wet-weather fecal coliform levels over 5,000 CFU/100 milliliters (mL) suggest (but do not prove) that human sources of bacteria could be present in the watershed (Watershed Protection Techniques, April 1999). In this study, the higher total and fecal coliform values do not appear restricted to wet-weather conditions. On the positive side, greater than 96 percent of the total coliform samples and 100 percent of the fecal coliform samples are less than 10,000 CFU/100mL, and 88 percent of the total coliform and 99 percent of the fecal coliform results are less than 5,000 CFU/100mL. Therefore, these higher concentrations are not routine.

Table 2.1. Summary of Total and Fecal Coliform Data

	Number of Samples	Number of Exceedances	Percent Exceedances	Maximum (CFU/100mL)	Average Exceedance (CFU/100mL)	Average of All Data (CFU/100mL)
Total Coliform	234	53	22.6%	25,400	6,835	1,945
Fecal Coliform	303	50	16.5%	7,700	1,214	315

Chapter 3. DESCRIPTION OF APPLICABLE WATER QUALITY STANDARDS AND TARGETS

3.1 Classification of the Waterbody and Criteria 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)**

This portion of the Hillsborough River is a Class III waterbody, with a designated use of recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife.

3.2 Applicable Water Quality Standards and Numeric Water Quality Target

Numeric criteria for bacterial quality are expressed in terms of fecal coliform bacteria and total coliform bacteria concentrations. The water quality criteria for protection of Class III waters, as established by Chapter 62-302, F.A.C., state 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.*
>
> ***Total Coliform Bacteria:***
> *The MPN per 100 mL shall be less than or equal to 1,000 as a monthly average nor exceed 1,000 in more than 20 percent of the samples examined during any month; and less than or equal to 2,400 at any time.*

For both parameters, the criteria state that monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30-day period. During the development of load curves for the impaired stream (as described in subsequent chapters), there were insufficient data (fewer than 10 samples in a given month) available to evaluate the geometric mean criterion for either fecal coliform or total coliform bacteria. Therefore, the criterion selected for the fecal coliform TMDL was not to exceed 400, and for total coliform, not to exceed 2,400 CFU/100mL.

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 total coliform in WBID 1443E of the Hillsborough River watershed, and the amount of pollutant loading contributed by each of these sources. Sources are broadly classified as either "point sources" or "nonpoint sources." Historically, the term point sources has meant discharges to surface waters that typically have a continuous flow via a discernable, confined, and discrete conveyance, such as a pipe. Domestic and industrial wastewater treatment facilities (WWTFs) are examples of traditional point sources. In contrast, the term "nonpoint sources" was used to describe intermittent, rainfall driven, diffuse sources of pollution associated with everyday human activities, including runoff from urban land uses, agriculture, silviculture, and mining; discharges from failing septic systems; and atmospheric deposition (U.S. Environmental Protection Agency, 2001).

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 Program (NPDES). These nonpoint sources included certain urban stormwater discharges, including those from local government master drainage systems, construction sites over 5 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 Total and Fecal Coliform in WBID 1443E of the Hillsborough River Watershed

Neither the upstream nor the downstream WBIDs are impaired for total or fecal coliforms. This indicates that the sources of the observed exceedances are likely from within WBID 1443E.

4.2.1 Point Sources

There are two NPDES permitted wastewater treatment facilities within WBID 1443E **(Figure 4.1).** Of these, only the Lowry Park facility (Lowry Park Zoological Society of Tampa Inc., Permit Number FL0186651-001-IW7C) has the potential to discharge total and fecal coliform loads directly into WBID 1443E of the Hillsborough River. The permit includes the authority to discharge industrial wastewater commingled with stormwater runoff via Outfall D001 to Hamilton

Creek, which flows to the Hillsborough River within WBID 1443E. The permit has "report only" limits for flow (no limit on flow; therefore no daily load limits in the current permit), and requires monitoring for total and fecal coliforms, with daily maximum concentration limits of 2,400 and 800 CFU/100mL, respectively. Based on the limited flow data below **(Table 4.1),** the facility has a monthly average discharge of 79,296 gallons per day (gpd) and an average daily maximum flow of 220,270 gpd, or 0.341 cubic feet per second (cfs). Since the bacterial loadings for the TMDL are calculated on a daily basis, the allowable loadings for the facility were set as daily limits. Based on the average daily maximum flow, the facility is allowed to discharge up to 2.00E10 CFU/day of total coliform on a daily basis. Similarly, given the average daily maximum flow, the facility is allowed to discharge up to 3.34E9 CFU/day of fecal coliform on a daily basis.

Table 4.1. Flow Data for Lowry Park Zoo

Date	Daily Maximum Flow Rate (gpd)	Monthly Average Flow Rate (gpd)
4/30/2002	No Data	
5/31/2002	No Data	
6/30/2002	No Data	
7/31/2002	No Data	
8/31/2002	164.3	137.7
9/30/2002	464.3	207.1
10/31/2002	389.5	192.5
11/30/2002	46.5	12.5
12/31/2002	389.5	192.5
1/31/2003	No Data	
2/28/2003	318.8	150.9
3/31/2003	1,288.2	207.1
4/30/2003	901.9	222.0
5/31/2003	426.7	207.1
6/30/2003	1,206,720	268,992
7/31/2003	464,832	253,008
8/31/2003	760,896	285,264
9/30/2003	426,672	222,048
Average	**220,270**	**79,296**

The other NPDES facility in the WBID is the Tampa Tribune, Permit Number FLRNEE254. It is the Department's understanding that this facility does not cause or contribute to total or fecal coliform bacterial loadings to the Hillsborough River.

Municipal Separate Storm Sewer System Permittees

WBID 1443E of the Hillsborough River is entirely within the city of Tampa, and the city of Tampa is covered under a Phase 1 individual municipal separate storm sewer system (MS4) permit (Permit Number FLS000008).

4.2.2 Land Uses and Nonpoint Sources

Additional total coliform loadings to WBID 1443E are generated from nonpoint sources in the watershed. Potential nonpoint sources of coliforms include loadings from surface runoff, wildlife, livestock, pets, and leaking septic tanks.

Wildlife

Wildlife deposit coliform bacteria along with their feces onto land surfaces, where it can be transported during storm events to nearby streams. Some wildlife (such as otters, beavers, raccoons, and birds) deposit their feces directly into the water. The bacterial load from naturally occurring wildlife is assumed to be background. In addition, any strategy employed to control this source would probably have a negligible impact on attaining water quality standards.

Agricultural Animals

This WBID contains only 2.5 acres (0.02 percent) of agricultural land uses. It is therefore unlikely that agricultural sources are a cause of the exceedances observed in WBID 1443E. In general, agricultural animals are the source of several types of coliform loading to streams. The livestock data listed in **Table 4.2** are for all of Hillsborough County (U.S. Department of Agriculture, 1997).

Table 4.2. Livestock Distribution for Hillsborough County

Livestock Distribution	Hillsborough County
Cattle/Calves	62,328
Milk Cow	4,463
Hogs/Pigs	3,567
Poultry layers >13 weeks	1,409,342
Poultry broilers	(D)
Sheep/Lambs	285
Horses	2,754

Notes: (D) – Data withheld to avoid disclosing data for individual farms.

Land Uses

The spatial distribution and acreage of different land use categories were identified using the 1999 land use coverage (scale 1:40,000) contained in the Department's geographic information

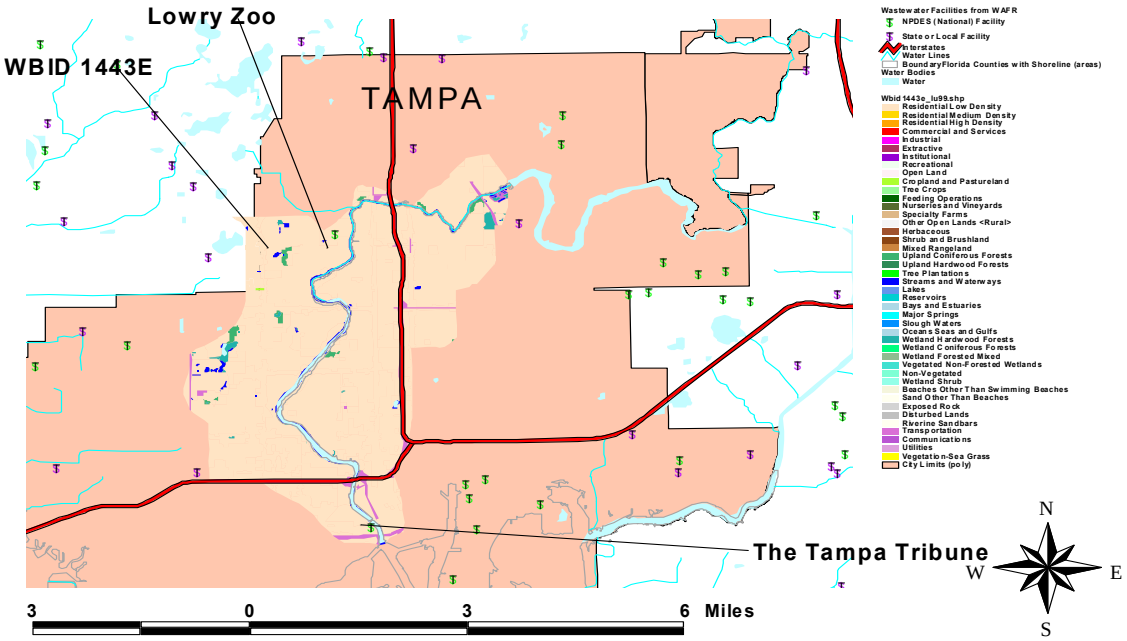
system (GIS) library. Land use categories in the watershed were aggregated using the simplified Level 1 codes tabulated in **Table 4.3.** **Figure 4.1** shows the acreage of the principal land uses in the watershed.

High-density residential is about 60 percent of the WBID area. Urban open is the next largest land use, making up about 30.4 percent of the area. Transportation is next, at 3.7 percent. These three categories make up over 93 percent of the total land use.

Table 4.3. Classification of Land Use Categories (Level 1) in WBID 1443E

Level 1	Count	Attribute	Perimeter	Area (square meters)	Area (acres)	Area (square miles)	Percentage
1000	126	Urban open	221,469.48	12,252,028.81	3,026.3	4.7270	30.37
1100	3	Residential low density < 2 dwelling units	3,164.17	140,593.19	34.7	0.0542	0.35
1200	6	Residential medium density 2->5 dwelling units	7,417.82	351,234.11	86.8	0.1355	0.87
1300	36	Residential high density	185,850.39	24,231,032.93	5,985.1	9.3487	60.07
2000	1	Agriculture	488.95	10,018.85	2.5	0.0039	0.02
4000	10	Forest/rural open	9,533.40	280,564.12	69.3	0.1082	0.70
5000	39	Water	44,772.83	1,311,259.36	323.9	0.5059	3.25
6000	31	Wetlands	12,015.61	271,415.01	67.0	0.1047	0.67
8000	12	Transportation, communication, and utilities	46,510.25	1,492,799.64	368.7	0.5759	3.70
		TOTAL	**531,222.90**	**40,340,946.01**	**9,964.2**	**15.5641**	**100.00**

Figure 4.1. Principal Land Uses and NPDES Facilities in WBID 1443E



Population

According to the U.S Census Bureau, the population density in and around WBID 1443E in the year 2000 was at or less than 405 people per square mile (10 persons per square mile is the minimum used by the Census Bureau). The Bureau reports that, in Hillsborough County, which includes all of WBID 1443E, the total population for 2000 was 998,948, with 425,962 housing units.

Septic Tanks

Data for septic tanks are based on the 1970 census results, with year-by-year additions based on new septic tank construction. The data do not reflect septic tanks that may have been removed. Hillsborough County has a cumulative registry of 100,483 septic tanks. With 425,962 households in the county, this means that approximately 76 percent of the residences in the county are connected to wastewater treatment plants, with the rest (24 percent) utilizing septic

tanks (Florida Department of Health Web site, 2004; U.S. Environmental Protection Agency, 2001, contains information regarding the contribution of coliforms from septic tanks.)

4.4 Source Summary

4.4.1 Summary of Total Coliform Loadings into WBID 1443E from Various Sources

Table 4.4 summarizes the average total and fecal coliform loadings for instream conditions and calculated average daily maximums for Lowry Zoo. Instream total coliform loads were calculated for January 1996 through December 2001. Instream fecal coliform loads were calculated for January 1996 through December 2002. Total and fecal coliform loads for Lowry Zoo are based on measured flow data from August 2002 through September 2003, multiplied by the appropriate conversion factors and measured coliform values.

Table 4.4. Average Daily Quantity of Total and Fecal Coliform Loading into WBID 1443E

Parameter	CFU/Day
Total Coliform (instream)	4.10E12
Fecal Coliform (instream)	9.77E11
Total Coliform (Lowry Zoo)	2.00E10
Fecal Coliform (Lowry Zoo)	3.34E9

Chapter 5: DETERMINATION OF ASSIMILATIVE CAPACITY

5.1 Determination of Assimilative Capacity

The load duration method used for many bacterial TMDLs in Florida relies on the availability of river flow data that is concurrent with the measured bacterial concentrations. While the Hillsborough River is gaged at multiple locations, this WBID is downstream of the Hillsborough Reservoir, which is a highly managed reservoir. An examination of the discharge data for the reservoir revealed data gaps that included many of the dates for which exceedances of the bacterial criteria were observed. As a direct comparison could not be made between many of the exceedances and the river flow on the day of the exceedance, the load duration method was not selected for these TMDLs. Instead, the methodology used is the "percent reduction" approach. For this method, the percent reduction needed to meet the applicable criterion is calculated for each value above the criterion, and then the median percent reduction is calculated for the portion of the record with the most exceedances (if the data indicate clustering of exceedances) or over the entire record if exceedances occur throughout.

5.1.1 Data Used in the Determination of the TMDL

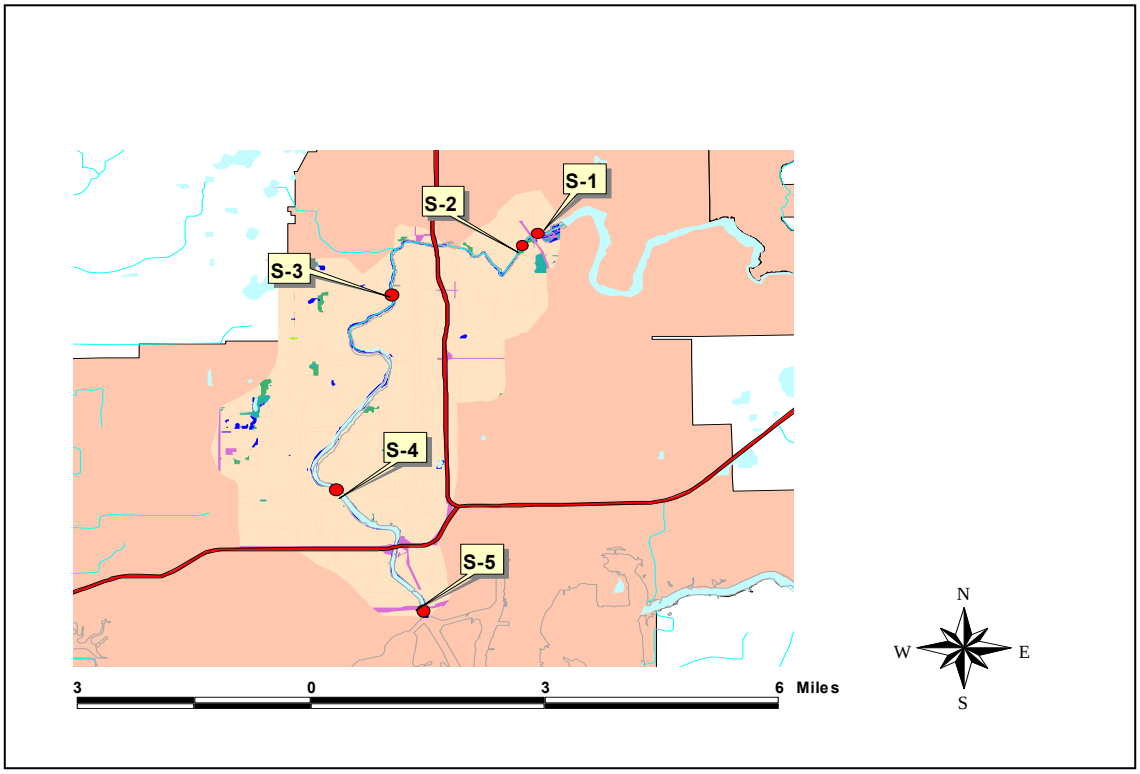
Five sampling stations in WBID 1443E were used for developing the total and fecal coliform TMDLs. The station names are listed in **Table 5.1** and shown in **Figure 5.1.** The primary data collector of historical data is the Hillsborough County Environmental Protection Commission. **Table 5.1** provides a brief statistical overview of the observed data at these sites.

Table 5.1. Observed Data at Sampling Sites, WBID 1443E

Fecal Coliform	Total Coliform	Map Symbol (Figure 5.1)
FLGW8499	FLGW8499	S-1
21FLHILL24030011*	21FLHILL24030011*	S-2
21FLHILL152	21FLHILL152	S-3
21FLHILL24030049*	21FLHILL24030049*	S-4
21FLHILL24030451*	21FLHILL24030451*	S-5

* In 1999, Hillsborough County changed the names of several long-term stations. Old stations 21FLHILL24030451, 21FLHILL24030011, and 21FLHILL24030049 were renamed 21FLHILL002, 21FLHILL105, AND 21FLHILL137, respectively.

Figure 5.1. Historical Monitoring Sites in WBID 1443E



5.1.2 TMDL Development Process

As described in **Section 5.1,** the percent reduction was determined for each individual exceedance using the equation below:

$$\frac{\text{[measured exceedance – criterion]*100}}{\text{measured exceedance}}$$

The total and fecal coliform TMDLs were calculated as the median of the percent reductions needed over the data range where exceedances occurred (see **Appendices B** and **C** for data).

5.1.3 Critical Conditions/Seasonality

As described in **Section 5.1,** no reliable flow data existed that could be used to link exceedances to critical periods of flow. To examine whether there were any critical seasons, the data for exceedances were divided into calendar seasons, with Winter (1) defined as January, February, and March; Spring (2) defined as April, May, and June; Summer (3) defined

as July, August, and September; and Fall (4) defined as October, November and December. By examining **Table 5.2** and **Figures 5.2, 5.3, 5.4,** and **5.5,** it can be seen that while exceedances occur in all seasons, values are generally higher in the spring, summer, and fall compared with winter. As exceedances occurred during all seasons, the TMDL will be calculated based on all of the data.

Table 5.2. Total and Fecal Coliform Exceedances, by Season

Season	Fecal Coliform	Total Coliform
Winter (1)	8	9
Spring (2)	14	14
Summer (3)	15	18
Fall (4)	13	12
Total	50	53

Figure 5.2. Total Coliform Exceedances by Season (1=Jan+Feb+Mar, 2= Apr+May+Jun, 3=Jul+Aug+Sep, 4=Oct+Nov+Dec)

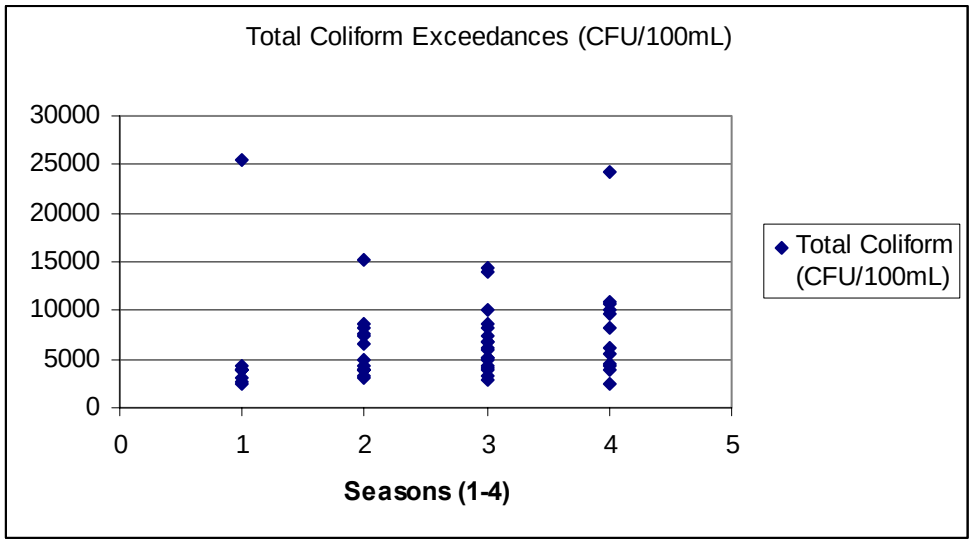


Figure 5.3. Fecal Coliform Exceedances by Season (1=Jan+Feb+ Mar, 2= Apr+May+Jun, 3=Jul+Aug+Sep, 4=Oct+Nov+Dec)

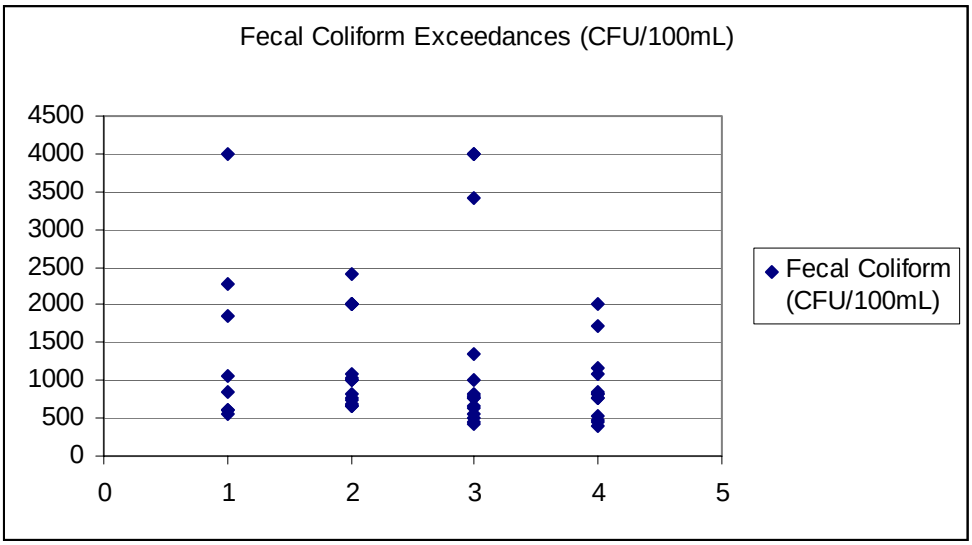


Figure 5.4. Fecal Coliform Data versus 400 CFU/100mL Criterion

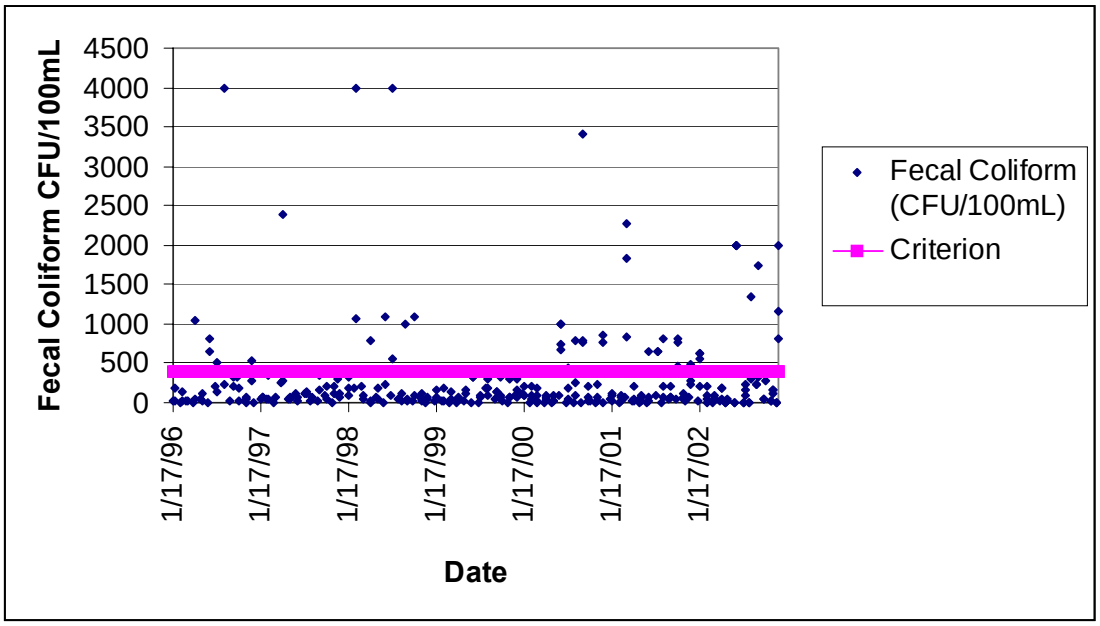
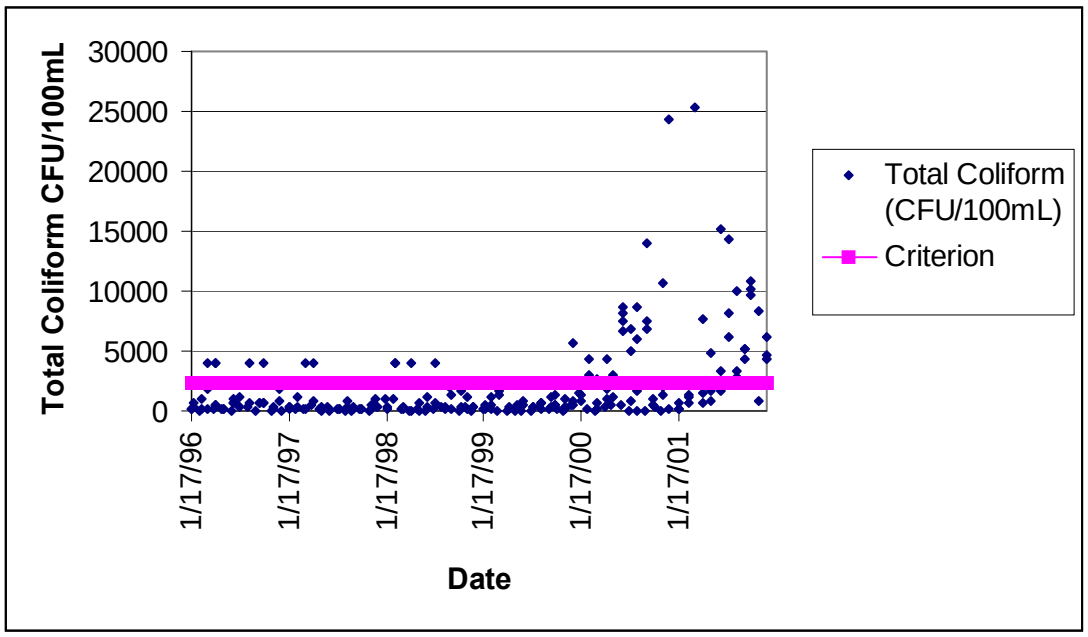


Figure 5.5. Total Coliform Data versus 2400 CFU/100mL Criterion



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 (Waste Load 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 WBID 1443E of the Hillsborough River are expressed in terms of both loading of CFUs for the WLA and a percent reduction for the LA, and represent the maximum daily total and fecal coliform loads the river segment can assimilate and maintain the total and fecal coliform criteria **(Table 6.1).** It should be noted that, because adequate flow data were not required, the LA was not adjusted to account for the WLA.

Table 6.1. TMDL Components for WBID 1443E of the Hillsborough River

Parameter	TMDL (percent reduction)	WLA		LA (percent reduction)†	MOS
		Wastewater (colonies/day)	NPDES Stormwater (percent reduction)		
Total Coliform	52.9%	2.00E10	52.9%	52.9%	Implicit
Fecal Coliform	51.2%	3.34E9	51.2%	51.2%	Implicit

6.2 Load Allocation

Based on the percent reduction approach, a total coliform reduction of 52.9 percent and a 51.2 percent reduction of fecal coliform are needed from nonpoint sources. It should be noted that the LA includes loading from stormwater discharges regulated by the Department and the SWFWMD that are not part of the NPDES Stormwater Program (see **Appendix A**).

6.3 Wasteload Allocation

6.3.1 NPDES Wastewater Discharges

The total coliform wasteload allocation for Lowry Park Zoological Society of Tampa Inc. (Permit Number FL0186651-001-IW7C) was set at the criterion times the average daily maximum flow for August 2002 through September 2003. It is 2.00E10 CFU/day.

The fecal coliform wasteload allocation for the park was set at the criterion times the average daily maximum flow for August 2002 through September 2003. It is 3.34E9 CFU/day.

6.3.2 NPDES Stormwater Discharges

The WLA for the Hillsborough County MS4 permit (Number FLS000006) is a 52.9 percent reduction in total coliform and a 51.2 percent reduction in fecal coliform. It should be noted that any MS4 permittee will only be responsible for reducing the loads associated with stormwater outfalls that it owns or otherwise has responsible control over, and it is not responsible for reducing other nonpoint source loads in its jurisdiction.

6.4 Margin of Safety

Consistent with the recommendations of the Allocation Technical Advisory Committee (Florida Department of Environmental Protection, February 2001), an implicit margin of safety (MOS) was used in the development of this TMDL. An implicit MOS was included in the TMDL by not allowing any exceedances of the state criterion, even though intermittent natural exceedances of the criterion would be expected and would be taken into account when determining impairment. The implicit MOS is also appropriate because existing loads are based on instream coliform measurements. These measurements include decay processes occurring instream and do not represent the maximum load that can be applied to the land and transported to the stream during a rain event. Additionally, this segment of the Hillsborough River is tidally influenced and characterized as estuarine as opposed to fresh water. As a result, the estuarine nature of the water in this segment will accelerate the coliform die-off and provide added dilution through tidally induced mixing, increasing the implicit margin of safety.

Chapter 7: NEXT STEPS: IMPLEMENTATION PLAN DEVELOPMENT AND BEYOND

7.1 Basin Management Action Plan

Following the adoption of this TMDL by rule, the next step in the TMDL process is to develop an implementation plan for the TMDL, which will be a component of the Basin Management Action Plan (BMAP) for the Tampa Bay Tributaries Basin. This document will be developed over the next year in cooperation with local stakeholders and will attempt to reach consensus on more detailed allocations and on how load reductions will be accomplished. The BMAP will include the following:

- Appropriate allocations among the affected parties,
- A description of the load reduction activities to be undertaken,
- Timetables for project implementation and completion,
- Funding mechanisms that may be utilized,
- Any applicable signed agreement,
- Local ordinances defining actions to be taken or prohibited,
- Local water quality standards, permits, or load limitation agreements, and
- Monitoring and follow-up measures.

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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 Chapter 62-40, F.A.C.

The rule requires the state's water management districts (WMDs) to establish stormwater pollutant load reduction goals (PLRGs) and adopt them as part of a Surface Water Improvement and Management (SWIM) plan, other watershed plan, or rule. Stormwater PLRGs are a major component of the load allocation part of a TMDL. To date, stormwater PLRGs have been established for Tampa Bay, Lake Thonotosassa, the Winter Haven Chain of Lakes, the Everglades, Lake Okeechobee, and Lake Apopka. No PLRG had been developed for Newnans Lake at the time this report was developed.

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 stormwater permitting program to designate certain stormwater discharges as "point sources" of pollution. These stormwater discharges include certain discharges that are associated with industrial activities designated by specific standard industrial classification (SIC) codes, construction sites disturbing 5 or more acres of land, and master drainage systems of local governments with a population above 100,000, which are better known as municipal separate storm sewer systems (MS4s). However, because the master drainage systems of most local governments in Florida are interconnected, the EPA has implemented Phase I of the MS4 permitting program on a countywide basis, which brings in all cities (incorporated areas), Chapter 298 urban water control districts, and the Florida Department of Transportation throughout the 15 counties meeting the population criteria.

An important difference between the federal and state stormwater permitting programs is that the federal program covers both new and existing discharges, while the state program focuses on new discharges. Additionally, Phase II of the NPDES Program will expand the need for these permits to construction sites between 1 and 5 acres, and to local governments with as few as 10,000 people. These revised rules require that these additional activities obtain permits by 2003. 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. The Department recently accepted delegation from the EPA for the stormwater part of the NPDES Program. It should be noted that most MS4 permits issued in Florida include a reopener clause that allows permit revisions to implement TMDLs once they are formally adopted by rule.

Appendix B. Observed Data for Calculating Percent Reductions for Fecal Coliform for the Hillsborough River, WBID 1443E

Fecal Coliform Station	Sample Date	Sample Time	Fecal Coliform (CFU/100mL)	Percent Reduction
21FLHILL24030451	1/17/1996	905	15	
21FLHILL24030049	1/23/1996	800	180	
21FLHILL24030011	1/23/1996	1055	20	
21FLHILL24030451	2/13/1996	920	10	
21FLHILL24030049	2/20/1996	805	140	
21FLHILL24030011	2/20/1996	1100	20	
21FLHILL24030451	3/13/1996	955	20	
21FLHILL24030049	3/19/1996	810	380	
21FLHILL24030011	3/19/1996	1055	20	
21FLHILL24030451	4/9/1996	952	10	
21FLHILL24030049	4/16/1996	815	1,040	61.5
21FLHILL24030011	4/16/1996	1050	40	
21FLHILL24030451	5/8/1996	940	40	
21FLHILL24030049	5/14/1996	815	20	
21FLHILL24030011	5/14/1996	1110	120	
21FLHILL24030451	6/11/1996	924	5	
21FLHILL24030049	6/18/1996	810	660	39.4
21FLHILL24030011	6/18/1996	1105	820	51.2
21FLHILL24030451	7/9/1996	915	200	
21FLHILL24030049	7/16/1996	815	500	20.0
21FLHILL24030011	7/16/1996	1050	140	
21FLHILL24030451	8/13/1996	919	225	
21FLHILL24030049	8/20/1996	807	4,000	90.0
21FLHILL24030011	8/20/1996	1100	420	4.8
21FLHILL24030451	9/10/1996	915	20	
21FLHILL24030049	9/24/1996	815	320	
21FLHILL24030011	9/24/1996	1045	200	
21FLHILL24030451	10/9/1996	950	320	
21FLHILL24030049	10/15/1996	835	180	
21FLHILL24030011	10/15/1996	1105	20	
21FLHILL24030451	11/13/1996	932	5	
21FLHILL24030049	11/19/1996	815	40	
21FLHILL24030011	11/19/1996	1045	80	
21FLHILL24030049	12/10/1996	810	280	
21FLHILL24030011	12/10/1996	1115	540	25.9
21FLHILL24030451	12/17/1996	920	10	
21FLHILL24030451	1/14/1997	910	35	

Fecal Coliform Station	Sample Date	Sample Time	Fecal Coliform (CFU/100mL)	Percent Reduction
21FLHILL24030049	1/21/1997	800	60	
21FLHILL24030011	1/21/1997	1045	60	
21FLHILL24030451	2/11/1997	915	50	
21FLHILL24030049	2/18/1997	810	40	
21FLHILL24030011	2/18/1997	1045	340	
21FLHILL24030451	3/11/1997	937	5	
21FLHILL24030049	3/18/1997	835	60	
21FLHILL24030011	3/18/1997	1120	360	
21FLHILL24030451	4/8/1997	945	255	
21FLHILL24030049	4/15/1997	825	280	
21FLHILL24030011	4/15/1997	1041	2,400	83.3
21FLHILL24030451	5/13/1997	920	35	
21FLHILL24030049	5/20/1997	815	40	
21FLHILL24030011	5/20/1997	1050	80	
21FLHILL24030451	6/10/1997	915	105	
21FLHILL24030049	6/17/1997	850	20	
21FLHILL24030011	6/17/1997	1209	60	
21FLHILL24030451	7/15/1997	922	105	
21FLHILL24030049	7/22/1997	820	140	
21FLHILL24030011	7/22/1997	1130	120	
21FLHILL24030451	8/12/1997	945	30	
21FLHILL24030049	8/19/1997	815	380	
21FLHILL24030011	8/19/1997	1105	80	
21FLHILL24030451	9/9/1997	944	25	
21FLHILL24030049	9/16/1997	830	160	
21FLHILL24030011	9/16/1997	1055	340	
21FLHILL24030451	10/7/1997	858	95	
21FLHILL24030049	10/14/1997	815	220	
21FLHILL24030011	10/14/1997	1105	40	
21FLHILL24030451	11/12/1997	942	5	
21FLHILL24030049	11/18/1997	825	200	
21FLHILL24030011	11/18/1997	1135	120	
21FLHILL24030451	12/3/1997	908	300	
21FLHILL24030049	12/9/1997	810	120	
21FLHILL24030011	12/9/1997	1035	80	
21FLHILL24030451	1/13/1998	920	185	
21FLHILL24030049	1/20/1998	820	320	
21FLHILL24030011	1/20/1998	1025	100	
21FLHILL24030451	2/10/1998	910	175	
21FLHILL24030049	2/17/1998	805	4,000	90.0
21FLHILL24030011	2/17/1998	1105	1,060	62.3
21FLHILL24030451	3/10/1998	925	205	
21FLHILL24030049	3/17/1998	810	40	

Fecal Coliform Station	Sample Date	Sample Time	Fecal Coliform (CFU/100mL)	Percent Reduction
21FLHILL24030011	3/17/1998	1035	100	
21FLHILL24030451	4/14/1998	930	5	
21FLHILL24030049	4/21/1998	805	780	48.7
21FLHILL24030011	4/21/1998	1130	20	
21FLHILL24030451	5/12/1998	924	70	
21FLHILL24030049	5/19/1998	850	40	
21FLHILL24030011	5/19/1998	1150	180	
21FLHILL24030451	6/9/1998	928	10	
21FLHILL24030049	6/16/1998	802	240	
21FLHILL24030011	6/16/1998	1035	1,080	63.0
21FLHILL24030451	7/14/1998	900	100	
21FLHILL24030049	7/21/1998	805	4,000	90.0
21FLHILL24030011	7/21/1998	1034	560	28.6
21FLHILL24030451	8/11/1998	932	45	
21FLHILL24030049	8/25/1998	806	120	
21FLHILL24030011	8/25/1998	1038	20	
21FLHILL24030451	9/8/1998	930	1,000	60.0
21FLHILL24030049	9/15/1998	820	40	
21FLHILL24030011	9/15/1998	1147	20	
21FLHILL24030451	10/13/1998	936	15	
21FLHILL24030049	10/20/1998	812	1,080	63.0
21FLHILL24030011	10/20/1998	1035	100	
21FLHILL24030451	11/9/1998	925	60	
21FLHILL24030049	11/17/1998	823	120	
21FLHILL24030011	11/17/1998	1058	20	
21FLHILL24030451	12/2/1998	927	5	
21FLHILL24030049	12/8/1998	810	80	
21FLHILL24030011	12/8/1998	1040	40	
21FLHILL002	1/12/1999	930	15	
21FLHILL137	1/19/1999	815	80	
21FLHILL105	1/19/1999	1100	160	
21FLHILL002	2/9/1999	935	25	
21FLHILL137	2/16/1999	811	20	
21FLHILL105	2/16/1999	1110	180	
21FLHILL002	3/9/1999	935	10	
21FLHILL137	3/16/1999	807	40	
21FLHILL105	3/16/1999	1100	140	
21FLHILL002	4/13/1999	940	5	
21FLHILL137	4/20/1999	812	40	
21FLHILL105	4/20/1999	1107	60	
21FLHILL002	5/11/1999	940	15	
21FLHILL137	5/18/1999	813	120	
21FLHILL105	5/18/1999	1115	160	

Fecal Coliform Station	Sample Date	Sample Time	Fecal Coliform (CFU/100mL)	Percent Reduction
21FLHILL002	6/8/1999	915	5	
21FLHILL137	6/15/1999	805	320	
21FLHILL105	6/15/1999	1100	320	
21FLHILL002	7/13/1999	928	10	
21FLHILL137	7/20/1999	808	100	
21FLHILL105	7/20/1999	1052	80	
21FLHILL002	8/10/1999	934	180	
21FLHILL137	8/17/1999	820	100	
21FLHILL152	8/17/1999	1130	300	
21FLHILL105	8/17/1999	1150	180	
21FLHILL002	9/14/1999	901	50	
21FLHILL137	9/22/1999	825	140	
21FLHILL152	9/22/1999	1110	400	
21FLHILL105	9/22/1999	1135	140	
21FLHILL137	10/12/1999	810	320	
21FLHILL152	10/12/1999	1110	100	
21FLHILL105	10/12/1999	1135	80	
21FLHILL002	10/19/1999	920	15	
21FLHILL002	11/8/1999	1140	5	
21FLHILL137	11/16/1999	814	80	
21FLHILL152	11/16/1999	1030	300	
21FLHILL105	11/16/1999	1050	60	
21FLHILL002	12/7/1999	918	85	
21FLHILL137	12/14/1999	755	80	
21FLHILL152	12/14/1999	1050	300	
21FLHILL105	12/14/1999	1120	160	
21FLHILL002	1/11/2000	928	105	
21FLHILL137	1/18/2000	820	100	
21FLHILL152	1/18/2000	1102	100	
21FLHILL105	1/18/2000	1120	200	
21FLHILL002	2/8/2000	919	10	
21FLHILL137	2/15/2000	806	200	
21FLHILL152	2/15/2000	1025	100	
21FLHILL105	2/15/2000	1045	40	
21FLHILL002	3/7/2000	918	5	
21FLHILL137	3/14/2000	810	20	
21FLHILL152	3/14/2000	1038	100	
21FLHILL105	3/14/2000	1105	180	
21FLHILL002	4/11/2000	918	5	
21FLHILL137	4/18/2000	803	40	
21FLHILL152	4/18/2000	1022	100	
21FLHILL105	4/18/2000	1042	80	
21FLHILL002	5/9/2000	1000	5	

Fecal Coliform Station	Sample Date	Sample Time	Fecal Coliform (CFU/100mL)	Percent Reduction
21FLHILL137	5/16/2000	810	20	
21FLHILL152	5/16/2000	1107	100	
21FLHILL105	5/16/2000	1145	20	
21FLHILL002	6/13/2000	922	95	
21FLHILL137	6/20/2000	815	740	45.9
21FLGW 8499	6/20/2000	930	1,000	60.0
21FLGW 8499	6/20/2000	930	1,000	60.0
21FLHILL152	6/20/2000	1110	360	
21FLHILL105	6/20/2000	1140	680	41.2
21FLHILL002	7/11/2000	940	5	
21FLHILL137	7/18/2000	805	40	
21FLHILL152	7/18/2000	1100	440	9.1
21FLHILL105	7/18/2000	1125	180	
21FLHILL002	8/9/2000	935	5	
21FLHILL137	8/15/2000	800	100	
21FLHILL152	8/15/2000	1045	780	48.7
21FLHILL105	8/15/2000	1115	260	
21FLHILL002	9/12/2000	930	5	
21FLHILL137	9/19/2000	810	800	50.0
21FLHILL152	9/19/2000	1115	760	47.4
21FLHILL105	9/19/2000	1140	3,420	88.3
21FLHILL137	10/10/2000	820	80	
21FLHILL152	10/10/2000	1100	200	
21FLHILL105	10/10/2000	1130	20	
21FLHILL002	10/17/2000	950	15	
21FLHILL002	11/7/2000	905	5	
21FLHILL137	11/14/2000	820	20	
21FLHILL152	11/14/2000	1100	60	
21FLHILL105	11/14/2000	1120	240	
21FLHILL002	12/6/2000	940	5	
21FLHILL137	12/12/2000	810	760	47.4
21FLHILL152	12/12/2000	1030	860	53.5
21FLHILL002	1/9/2001	910	52	
21FLHILL137	1/16/2001	800	20	
21FLHILL152	1/16/2001	1037	100	
21FLHILL105	1/16/2001	1100	120	
21FLHILL002	2/13/2001	909	10	
21FLHILL137	2/20/2001	814	20	
21FLHILL152	2/20/2001	1105	100	
21FLHILL105	2/20/2001	1111	60	
21FLHILL002	3/14/2001	911	72	
21FLHILL137	3/20/2001	803	840	52.4
21FLHILL152	3/20/2001	1028	2,280	82.5

Fecal Coliform Station	Sample Date	Sample Time	Fecal Coliform (CFU/100mL)	Percent Reduction
21FLHILL105	3/20/2001	1105	1,840	78.3
21FLHILL002	4/10/2001	932	14	
21FLHILL137	4/17/2001	825	40	
21FLHILL152	4/17/2001	1121	20	
21FLHILL105	4/17/2001	1145	200	
21FLHILL002	5/8/2001	929	2	
21FLHILL137	5/15/2001	823	20	
21FLHILL152	5/15/2001	1050	60	
21FLHILL105	5/15/2001	1110	100	
21FLHILL002	6/12/2001	930	2	
21FLHILL137	6/19/2001	820	60	
21FLHILL152	6/19/2001	1132	20	
21FLHILL105	6/19/2001	1205	660	39.4
21FLHILL002	7/17/2001	857	86	
21FLHILL137	7/24/2001	805	660	39.4
21FLHILL152	7/24/2001	1050	380	
21FLHILL105	7/24/2001	1114	640	37.5
21FLHILL002	8/14/2001	925	2	
21FLHILL137	8/21/2001	812	820	51.2
21FLHILL152	8/21/2001	1100	220	
21FLHILL105	8/21/2001	1112	60	
21FLHILL002	9/11/2001	909	54	
21FLHILL137	9/18/2001	816	80	
21FLHILL152	9/18/2001	1059	80	
21FLHILL105	9/18/2001	1124	200	
21FLHILL002	10/10/2001	920	48	
21FLHILL137	10/16/2001	807	820	51.2
21FLHILL152	10/16/2001	1038	460	13.0
21FLHILL105	10/16/2001	1101	760	47.4
21FLHILL137	11/13/2001	814	40	
21FLHILL152	11/13/2001	1101	120	
21FLHILL105	11/13/2001	1123	80	
21FLHILL002	11/19/2001	940	24	
21FLHILL002	12/5/2001	915	80	
21FLHILL137	12/11/2001	819	480	16.7
21FLHILL152	12/11/2001	1104	280	
21FLHILL105	12/11/2001	1127	240	
21FLHILL002	1/8/2002	932	14	
21FLHILL137	1/15/2002	810	550	27.3
21FLHILL152	1/15/2002	1127	220	
21FLHILL105	1/15/2002	1148	620	35.5
21FLHILL105	1/15/2002	1148	620	35.5
21FLHILL002	2/13/2002	913	4	

Fecal Coliform Station	Sample Date	Sample Time	Fecal Coliform (CFU/100mL)	Percent Reduction
21FLHILL137	2/19/2002	824	100	
21FLHILL152	2/19/2002	1122	50	
21FLHILL105	2/19/2002	1141	200	
21FLHILL002	3/12/2002	922	4	
21FLHILL137	3/19/2002	812	40	
21FLHILL152	3/19/2002	1122	50	
21FLHILL105	3/19/2002	1200	100	
21FLHILL002	4/9/2002	858	12	
21FLHILL137	4/16/2002	813	190	
21FLHILL152	4/16/2002	1045	40	
21FLHILL105	4/16/2002	1108	180	
21FLHILL002	5/7/2002	915	2	
21FLHILL002	5/7/2002	915	2	
21FLHILL137	5/14/2002	800	20	
21FLHILL152	5/14/2002	1038	20	
21FLHILL105	5/14/2002	1059	40	
21FLHILL002	6/11/2002	924	2	
21FLHILL002	6/11/2002	924	2	
21FLHILL137	6/18/2002	812	2,000	80.0
21FLHILL152	6/18/2002	1048	2,000	80.0
21FLHILL105	6/18/2002	1108	2,000	80.0
21FLHILL002	7/16/2002	856	2	
21FLHILL002	7/16/2002	856	2	
21FLHILL137	7/23/2002	803	90	
21FLHILL152	7/23/2002	1050	240	
21FLHILL105	7/23/2002	1116	160	
21FLHILL002	8/13/2002	901	4	
21FLHILL002	8/13/2002	901	4	
21FLHILL137	8/20/2002	813	1,340	70.1
21FLHILL152	8/20/2002	1035	350	
21FLHILL105	8/20/2002	1054	310	
21FLHILL002	9/10/2002	931	226	
21FLHILL002	9/10/2002	931	226	
21FLHILL137	9/17/2002	805	1,730	76.9
21FLHILL152	9/17/2002	1102	330	
21FLHILL105	9/17/2002	1125	370	
21FLHILL002	10/8/2002	1024	46	
21FLHILL002	10/8/2002	1024	46	
21FLHILL137	10/15/2002	805	360	
21FLHILL152	10/15/2002	1045	410	2.4
21FLHILL105	10/15/2002	1105	270	
21FLHILL002	11/12/2002	948	12	
21FLHILL002	11/12/2002	948	12	

Fecal Coliform Station	Sample Date	Sample Time	Fecal Coliform (CFU/100mL)	Percent Reduction
21FLHILL137	11/19/2002	740	120	
21FLHILL152	11/19/2002	1025	170	
21FLHILL105	11/19/2002	1048	170	
21FLHILL002	12/4/2002	915	2	
21FLHILL002	12/4/2002	915	2	
21FLHILL137	12/10/2002	808	2,000	80.0
21FLHILL152	12/10/2002	1051	1,170	65.8
21FLHILL105	12/10/2002	1113	820	51.2
Median Percent Reduction				**51.2**

Appendix C. Observed Data for Calculating Percent Reductions for Total Coliform for the Hillsborough River, WBID 1443E

Total Coliform Station	Sample Date	Sample Time	Total Coliform (CFU/100mL)	Percent Reduction
21FLHILL24030451	1/17/96	905	130	
21FLHILL24030451	1/17/96	905	130	
21FLHILL24030011	1/23/96	1055	260	
21FLHILL24030049	1/23/96	800	700	
21FLHILL24030451	2/13/96	920	70	
21FLHILL24030011	2/20/96	1100	220	
21FLHILL24030049	2/20/96	805	1,000	
21FLHILL24030451	3/13/96	955	100	
21FLHILL24030011	3/19/96	1055	4,000	40.0
21FLHILL24030049	3/19/96	810	1,800	
21FLHILL24030451	4/9/96	952	190	
21FLHILL24030011	4/16/96	1050	460	
21FLHILL24030011	4/16/96	1050	460	
21FLHILL24030049	4/16/96	815	4,000	40.0
21FLHILL24030049	4/16/96	815	4,000	40.0
21FLHILL24030451	5/8/96	940	130	
21FLHILL24030011	5/14/96	1110	220	
21FLHILL24030049	5/14/96	815	100	
21FLHILL24030451	6/11/96	924	10	
21FLHILL24030011	6/18/96	1105	1,000	
21FLHILL24030049	6/18/96	810	680	
21FLHILL24030049	6/18/96	810	680	
21FLHILL24030451	7/9/96	915	480	
21FLHILL24030011	7/16/96	1050	360	
21FLHILL24030049	7/16/96	815	1,100	
21FLHILL24030451	8/13/96	919	360	
21FLHILL24030011	8/20/96	1100	700	
21FLHILL24030049	8/20/96	807	4,000	40.0
21FLHILL24030451	9/10/96	915	70	
21FLHILL24030011	9/24/96	1045	620	
21FLHILL24030049	9/24/96	815	620	
21FLHILL24030451	10/9/96	950	610	
21FLHILL24030011	10/15/96	1105	4,000	40.0
21FLHILL24030049	10/15/96	835	740	
21FLHILL24030451	11/13/96	932	50	
21FLHILL24030011	11/19/96	1045	340	
21FLHILL24030049	11/19/96	815	180	
21FLHILL24030011	12/10/96	1115	1,820	
21FLHILL24030049	12/10/96	810	800	

Total Coliform Station	Sample Date	Sample Time	Total Coliform (CFU/100mL)	Percent Reduction
21FLHILL24030451	12/17/96	920	30	
21FLHILL24030451	1/14/97	910	340	
21FLHILL24030011	1/21/97	1045	340	
21FLHILL24030049	1/21/97	800	160	
21FLHILL24030451	2/11/97	915	210	
21FLHILL24030011	2/18/97	1045	1,180	
21FLHILL24030049	2/18/97	810	280	
21FLHILL24030451	3/11/97	937	120	
21FLHILL24030011	3/18/97	1120	4,000	40.0
21FLHILL24030049	3/18/97	835	220	
21FLHILL24030451	4/8/97	945	530	
21FLHILL24030011	4/15/97	1041	4,000	40.0
21FLHILL24030049	4/15/97	825	860	
21FLHILL24030451	5/13/97	920	150	
21FLHILL24030011	5/20/97	1050	300	
21FLHILL24030049	5/20/97	815	80	
21FLHILL24030451	6/10/97	915	300	
21FLHILL24030011	6/17/97	1209	140	
21FLHILL24030049	6/17/97	850	20	
21FLHILL24030451	7/15/97	922	110	
21FLHILL24030011	7/22/97	1130	180	
21FLHILL24030049	7/22/97	820	140	
21FLHILL24030451	8/12/97	945	60	
21FLHILL24030011	8/19/97	1105	300	
21FLHILL24030049	8/19/97	815	800	
21FLHILL24030451	9/9/97	944	30	
21FLHILL24030011	9/16/97	1055	340	
21FLHILL24030049	9/16/97	830	180	
21FLHILL24030451	10/7/97	858	200	
21FLHILL24030011	10/14/97	1105	180	
21FLHILL24030049	10/14/97	815	220	
21FLHILL24030451	11/12/97	942	80	
21FLHILL24030011	11/18/97	1135	200	
21FLHILL24030049	11/18/97	825	420	
21FLHILL24030451	12/3/97	908	990	
21FLHILL24030011	12/9/97	1035	280	
21FLHILL24030049	12/9/97	810	360	
21FLHILL24030451	1/13/98	920	1,080	
21FLHILL24030011	1/20/98	1025	200	
21FLHILL24030049	1/20/98	820	320	
21FLHILL24030451	2/10/98	910	930	
21FLHILL24030011	2/17/98	1105	4,000	40.0
21FLHILL24030049	2/17/98	805	4,000	40.0
21FLHILL24030451	3/10/98	925	150	

Total Coliform Station	Sample Date	Sample Time	Total Coliform (CFU/100mL)	Percent Reduction
21FLHILL24030011	3/17/98	1035	120	
21FLHILL24030049	3/17/98	810	360	
21FLHILL24030451	4/14/98	930	60	
21FLHILL24030011	4/21/98	1130	80	
21FLHILL24030049	4/21/98	805	4,000	40.0
21FLHILL24030451	5/12/98	924	90	
21FLHILL24030011	5/19/98	1150	680	
21FLHILL24030049	5/19/98	850	60	
21FLHILL24030451	6/9/98	928	20	
21FLHILL24030011	6/16/98	1035	1,240	
21FLHILL24030049	6/16/98	802	260	
21FLHILL24030451	7/14/98	900	110	
21FLHILL24030011	7/21/98	1034	660	
21FLHILL24030049	7/21/98	805	4,000	40.0
21FLHILL24030451	8/11/98	932	270	
21FLHILL24030011	8/25/98	1038	240	
21FLHILL24030049	8/25/98	806	400	
21FLHILL24030451	9/8/98	930	2,000	
21FLHILL24030011	9/15/98	1147	120	
21FLHILL24030049	9/15/98	820	1,360	
21FLHILL24030451	10/13/98	936	80	
21FLHILL24030011	10/20/98	1035	380	
21FLHILL24030049	10/20/98	812	1,720	
21FLHILL24030451	11/9/98	925	280	
21FLHILL24030011	11/17/98	1058	220	
21FLHILL24030049	11/17/98	823	1,240	
21FLHILL24030451	12/2/98	927	30	
21FLHILL24030011	12/8/98	1040	400	
21FLHILL24030049	12/8/98	810	320	
21FLHILL002	1/12/99	930	90	
21FLHILL105	1/19/99	1100	540	
21FLHILL137	1/19/99	815	120	
21FLHILL002	2/9/99	935	110	
21FLHILL105	2/16/99	1110	560	
21FLHILL137	2/16/99	811	1,200	
21FLHILL002	3/9/99	935	50	
21FLHILL105	3/16/99	1100	1,600	
21FLHILL137	3/16/99	807	1,300	
21FLHILL002	4/13/99	940	10	
21FLHILL105	4/20/99	1107	340	
21FLHILL137	4/20/99	812	140	
21FLHILL002	5/11/99	940	60	
21FLHILL105	5/18/99	1115	380	
21FLHILL137	5/18/99	813	500	

Total Coliform Station	Sample Date	Sample Time	Total Coliform (CFU/100mL)	Percent Reduction
21FLHILL002	6/8/99	915	10	
21FLHILL105	6/15/99	1100	760	
21FLHILL137	6/15/99	805	580	
21FLHILL002	7/13/99	928	80	
21FLHILL105	7/20/99	1052	400	
21FLHILL137	7/20/99	808	280	
21FLHILL002	8/10/99	934	400	
21FLHILL105	8/17/99	1150	660	
21FLHILL152	8/17/99	1130	600	
21FLHILL137	8/17/99	820	160	
21FLHILL002	9/14/99	901	180	
21FLHILL105	9/22/99	1135	1,220	
21FLHILL152	9/22/99	1110	2,300	
21FLHILL137	9/22/99	825	400	
21FLHILL105	10/12/99	1135	440	
21FLHILL152	10/12/99	1110	1,300	
21FLHILL137	10/12/99	810	580	
21FLHILL002	10/19/99	920	130	
21FLHILL002	11/8/99	1140	30	
21FLHILL105	11/16/99	1050	200	
21FLHILL152	11/16/99	1030	300	
21FLHILL137	11/16/99	814	980	
21FLHILL002	12/7/99	918	490	
21FLHILL105	12/14/99	1120	820	
21FLHILL152	12/14/99	1050	5,600	57.1
21FLHILL137	12/14/99	755	420	
21FLHILL002	1/11/00	928	1,580	
21FLHILL105	1/18/00	1120	2,420	0.8
21FLHILL152	1/18/00	1102	1,400	
21FLHILL137	1/18/00	820	760	
21FLHILL002	2/8/00	919	190	
21FLHILL105	2/15/00	1045	3,040	21.1
21FLHILL152	2/15/00	1025	4,400	45.5
21FLHILL137	2/15/00	806	2,180	
21FLHILL002	3/7/00	918	80	
21FLHILL105	3/14/00	1105	2,600	7.7
21FLHILL152	3/14/00	1038	600	
21FLHILL137	3/14/00	810	200	
21FLHILL002	4/11/00	918	290	
21FLHILL105	4/18/00	1042	4,300	44.2
21FLHILL152	4/18/00	1022	1,800	
21FLHILL137	4/18/00	803	940	
21FLHILL002	5/9/00	1000	520	
21FLHILL105	5/16/00	1145	3,000	20.0

Total Coliform Station	Sample Date	Sample Time	Total Coliform (CFU/100mL)	Percent Reduction
21FLHILL152	5/16/00	1107	2,100	
21FLHILL137	5/16/00	810	1,180	
21FLHILL002	6/13/00	922	540	
21FLHILL105	6/20/00	1140	6,600	63.6
21FLHILL152	6/20/00	1110	8,200	70.7
21FLGW 8499	6/20/00	930	7,500	68.0
21FLHILL137	6/20/00	815	8,600	72.1
21FLHILL002	7/11/00	940	20	
21FLHILL105	7/18/00	1125	6,800	64.7
21FLHILL152	7/18/00	1100	5,000	52.0
21FLHILL137	7/18/00	805	800	
21FLHILL002	8/9/00	935	80	
21FLHILL105	8/15/00	1115	6,000	60.0
21FLHILL152	8/15/00	1045	8,600	72.1
21FLHILL137	8/15/00	800	1,600	
21FLHILL002	9/12/00	930	60	
21FLHILL105	9/19/00	1140	14,000	82.9
21FLHILL152	9/19/00	1115	6,800	64.7
21FLHILL137	9/19/00	810	7,500	68.0
21FLHILL105	10/10/00	1130	1,000	
21FLHILL152	10/10/00	1100	2,500	4.0
21FLHILL137	10/10/00	820	500	
21FLHILL002	10/17/00	950	330	
21FLHILL002	11/7/00	905	80	
21FLHILL105	11/14/00	1120	10,600	77.4
21FLHILL152	11/14/00	1100	2,000	
21FLHILL137	11/14/00	820	1,300	
21FLHILL002	12/6/00	940	250	
21FLHILL152	12/12/00	1030	24,300	90.1
21FLHILL105	1/16/01	1100	600	
21FLHILL152	1/16/01	1037	100	
21FLHILL137	1/16/01	800	100	
21FLHILL105	2/20/01	1111	1,200	
21FLHILL152	2/20/01	1105	1,400	
21FLHILL137	2/20/01	814	700	
21FLHILL137	3/20/01	803	25,400	90.6
21FLHILL105	4/17/01	1145	7,700	68.8
21FLHILL152	4/17/01	1121	700	
21FLHILL137	4/17/01	825	1,500	
21FLHILL105	5/15/01	1110	4,900	51.0
21FLHILL152	5/15/01	1050	1,600	
21FLHILL137	5/15/01	823	800	
21FLHILL105	6/19/01	1205	15,200	84.2
21FLHILL152	6/19/01	1132	3,300	27.3

Total Coliform Station	Sample Date	Sample Time	Total Coliform (CFU/100mL)	Percent Reduction
21FLHILL137	6/19/01	820	1,700	
21FLHILL105	7/24/01	1114	14,400	83.3
21FLHILL152	7/24/01	1050	6,100	60.7
21FLHILL137	7/24/01	805	8,200	70.7
21FLHILL105	8/21/01	1112	2,800	14.3
21FLHILL152	8/21/01	1100	3,300	27.3
21FLHILL137	8/21/01	812	10,000	76.0
21FLHILL105	9/18/01	1124	5,200	53.8
21FLHILL152	9/18/01	1059	5,100	52.9
21FLHILL137	9/18/01	816	4,400	45.5
21FLHILL105	10/16/01	1101	10,100	76.2
21FLHILL152	10/16/01	1038	9,700	75.3
21FLHILL137	10/16/01	807	10,800	77.8
21FLHILL105	11/13/01	1123	8,300	71.1
21FLHILL152	11/13/01	1101	2,100	
21FLHILL137	11/13/01	814	800	
21FLHILL105	12/11/01	1127	6,100	60.7
21FLHILL152	12/11/01	1104	4,600	47.8
21FLHILL137	12/11/01	819	4,300	44.2
Median Percent Reduction				**52.9**

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