CDM Camp Dresser & McKee

Report

SARASOTA BAY
NATIONAL ESTUARY PROGRAM

POINT/NON-POINT SOURCE
POLLUTION LOADING ASSESSMENT
PHASE III

AUGUST 31, 1992

Contents

TABLE OF CONTENTS

Section			Page
1.0	INTRODUCTION		1-1
	1.1	Background of the Sarasota Bay National Estuary Program	1-1
	1.2	Purpose and Scope of Point and Nonpoint Pollution Loading Analysis	1-2
	1.3	Organization of Report	1-4
2.0	REVIEW OF EXISTING LOADINGS		2-1
3.0	REFINEMENT OF FUTURE LOADINGS		3-1
	3.1	Five-Year Future Loadings	3-1
	3.2	Twenty-Year Future Loadings	3-7
		3.2.1 Population Projection Analysis	3-7
		3.2.2 Projected Twenty-Year Future Land Use	3-12
		3.2.3 Projected Twenty-Year Future Point Source Discharges	3-12
		3.2.4 Projected Pollution Loadings	3-15
	3.3	Buildout Future Loadings	3-19
		3.3.1 Projected Buildout Future Land Use	3-19
		3.3.2 Projected Buildout Future Point Source Discharges	3-19
		3.3.3 Projected Pollution Loadings	3-19
4.0	ALTERNATIVE MANAGEMENT STRATEGIES FOR NONPOINT POLLUTION		4-1
	4.1	Structural Best Management Practices (BMPs)	4-1
		4.1.1 BMP Alternatives	4-1
		4.1.2 Comparison of BMPs	4-2
		4.1.3 Design Criteria for Preferred BMP	4-8
		4.1.4 Maintenance Requirements for Preferred BMP	4-10
		4.1.5 BMP Pollutant Removal Efficiencies	4-13
		4.1.6 Onsite Versus Regional Deployment of BMPs	4-15
	4.2	Nonstructural Controls	4-21
		4.2.1 Comparison of Structural and Nonstructural BMPs	4-22
		4.2.2 Density Restrictions	4-24
		4.2.3 Clustered Development	4-26
		4.2.4 Restrictions for Industrial/Commercial Land Uses	4-29
		4.2.5 Buffer Zones	4-29
	4.3	Agricultural Best Management Practices	4-30
	4.4	Management Strategies Selected for Analysis	4-30

CONTENTS
(Continued)

Section			Page
5.0	POINT SOURCE MANAGEMENT OPTIONS		5-1
	5.1	Continuation of Existing Methods	5-1
	5.2	Regional Wastewater Plan	5-2
6.0	EVALUATION OF ALTERNATIVE MANAGEMENT STRATEGIES		6-1
	6.1	Evaluated Alternatives	6-1
	6.2	Average Annual Loading Results	6-3
	6.3	Conceptual Costs for Management Alternatives	6-7
	6.4	Other Impacts	6-13
	6.5	Ranking of Alternatives	6-14
	6.6	Selected Management Strategy	6-18
7.0	DETAILED EVALUATION OF SELECTED MANAGEMENT ALTERNATIVES		7-1
	7.1	Loading Results for Various Rainfall Scenarios	7-1
		7.1.1 Twenty-Year Future	7-1
		7.1.2 Buildout Future	7-5
	7.2	Spatial Distribution of Loadings to Sarasota Bay	7-8
	7.3	Potential for Additional Pollution Control	7-14
		7.3.1 Retrofit BMPs	7-15
		7.3.2 Further Improvement of Wastewater Treatment System	7-17
		7.3.3 Wetland Control of Nonpoint Pollution Loading	7-18
8.0	CONCLUSIONS AND RECOMMENDATIONS		8-1
	8.1	Existing Conditions	8-1
	8.2	Future Conditions (Uncontrolled)	8-6
	8.3	Future Conditions (Controlled)	8-6
	8.4	Water Quality Impacts	8-8
	8.5	Implementation of Management Strategies	8-9
	8.6	Additional Control Measures	8-11
9.0	REFERENCES		9-1

LIST OF FIGURES

Figure		Page
1-1	Sarasota Bay NEP Study Area	1-3
4-1	Typical Retention BMP	4-3
4-2	Typical Extended - Dry Detention BMP	4-5
4-3	Typical Wet Detention BMP	4-6
4-4	Deployment Alternatives for Structural BMPs	4-16
6-1	Evaluation Matrix for Alternative Management Strategies	6-15
7-1	Segmentation of Sarasota Bay for Water Quality Analyses	7-8
7-2	Relationship Between Nutrient Loading and Percent Removal in Wetlands Receiving Wastewater Discharges	7-20
8-1	Total P Distribution by Source in Sarasota Bay NEP Study Area	8-2
8-2	Total N Distribution by Source in Sarasota Bay NEP Study Area	8-3
8-3	Lead Distribution by Source in Sarasota Bay NEP Study Area	8-4
8-4	Zinc Distribution by Source in Sarasota Bay NEP Study Area	8-5

LIST OF TABLES

Table		Page
2-1	Existing Land Use Distribution in Sarasota Bay NEP Study Area	2-2
2-2	Loadings by Source for Existing Land Use Conditions	2-3
2-3	Loadings by Jurisdiction for Existing Land Use Conditions	2-4
3-1	Five-Year Future Land Use Distribution in Sarasota Bay NEP Study Area	3-2
3-2	Point Source Flows and Concentrations for Five-Year Future Land Use Conditions	3-3
3-3	Loadings by Source for Five-Year Future Land Use Conditions	3-5
3-4	Loadings by Jurisdiction for Five-Year Future Land Use Conditions	3-6
3-5	Census Data for Manatee and Sarasota Counties	3-8
3-6	Projected Twenty-Year Future Population Growth for Manatee and Sarasota Counties	3-10
3-7	Relationship between Existing, Twenty-Year Future and Buildout Future Scenarios	3-11
3-8	Twenty-Year Future Land Use Distribution in the Sarasota Bay NEP Study Area	3-13
3-9	Point Source Flows and Concentrations for Twenty Year Future Conditions	3-14
3-10	Loadings by Source for Twenty-Year Future Land Use Conditions	3-16
3-11	Loadings by Jurisdiction for Twenty-Year Future Land Use Conditions	3-17
3-12	Buildout Future Land Use Distribution in the Sarasota Bay NEP Study Area	3-20
3-13	Point Source Flows and Concentrations for Buildout Future Land Use Conditions	3-21
3-14	Loadings by Source for Buildout Future Land Use Conditions	3-22
3-15	Loadings by Jurisdiction for Buildout Future Land Use Conditions	3-23
4-1	Average Pollutant Removal Efficiencies for Detention BMPs	4-14
4-2	Comparison of Reliability Levels for Nonpoint Pollution Management Options	4-23
4-3	Average Annual Unit Loadings for Various Land Uses with and without BMPs	4-25
6-1	Average Annual Loadings for Twenty-Year Future Land Use Conditions with Management Alternatives	6-5
6-2	Average Annual Loadings for Buildout Future Land Use Conditions with Management Alternatives	6-6
6-3	Costs for Regional Wastewater Plan	6-8
6-4	Costs for Onsite Wet Detention BMPs	6-10
6-5	Costs for Alternatives with BMPs for Buildout Future Land Use	6-12

LIST OF TABLES
Continued

Table		Page
7-1	Loadings by Source for Twenty-Year Future Land Use Conditions with Selected Management Strategy	7-2
7-2	Loadings by Jurisdiction for Twenty-Year Future Land Use Conditions with Selected Management Strategy	7-3
7-3	Loadings by Source for Buildout Future Land Use Conditions with Selected Management Strategy	7-6
7-4	Loadings by Jurisdiction for Buildout Future Land Use Conditions with Selected Management Strategy	7-7
7-5	Summary of Bay Segment Drainage Areas, Surface Areas and Florida TSI Classifications	7-10
7-6	Average Annual Direct Discharges by Bay Segment for Existing and 20-year Future Land Use Conditions with and without Selected Management Strategy	7-11
7-7	Average Annual Direct Discharges by Bay Segment for Existing and Buildout Future Land Use Conditions with and without Selected Management Strategy	7-13
7-8	Costs and Pollution Benefits for Additional Management Alternatives	7-16
7-9	Estimates of Nitrogen and Phosphorus Removal in Wetlands Used for Stormwater Runoff Control	7-21

LIST OF APPENDICES

Appendix

A Loading Estimate Tables for Existing Land Use Conditions

B Loading Estimate Tables for Five-year Future Land Use Conditions

C Loading Estimate Tables for Twenty-year Future Land Use Conditions

D Loading Estimate Tables for Buildout Future Land Use Conditions

E Loading Estimate Tables for Twenty-Year Future Land Use Conditions with Selected Management Strategy

F Loading Estimate Tables for Buildout Future Land Use Conditions with Selected Management Strategy

1

Section One

1.0 INTRODUCTION

1.1 BACKGROUND OF THE SARASOTA BAY NATIONAL ESTUARY PROGRAM

Sarasota Bay was identified in Section 317 of the Water Quality Act of 1987 as an estuary to be given priority consideration for inclusion in the National Estuary Program (NEP). As a result, Governor Bob Martinez nominated Sarasota Bay to the NEP, in a May 19, 1987 letter to EPA Administrator Lee Thomas. According to the Act, documentation was required to support the nomination. This documentation would evaluate the need for a management conference, likelihood of program success, and need to protect water quality beyond existing controls.

In 1987, the EPA established a cooperative agreement with Mote Marine Laboratory to gather data regarding environmental status, trends and problems in Sarasota Bay. These data were to be used as the documentation to support the Bay's nomination to the NEP. The report developed by Mote was presented at a workshop of federal, state and local government representatives on March 17, 1988. Through the workshop, additional information on Sarasota Bay was obtained.

The Florida Department of Environmental Regulation (FDER) used the Mote report as the basis for the completion of the Governor's nomination document. The supporting documentation was submitted on May 31, 1988 to the EPA Office of Marine and Estuary Protection. After EPA's evaluation, the Bay was designated as a member of the NEP on July 18, 1988.

In May of 1989, the Sarasota Bay NEP released a Request for Proposals (RFP) for work related to the preservation, restoration and enhancement of the Bay. The RFP included the following areas:

- Baywide Segmentation and Mapping

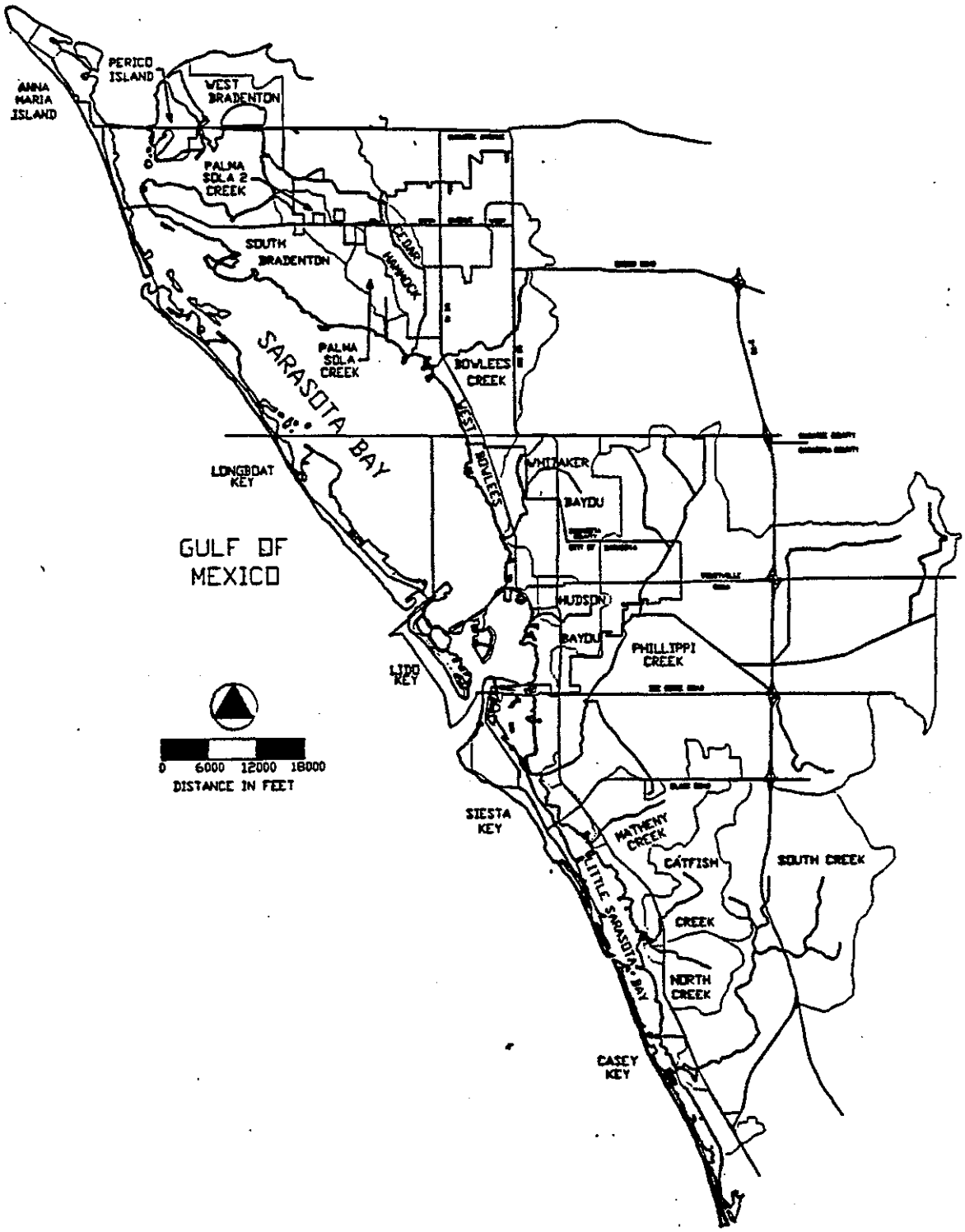
- Wetland Habitat Assessment
- Estuarine Bottom Habitat Assessment
- Regional Beach/Inlet Management
- Impacts of Sea Level Rise
- Fishery Resource Assessment
- Shellfish Contamination Assessment
- Point and Nonpoint Pollution Loading Assessment, Calibration, Verification, and Projections
- Resource Access and Use Assessment
- Data Management

The information gathered in these areas will lead to the development of a comprehensive conservation and management plan (CCMP).

1.2 PURPOSE AND SCOPE OF POINT AND NONPOINT POLLUTION LOADING ANALYSIS

CDM was selected to conduct the analysis of point and nonpoint source loadings to Sarasota Bay. Basically, the objective of the analysis is to quantify the loadings of nutrients and metals to the Bay, to identify the areas that are contributing the largest share of the total load, and to analyze alternative measures for reducing the loadings. A map of the study area is presented in Figure 1-1.

For purposes of this study, assessment of pollutant loadings was restricted to total nitrogen, total phosphorus, lead and zinc. Sources of loadings evaluated include baseflow, storm event runoff, atmospheric, and point source loadings. While it is fully recognized that there are other contaminating substances entering Sarasota Bay through a variety of other sources, these parameters were chosen as surrogates for major non-point



CDM

environmental engineers, scientists, planners, & management consultants

Sarasota Bay NEP Study Area

Figure 1-1

and point source loadings. These parameters represent contaminants which are well characterized in the literature, and for which documented relationships with land use exist. As such, this study does not attempt to characterize all pollutant loadings, nor all sources of pollution, but rather focuses on the major loadings delivered to Sarasota Bay.

The analysis is divided into three distinct phases. In Phase 1, existing data are used to estimate current loading levels. Phase 2 is designed to collect field measurements or other data required to improve the estimates developed in Phase 1. Analysis of future loadings, based on projected changes in population, land use, and other factors, is performed in Phase 3. Evaluation of alternative management programs is also part of Phase 3.

This report documents the results generated in Phase 3. Topics covered in the report include the development of future loading estimates, identification of alternative strategies for controlling nonpoint pollution, identification of point source control alternatives, and evaluation of the alternative management strategies.

1.3 ORGANIZATION OF REPORT

The loading estimates for existing land use conditions are presented in Chapter 2. Chapter 3 discusses the development of five-year, twenty-year, and buildout future land use conditions, including refinements of the preliminary future land use data developed in Phase 1. Identified alternative management strategies for nonpoint source pollution are presented in Chapter 4, and identified point source management alternatives are presented in Chapter 5. The evaluation of the pollution loading impacts, conceptual costs and other impacts associated with each management alternative is presented in Chapter 6. Chapter 7 presents a detailed analysis of selected management alternatives, and Chapter 8 includes conclusions and recommendations based on the results. References are included in Chapter 9.

2

Section Two

2.0 REVIEW OF EXISTING LOADINGS

A summary of the Sarasota Bay NEP study area loadings estimated for existing land use conditions are presented below. These values were previously presented in the Phase 1 report (CDM, 1992). Details regarding the assumptions and data used to generate these values can be found in the Phase 1 report.

The existing land use distribution used in the loading analysis is presented in Table 2-1. The table indicates that Sarasota County (excluding the City of Sarasota) comprises almost two-thirds of the land in the study area. Manatee County comprises roughly twenty percent of the land area, whereas the City of Sarasota and the Barrier Islands each comprise less than 10 percent of the total area. Overall, slightly more than half of the land area consists of urban development (residential, commercial, industrial and institutional land uses), and the rest is rural. Of the urban development, about 81 percent is residential, primarily medium density and high density. For the rural areas, about 18 percent is either cropland or citrus, and the rest is primarily rangeland/woodlands, open/recreation and forested uplands.

Tables 2-2 and 2-3 summarize the loading estimates for existing land use conditions. Table 2-2 presents the loadings by source, and Table 2-3 presents the loadings by jurisdiction. The jurisdictions considered in this study are Sarasota County, Manatee County, the City of Sarasota, the Barrier Islands, and the Bay surface. A complete set of tables, which include loading estimates by watershed and by source within the NEP study area, is included in Appendix A of this report.

As shown in the tables, loading estimates were determined for five different meteorological conditions, which are as follows:

- Average annual
- Wet season

TABLE 2-1
EXISTING LAND USE BY JURISDICTION IN
SARASOTA BAY NEP STUDY AREA

Land Use	AREA (Acres)				
	City of Sarasota	Sarasota County	Manatee County	Barrier Islands	Total
Cropland	0	3,756	1,912	130	5,798
Forested Uplands	168	673	1,052	44	1,937
Rangeland/Woodlands	126	15,544	1,253	19	16,942
Open/Recreation	650	11,688	2,222	1,373	15,933
Wetland	0	1,449	415	403	2,267
Citrus	4	2,278	209	0	2,492
LDSF Resid (1 du/ac)	368	7,375	292	388	8,423
MDSF Resid (4.5 du/ac)	1,320	6,827	2,012	1,641	11,800
HDSF Resid (7.5 du/ac)	2,164	5,163	3,422	741	11,490
Multi-family Bldg (9 du/ac)	946	1,983	2,677	754	6,360
Mobile Home (9 du/ac)	0	1,065	862	37	1,964
Commercial/Services	926	1,485	654	169	3,234
Institutional	529	647	365	0	1,541
Industrial	521	1,106	1,989	40	3,656
Transportation	17	203	633	15	868
Waterbody	75	1,028	228	2	1,333
STP and Power Plants	30	30	30	5	95
Total	7,844	62,301	20,226	5,761	96,132

TABLE 2-2

LOADING BY SOURCE FOR EXISTING LAND USE CONDITIONS

Scenario/ Source	Total P (lb)	% of Total	Total N (lb)	% of Total	Lead (lb)	% of Total	Zinc (lb)	% of Total
AVERAGE ANNUAL								
Surface Runoff	110,870	45.1%	588,210	46.3%	30,180	90.3%	23,260	25.4%
Baseflow	33,800	13.8%	112,690	8.9%	300	0.9%	5,620	6.1%
Septic Tanks	8,230	3.3%	123,520	9.7%	0	0.0%	0	0.0%
Point Source	31,140	12.7%	109,330	8.6%	490	1.5%	2,520	2.8%
Rainfall	61,730	25.1%	337,460	26.5%	2,470	7.4%	60,080	65.7%
TOTAL	245,770	100.0%	1,271,210	100.0%	33,440	100.0%	91,480	100.0%
WET SEASON								
Surface Runoff	68,290	46.5%	363,100	48.1%	18,640	90.7%	14,390	25.5%
Baseflow	24,790	16.9%	82,590	10.9%	200	1.0%	4,110	7.3%
Septic Tanks	4,120	2.8%	61,740	8.2%	0	0.0%	0	0.0%
Point Source	11,410	7.8%	39,660	5.3%	190	0.9%	940	1.7%
Rainfall	38,100	26.0%	208,290	27.6%	1,520	7.4%	37,090	65.6%
TOTAL	146,710	100.0%	755,380	100.0%	20,550	100.0%	56,530	100.0%
DRY SEASON								
Surface Runoff	42,330	42.8%	225,090	43.6%	11,540	89.8%	8,900	25.4%
Baseflow	9,030	9.1%	30,090	5.8%	50	0.4%	1,510	4.3%
Septic Tanks	4,130	4.2%	61,820	12.0%	0	0.0%	0	0.0%
Point Source	19,690	19.9%	69,530	13.5%	310	2.4%	1,570	4.5%
Rainfall	23,630	23.9%	129,170	25.0%	950	7.4%	23,000	65.8%
TOTAL	98,810	100.0%	515,700	100.0%	12,850	100.0%	34,980	100.0%
WET YEAR								
Surface Runoff	141,510	43.8%	750,770	46.2%	38,540	90.0%	29,700	24.8%
Baseflow	63,630	19.7%	212,180	13.0%	640	1.5%	10,610	8.9%
Septic Tanks	8,230	2.5%	123,520	7.6%	0	0.0%	0	0.0%
Point Source	31,140	9.6%	109,330	6.7%	490	1.1%	2,520	2.1%
Rainfall	78,800	24.4%	430,790	26.5%	3,150	7.4%	76,700	64.2%
TOTAL	323,310	100.0%	1,626,590	100.0%	42,820	100.0%	119,530	100.0%
DRY YEAR								
Surface Runoff	84,660	47.5%	449,260	46.7%	23,080	90.5%	17,760	26.4%
Baseflow	6,870	3.9%	22,920	2.4%	40	0.2%	1,150	1.7%
Septic Tanks	8,230	4.6%	123,520	12.8%	0	0.0%	0	0.0%
Point Source	31,140	17.5%	109,330	11.4%	490	1.9%	2,520	3.7%
Rainfall	47,150	26.5%	257,730	26.8%	1,890	7.4%	45,890	68.2%
TOTAL	178,050	100.0%	962,760	100.0%	25,500	100.0%	67,320	100.0%

TABLE 2-3

LOADING BY JURISDICTION FOR EXISTING LAND USE CONDITIONS

Scenario/ Jurisdiction	Total P (lb)	% of Total	Total N (lb)	% of Total	Lead (lb)	% of Total	Zinc (lb)	% of Total
AVERAGE ANNUAL								
Sarasota Co.	103,510	42.1%	559,270	44.0%	12,100	36.2%	15,590	17.0%
Sarasota City	25,040	10.2%	109,340	8.6%	6,010	18.0%	5,110	5.6%
Manatee Co.	39,930	16.2%	200,140	15.7%	11,030	33.0%	8,470	9.3%
Islands	15,560	6.3%	65,000	5.1%	1,830	5.5%	2,230	2.4%
Bay Surface	61,730	25.1%	337,460	26.5%	2,470	7.4%	60,080	65.7%
TOTAL	245,770	100.0%	1,271,210	100.0%	33,440	100.0%	91,480	100.0%
WET SEASON								
Sarasota Co.	62,720	42.8%	329,860	43.7%	7,460	36.3%	9,850	17.4%
Sarasota City	13,620	9.3%	61,920	8.2%	3,660	17.8%	3,000	5.3%
Manatee Co.	24,030	16.4%	119,270	15.8%	6,820	33.2%	5,340	9.4%
Islands	8,240	5.6%	36,040	4.8%	1,090	5.3%	1,250	2.2%
Bay Surface	38,100	26.0%	208,290	27.6%	1,520	7.4%	37,090	65.6%
TOTAL	146,710	100.0%	755,380	100.0%	20,550	100.0%	56,530	100.0%
DRY SEASON								
Sarasota Co.	40,660	41.1%	229,470	44.5%	4,640	36.1%	5,740	16.4%
Sarasota City	11,300	11.4%	47,240	9.2%	2,320	18.1%	2,120	6.1%
Manatee Co.	15,900	16.1%	80,890	15.7%	4,220	32.8%	3,140	9.0%
Islands	7,320	7.4%	28,930	5.6%	720	5.6%	980	2.8%
Bay Surface	23,630	23.9%	129,170	25.0%	950	7.4%	23,000	65.8%
TOTAL	98,810	100.0%	515,700	100.0%	12,850	100.0%	34,980	100.0%
WET YEAR								
Sarasota Co.	141,380	43.7%	717,840	44.1%	15,560	36.3%	22,070	18.5%
Sarasota City	30,200	9.3%	134,450	8.3%	7,630	17.8%	6,460	5.4%
Manatee Co.	53,400	16.5%	261,390	16.1%	14,150	33.0%	11,420	9.6%
Islands	19,530	6.0%	82,120	5.0%	2,330	5.4%	2,880	2.4%
Bay Surface	78,800	24.4%	430,790	26.5%	3,150	7.4%	76,700	64.2%
TOTAL	323,310	100.0%	1,626,590	100.0%	42,820	100.0%	119,530	100.0%
DRY YEAR								
Sarasota Co.	70,150	39.4%	420,330	43.7%	9,150	35.9%	9,900	14.7%
Sarasota City	20,500	11.5%	87,610	9.1%	4,630	18.2%	3,940	5.9%
Manatee Co.	28,130	15.8%	146,920	15.3%	8,410	33.0%	5,950	8.8%
Islands	12,120	6.8%	50,170	5.2%	1,420	5.6%	1,640	2.4%
Bay Surface	47,150	26.5%	257,730	26.8%	1,890	7.4%	45,890	68.2%
TOTAL	178,050	100.0%	962,760	100.0%	25,500	100.0%	67,320	100.0%

- Dry season
- Wet year
- Dry year

The average annual loadings were calculated assuming a rainfall of 54.6 inches, based on long-term precipitation records at gages within the study area. Average wet season and dry season precipitation totals were also obtained from the long-term records. The wet season value was determined for the months of June through September, and the dry season value was determined for the months of October through May. The wet year and dry year precipitation values were established as the 90th percentile and 10th percentile values of annual precipitation during the period of record.

The results shown in Tables 2-2 and 2-3 are slightly lower than comparable tables in the Phase I report, because the Phase III tables include the pollution reduction benefit provided by existing best management practices (BMPs). Visual inspection of aerial photographs indicated that overall a relatively small fraction of the existing development (between 10 and 15 percent) is served by BMPs, though some watersheds have a higher level of coverage than others. In Phase I, where loading estimates were made to evaluate the relative impacts of various sources, the impact of existing BMPs was not considered. The addition of the existing BMPs represents a refinement of the existing (and future) loading estimates. The calculated reductions in annual Bay loadings due to existing BMPs are:

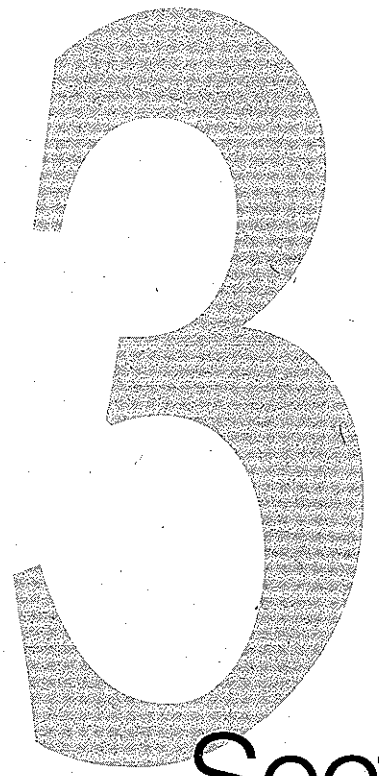
Total P:	6,960 lb/yr
Total N:	21,790 lb/yr
Lead:	3,610 lb/yr
Zinc:	1,630 lb/yr

The difference between annual Bay loadings with and without the consideration of existing BMPs is typically only 2 to 3 percent, through the difference for lead is about 10

percent. The difference is more pronounced for lead because over 90 percent of the lead loading to the Bay is attributable to surface runoff, the only source that is affected by BMP implementation.

The results in Table 2-2 show that surface runoff and precipitation falling directly on the Bay surface account for the majority of the pollution loading to the Bay. Point sources and septic tanks combined account for 16 to 18 percent of the total nutrient loadings and 1 to 3 percent of the metals loadings, and baseflow contributes an even lower percentage of the total loading. Analyses of wet and dry seasons, and wet and dry years, indicate that the distribution of loadings between the various sources of pollution remains similar to the average year distributions. Point source loadings tend to be more prominent during dry periods, but are still lower than surface runoff and precipitation loadings.

Table 2-3 shows that the pollution loadings from Sarasota County, from Manatee County and from direct precipitation on the Bay surface are the largest contributors of pollution loading. Considering that the Counties and the Bay surface (estimated as 33,280 acres based on USGS quadrangle maps) make up over 80 percent of the total study area, one would expect these jurisdictions to dominate the pollution loadings. For the City of Sarasota and for Manatee County, the relative contributions of lead are higher than for the other pollutants, because of the highly developed nature of the City and parts of the County. For all of the pollutants, the Barrier Islands are responsible for 7 percent or less of the total loadings.



Section Three

3.0 REFINEMENT OF FUTURE LOADINGS

In Phase 1 of the Sarasota Bay NEP study, preliminary five-year future and buildout future loadings were developed. Because new information has been obtained since the preliminary estimates were developed, the loadings for the two future scenarios have been modified where appropriate in Phase 3. In addition, loadings for a twenty-year future scenario have been developed in Phase 3. Population projections were used to estimate how much of the buildout future development is expected to occur within the next twenty years.

3.1 FIVE-YEAR FUTURE LOADINGS

The five-year future loadings from the Phase 1 analysis were not changed in Phase 3. A review of new information compiled for the Phase 3 analysis indicated that modifications of the land use and point source loading data established in Phase 1 were not required.

The five-year future land use distribution used in the loading analysis is presented in Table 3-1. Changes to the existing land use distribution were made based on the Development of Regional Impact (DRI) data provided by Manatee and Sarasota Counties. The DRI information was screened to determine which projects were located in the NEP study area. Appropriate projects were located on the existing land use maps to determine where the development would occur, and the type of land that would be converted to urban area. Overall, the development of 1,686 acres of rural land was projected, all in Sarasota County.

Table 3-2 presents the point source loading data for the 5-year future scenario. As discussed in the Phase I report, the flow rates represent only the surface water discharges plus a fraction of the discharge to percolation ponds, drainfields and irrigated areas. This fraction was set equal to 0.27, which is the ratio of streamflow to precipitation in the

TABLE 3-1
5-YEAR FUTURE LAND USE (YEAR 1995) BY JURISDICTION IN
SARASOTA BAY NEP STUDY AREA

Land Use	AREA (Acres)				
	City of Sarasota	Sarasota County	Manatee County	Barrier Islands	Total
Cropland	0	3,756	1,912	130	5,668
Forested Uplands	168	673	1,052	44	1,906
Rangeland/Woodlands	126	14,194	1,253	19	15,573
Open/Recreation	650	11,439	2,222	1,373	14,644
Wetland	0	1,449	415	403	2,267
Citrus	4	2,190	209	0	2,836
LDSF Resid (1 du/ac)	368	7,288	292	388	10,654
MDSF Resid (4.5 du/ac)	1,320	8,233	2,012	1,641	12,410
HDSF Resid (7.5 du/ac)	2,164	5,163	3,422	741	11,503
Multi-family Bldg (9 du/ac)	946	1,983	2,677	754	5,643
Mobile Home (9 du/ac)	0	1,065	862	37	2,100
Commercial/Services	926	1,713	654	169	3,292
Institutional	529	667	365	0	1,564
Industrial	521	1,226	1,989	40	3,776
Transportation	17	203	633	15	868
Waterbody	75	1,028	228	2	1,333
STP and Power Plants	30	30	30	5	95
Total	7,844	62,301	20,226	5,761	96,132

TABLE 3-2

POINT SOURCE FLOWS AND CONCENTRATIONS FOR FIVE-YEAR FUTURE LAND USE CONDITIONS

WATERSHED	DISCHARGE (mgd)			CONCENTRATION (mg/L)			
	ANNUAL	WET SEASON	DRY SEASON	TOTAL P	TOTAL N	LEAD	ZINC
Phillippi Creek	1.63	1.63	1.63	1.03	3.78	0.015	0.076
Matheny Creek	1.52	1.52	1.52	1.05	3.44	0.019	0.094
Whitaker Bayou	1.61	2.19	1.33	1.05	3.43	0.019	0.094
Direct to Bay	0.04	0.04	0.04	1.48	7.38	0.007	0.037
Siesta Key	1.82	1.82	1.82	1.00	3.00	0.020	0.100
South Bradenton	2.66	2.66	2.66	0.74	3.69	0.004	0.018

study area. The value of 1.61 mgd for the City of Sarasota WWTP (Whitaker Bayou watershed) is based on a flow of 9.0 mgd discharging to surface water for a total of 59 days per year plus package plant discharge of 0.17 mgd. The 59 days of discharge is consistent with an NPDES permit that is currently being sought by the City WWTP. The Southwest WWTP discharge of 2.66 mgd (South Bradenton watershed) reflects 27 percent of the 9.8 mgd attributed to irrigation. The other discharge rates, which represent one or more private utilities in the Siesta Key, Phillippi Creek and Matheny Creek and Direct to Bay Watersheds, are equal to the rates for existing conditions.

Tables 3-3 and 3-4 summarize the loading estimates for the five-year future land use conditions. Table 3-3 presents the loadings by source, and Table 3-4 presents the loadings by jurisdiction. A complete set of tables, which includes loading estimates by watershed and by source, is included in Appendix B of this report.

A comparison of Tables 2-2 and 3-3 reveals a small decrease in overall total P loadings and a small increase in total N and metals loadings for the five-year future scenario. In the five-year scenario, the point source loadings are less than existing loadings because of the projected shift from surface water discharge to irrigation reuse for the City of Sarasota wastewater treatment facility. Baseflow loadings are also slightly lower, because less baseflow volume is expected as more impervious cover is added to the study area. These reductions are offset by an increase in surface runoff loadings due to new development. Future septic tank loadings are expected to be roughly equivalent to existing loadings. Though some new development is constructed with septic tanks, it is typically low density residential development which would have small pollution loading impacts relative to more intensive development. In addition, the implementation of new septic tanks may be offset by the elimination of existing septic tanks that are being connected to sewer systems, and upgrading of existing septic tanks in accordance with the new state regulations. Consequently, future septic tank loadings are not expected to be any higher than existing loadings. Direct precipitation loadings to the Bay surface are also assumed to be the same as the existing loadings.

TABLE 3-3

LOADING BY SOURCE FOR 5-YEAR FUTURE LAND USE CONDITIONS

Scenario/ Source	Total P (lb)	% of Total	Total N (lb)	% of Total	Lead (lb)	% of Total	Zinc (lb)	% of Total
AVERAGE ANNUAL								
Surface Runoff	113,340	46.5%	601,050	47.2%	31,320	90.8%	24,030	26.2%
Baseflow	33,480	13.7%	111,650	8.8%	300	0.9%	5,570	6.1%
Septic Tanks	8,260	3.4%	123,890	9.7%	0	0.0%	0	0.0%
Point Source	26,820	11.0%	98,890	7.8%	390	1.1%	1,980	2.2%
Rainfall	61,730	25.3%	337,460	26.5%	2,470	7.2%	60,080	65.5%
TOTAL	243,630	100.0%	1,272,940	100.0%	34,480	100.0%	91,660	100.0%
WET SEASON								
Surface Runoff	69,820	47.8%	371,050	48.9%	19,350	91.2%	14,860	26.2%
Baseflow	24,550	16.8%	81,830	10.8%	200	0.9%	4,070	7.2%
Septic Tanks	4,130	2.8%	61,900	8.2%	0	0.0%	0	0.0%
Point Source	9,550	6.5%	35,000	4.6%	140	0.7%	720	1.3%
Rainfall	38,100	26.1%	208,290	27.5%	1,520	7.2%	37,090	65.4%
TOTAL	146,150	100.0%	758,070	100.0%	21,210	100.0%	56,740	100.0%
DRY SEASON								
Surface Runoff	43,280	44.5%	230,000	44.7%	11,980	90.6%	9,200	26.3%
Baseflow	8,940	9.2%	29,810	5.8%	50	0.4%	1,510	4.3%
Septic Tanks	4,140	4.3%	61,980	12.0%	0	0.0%	0	0.0%
Point Source	17,290	17.8%	64,000	12.4%	250	1.9%	1,260	3.6%
Rainfall	23,630	24.3%	129,170	25.1%	950	7.2%	23,000	65.8%
TOTAL	97,280	100.0%	514,960	100.0%	13,230	100.0%	34,970	100.0%
WET YEAR								
Surface Runoff	144,620	45.0%	767,170	47.0%	40,000	90.6%	30,690	25.6%
Baseflow	63,060	19.6%	210,240	12.9%	630	1.4%	10,510	8.8%
Septic Tanks	8,260	2.6%	123,890	7.6%	0	0.0%	0	0.0%
Point Source	26,820	8.3%	98,890	6.1%	390	0.9%	1,980	1.7%
Rainfall	78,800	24.5%	430,790	26.4%	3,150	7.1%	76,700	64.0%
TOTAL	321,560	100.0%	1,630,980	100.0%	44,170	100.0%	119,880	100.0%
DRY YEAR								
Surface Runoff	106,050	52.9%	560,060	51.7%	30,460	92.7%	23,610	32.3%
Baseflow	6,190	3.1%	20,680	1.9%	30	0.1%	1,040	1.4%
Septic Tanks	8,270	4.1%	124,060	11.5%	0	0.0%	0	0.0%
Point Source	32,910	16.4%	120,030	11.1%	490	1.5%	2,470	3.4%
Rainfall	47,150	23.5%	257,730	23.8%	1,890	5.7%	45,890	62.9%
TOTAL	200,570	100.0%	1,082,560	100.0%	32,870	100.0%	73,010	100.0%

TABLE 3-4

LOADING BY JURISDICTION FOR 5-YEAR FUTURE LAND USE CONDITIONS

Scenario/ *Jurisdiction*	Total P (lb)	% of Total	Total N (lb)	% of Total	*Lead* (lb)	% of Total	Zinc (lb)	% of Total
AVERAGE ANNUAL								
Sarasota Co.	105,690	43.4%	571,440	44.9%	13,240	38.4%	16,310	17.8%
Sarasota City	19,410	8.0%	92,380	7.3%	5,900	17.1%	4,540	5.0%
Manatee Co.	41,240	16.9%	206,660	16.2%	11,040	32.0%	8,500	9.3%
Islands	15,560	6.4%	65,000	5.1%	1,830	5.3%	2,230	2.4%
Bay Surface	61,730	25.3%	337,460	26.5%	2,470	7.2%	60,080	65.5%
TOTAL	243,630	100.0%	1,272,940	100.0%	34,480	100.0%	91,660	100.0%
WET SEASON								
Sarasota Co.	64,020	43.8%	337,210	44.5%	8,170	38.5%	10,280	18.1%
Sarasota City	11,320	7.7%	55,050	7.3%	3,610	17.0%	2,770	4.9%
Manatee Co.	24,470	16.7%	121,480	16.0%	6,820	32.2%	5,350	9.4%
Islands	8,240	5.6%	36,040	4.8%	1,090	5.1%	1,250	2.2%
Bay Surface	38,100	26.1%	208,290	27.5%	1,520	7.2%	37,090	65.4%
TOTAL	146,150	100.0%	758,070	100.0%	21,210	100.0%	56,740	100.0%
DRY SEASON								
Sarasota Co.	41,550	42.7%	234,350	45.5%	5,080	38.4%	6,040	17.3%
Sarasota City	8,020	8.2%	37,340	7.3%	2,260	17.1%	1,790	5.1%
Manatee Co.	16,760	17.2%	85,170	16.5%	4,220	31.9%	3,160	9.0%
Islands	7,320	7.5%	28,930	5.6%	720	5.4%	980	2.8%
Bay Surface	23,630	24.3%	129,170	25.1%	950	7.2%	23,000	65.8%
TOTAL	97,280	100.0%	514,960	100.0%	13,230	100.0%	34,970	100.0%
WET YEAR								
Sarasota Co.	143,950	44.8%	732,670	44.9%	17,010	38.5%	22,960	19.2%
Sarasota City	24,570	7.6%	117,490	7.2%	7,520	17.0%	5,890	4.9%
Manatee Co.	54,710	17.0%	267,910	16.4%	14,160	32.1%	11,450	9.6%
Islands	19,530	6.1%	82,120	5.0%	2,330	5.3%	2,880	2.4%
Bay Surface	78,800	24.5%	430,790	26.4%	3,150	7.1%	76,700	64.0%
TOTAL	321,560	100.0%	1,630,980	100.0%	44,170	100.0%	119,880	100.0%
DRY YEAR								
Sarasota Co.	96,990	48.4%	550,570	50.9%	16,620	50.6%	16,130	22.1%
Sarasota City	14,870	7.4%	70,650	6.5%	4,520	13.8%	3,370	4.6%
Manatee Co.	29,440	14.7%	153,440	14.2%	8,420	25.6%	5,980	8.2%
Islands	12,120	6.0%	50,170	4.6%	1,420	4.3%	1,640	2.2%
Bay Surface	47,150	23.5%	257,730	23.8%	1,890	5.7%	45,890	62.9%
TOTAL	200,570	100.0%	1,082,560	100.0%	32,870	100.0%	73,010	100.0%

A comparison of Tables 2-3 and 3-4 shows an increase in loadings for Sarasota County and Manatee County, a decrease in loadings for the City of Sarasota, and the same loading for the Barrier Islands. No changes were projected for the Barrier Islands because no DRIs were identified in the study area. In Sarasota County, the new development and the corresponding increases in surface runoff and wastewater are the reasons for the loading increases. Transition from surface water discharge to agricultural and urban reuse for the City of Sarasota wastewater treatment plant is the reason for the reduced loadings from the City. In Manatee County, increased wastewater flows account for the loading increases.

3.2 TWENTY-YEAR FUTURE LOADINGS

3.2.1 POPULATION PROJECTION ANALYSIS

A twenty-year future land use scenario was developed in Phase 3, based on a population projection analysis. The analysis used 1980 and 1990 census data, as well as year 2010 population projections for Sarasota and Manatee Counties developed by the Bureau of Economic and Business Research at the University of Florida. The projected twenty-year future growth was compared to buildout future growth (based on the existing and buildout land use conditions defined in Phase 1) to determine how much of the future development will occur in the next twenty years. Details regarding the analysis are presented below.

Table 3-5 presents growth in Sarasota and Manatee Counties between 1980 and 1990. The values in the table represent actual census counts of permanent residents in the two counties. Within each county, the population is distributed between incorporated areas and unincorporated areas. In Manatee County, the table shows that the growth rate for the barrier islands is relatively low, compared to the growth in the City of Bradenton and the unincorporated areas of the County. In Sarasota County, the growth rates for Longboat Key, the City of Venice and the unincorporated areas of the County are about 40 percent over the ten-year period. Because the City of Sarasota is virtually built out, its growth

TABLE 3-5
CENSUS DATA FOR MANATEE AND SARASOTA COUNTIES

JURISDICTION	POPULATION		% CHANGE
	APRIL 1, 1980	APRIL 1, 1990	
Manatee County			
Anna Maria	1,537	1,744	13.5%
Bradenton	30,228	43,779	44.8%
Bradenton Beach	1,595	1,657	3.9%
Holmes Beach	4,023	4,810	19.6%
Longboat Key (part)	2,460	2,544	3.4%
Palmetto	8,637	9,268	7.3%
Unincorporated	99,965	147,905	48.0%
Sarasota County			
Longboat Key (part)	2,383	3,393	42.4%
North Port	6,205	11,973	93.0%
Sarasota	48,868	50,961	4.3%
Venice	12,153	16,922	39.2%
Unincorporated	132,642	194,527	46.7%

rate was much lower than the rest of the County. The City of North Port, on the other hand, had a much higher growth rate than the County as a whole.

The estimated growth between the years 1990 and 2010 is presented in Table 3-6. For both Manatee and Sarasota County, the 1990 census population data were available for incorporated and unincorporated areas, whereas the year 2010 population projections were available only for each County as a whole. Thus, any estimate of twenty-year growth for a particular incorporated area was developed by assuming the same percent growth that was observed between 1980 and 1990. In Manatee County, for example, the growth rate of 25.4 percent for the incorporated areas of Anna Maria, Bradenton Beach, Holmes Beach and Longboat Key was established based on the combined 11.9 percent growth that these areas exhibited between 1980 and 1990. The 25.4 percent value was used to establish a year 2010 population projection of 13,491 residents for these areas. This total was then subtracted from the total County estimate of 269,100 residents to establish the year 2010 population estimate for the rest of the County. In Sarasota County, the percent growth assigned to the City of North Port (273 percent) was established based on the 93.1 percent growth observed between 1980 and 1990, whereas zero growth was assumed for the City of Sarasota because it is virtually built out. The population projections for these two cities was then subtracted from the total Sarasota County population projection to determine the growth in the other areas of the County.

The relationship between the existing, twenty-year future and buildout future scenarios is shown in Table 3-7. The twenty-year growth values were taken directly from Table 3-6. The buildout future growth values were calculated by assigning densities (i.e., number of dwelling units per acre) to each of the residential land uses in the existing land use and buildout future land use data bases. The buildout future land use data base was established in Phase I based on the comprehensive plans of the jurisdictions in the study area. After calculating the total number of dwelling units for each land use scenario, the ratio of buildout future to existing dwelling units was calculated to determine the buildout growth. For example, the ratio of buildout future to existing dwelling units in the

TABLE 3-6

PROJECTED GROWTH FOR MANATEE AND SARASOTA COUNTIES

JURISDICTION	YEAR 2010 POPULATION PROJECTION	YEAR 1990 CENSUS POPULATION	% GROWTH BASED ON YEAR 1990 CENSUS POPULATION
Manatee County			
Anna Maria/ Bradenton Beach/ Holmes Beach/ Longboat Key (part)	13,491	10,755	25.4%
Bradenton/ Palmetto/ Unincorporated	255,609	200,952	27.2%
TOTAL	269,100	211,707	27.1%
Sarasota County			
North Port	44,598	11,973	272.5%
Sarasota	50,961	50,961	0.0%
Longboat Key (part)/ Venice/ Unincorporated	277,041	214,842	29.0%
TOTAL	372,600	277,776	34.1%

TABLE 3-7

RELATIONSHIP BETWEEN TWENTY-YEAR AND BUILDOUT FUTURE SCENARIOS

WATERSHED	20-YEAR % GROWTH BASED ON YEAR 1990 CENSUS POPULATION	BUILDOUT % GROWTH BASED ON YEAR 1990 CENSUS POPULATION	PERCENT OF FUTURE DEVELOPMENT OCCURRING IN THE NEXT TWENTY YEARS	NUMBER OF YEARS TO BUILDOUT
Barrier Islands				
Anna Maria	25.4%	14.8%	100%	12
Longboat Key	25.4%	37.2%	68%	28
Perico Island	27.2%	348.0%	8%	125
Siesta Key	29.0%	21.2%	100%	15
Other Islands	29.0%	21.2%	100%	15
Manatee County				
All Watersheds	27.2%	49.2%	55%	33
Sarasota County				
All Watersheds	29.0%	71.1%	41%	42

unincorporated part of Sarasota County was 1.71, which is shown in the table as a buildout growth of 71 percent. The twenty-year future percent growth values are divided by the buildout future percent growth values to determine what percentage of the buildout future development will occur in the next twenty years. The values in Table 3-7 indicate that Anna Maria, Siesta Key and other Islands are expected to be completely developed within a twenty-year planning horizon, while Longboat Key, Perico Island and the unincorporated areas of Sarasota and Manatee Counties are expected to be partly undeveloped. Longboat Key is expected to be about two-thirds of the way to buildout, Manatee County is expected to be slightly more than halfway to buildout, Sarasota County is expected to be about 40 percent of the way to buildout, and Perico Island is expected to be less than 10 percent of the way to buildout at the end of twenty years. For these watersheds, the number of years to buildout ranges from 28 years (Longboat Key) to 125 years (Perico Island). These values were calculated assuming a growth rate equal to that observed between 1980 and 1990.

3.2.2 PROJECTED TWENTY-YEAR FUTURE LAND USE

The twenty-year future land use distribution for the NEP study area is presented in Table 3-8. The values in the table were determined by linearly interpolating between the values for existing land use and for buildout future land use, knowing how much of the buildout future development will occur in the next twenty years (see Table 3-7). For example, in a watershed with 200 acres of existing industrial land use, 400 acres of buildout future industrial land use, and 40 percent of the buildout future development expected to occur in the next twenty years, the area of industrial land use in the twenty-year future land use scenario is 280 acres.

3.2.3 PROJECTED TWENTY-YEAR FUTURE POINT SOURCE DISCHARGES

The twenty-year future point source flow rates for the NEP study area are listed in Table 3-9. Like the land use distribution, the discharge flow rates were determined by linear

TABLE 3-8

20-YEAR FUTURE LAND USE (YEAR 2010) BY JURISDICTION IN SARASOTA BAY NEP STUDY AREA

Land Use	AREA (Acres)				
	City of Sarasota	Sarasota County	Manatee County	Barrier Islands	Total
Cropland	0	2,917	855	120	3,892
Forested Uplands	168	413	492	21	1,093
Rangeland/Woodlands	126	10,676	609	0	11,410
Open/Recreation	650	9,056	1,173	793	11,672
Wetland	0	1,449	415	403	2,267
Citrus	4	1,501	145	0	1,651
LDSF Resid (1 du/ac)	368	9,558	509	426	10,861
MDSF Resid (4.5 du/ac)	1,320	13,049	3,184	2,127	19,680
HDSF Resid (7.5 du/ac)	2,164	5,163	4,654	845	12,827
Multi-family Bldg (9 du/ac)	946	1,983	2,988	754	6,672
Mobile Home (9 du/ac)	0	1,065	862	37	1,964
Commercial/Services	926	1,603	748	172	3,448
Institutional	529	655	365	2	1,551
Industrial	521	1,953	2,245	40	4,759
Transportation	17	203	633	15	868
Waterbody	75	1,028	228	2	1,333
STP and Power Plants	30	30	121	5	186
Total	7,844	62,301	20,226	5,761	96,132

TABLE 3-9

POINT SOURCE FLOWS AND CONCENTRATIONS FOR TWENTY-YEAR FUTURE CONDITIONS

WATERSHED	DISCHARGE (mgd)			CONCENTRATION (mg/L)			
	ANNUAL	WET SEASON	DRY SEASON	TOTAL P	TOTAL N	LEAD	ZINC
Phillippi Creek	2.03	2.03	2.03	1.03	3.78	0.015	0.076
Matheny Creek	1.90	1.90	1.90	1.05	3.44	0.019	0.094
Whitaker Bayou	2.10	2.94	1.68	1.00	3.00	0.020	0.100
Direct to Bay	0.04	0.04	0.04	1.48	7.38	0.007	0.037
Siesta Key	2.20	2.20	2.20	1.00	3.00	0.020	0.100
South Bradenton	4.34	4.34	4.34	0.74	3.69	0.004	0.018

interpolation between the existing and buildout future scenarios. As discussed in the Phase 1 report, the flow rates represent only the surface water discharges plus a fraction of the discharge to percolation ponds, drainfields and irrigated areas. This fraction was set equal to 0.27, which is the local ratio of streamflow to precipitation. The value of 2.10 mgd for the City of Sarasota WWTP (Whitaker Bayou watershed) reflects a 13 mgd surface water discharge for a total of 59 days per year. The Southwest WWTP in Manatee County (South Bradenton watershed) was assigned a flow rate of 4.34 mgd, which reflects the 20-year projected irrigation and deep well discharge rates of 16 mgd and 2 mgd, respectively. The 2.2 mgd discharge assigned to Siesta Key is associated with the Siesta Key Utilities Association, and the discharges for Phillippi Creek, Matheny Creek and Direct to Bay watersheds represent the discharges from one or more private utilities in those watersheds.

Table 3-9 also includes the pollutant concentrations attributed to each discharge. The concentrations of nutrients and metals were established such that the product of flow and concentration was equal to the combined mass of pollutant from surface water and percolation pond/drainfield/irrigation discharges. Effluent concentrations and removal efficiencies for various types of discharges were also established in Phase 1. It was assumed that no load would reach the Bay from deep well injection. For percolation ponds and drainfields, a removal rate of 90 percent was assumed for all pollutants, based on a previous CDM study (CDM, 1985) which estimated removal efficiencies of retention and exfiltration BMPs. A slightly higher removal rate of 95 percent was assumed for irrigation practices, with the higher efficiency attributed to plant uptake.

3.2.4 PROJECTED POLLUTION LOADINGS

Tables 3-10 and 3-11 summarize the loading estimates for the twenty-year future land use conditions. Table 3-10 presents the loadings by source, and Table 3-11 presents the loadings by jurisdiction. A complete set of tables, which includes loading estimates by

TABLE 3-10

LOADING BY SOURCE FOR 20-YEAR FUTURE LAND USE CONDITIONS

Scenario/ Source	Total P (lb)	% of Total	Total N (lb)	% of Total	Lead (lb)	% of Total	Zinc (lb)	% of Total
AVERAGE ANNUAL								
Surface Runoff	126,340	47.9%	671,120	49.0%	36,190	91.8%	27,860	29.1%
Baseflow	31,750	12.0%	105,890	7.7%	280	0.7%	5,310	5.5%
Septic Tanks	8,230	3.1%	123,520	9.0%	0	0.0%	0	0.0%
Point Source	35,510	13.5%	132,270	9.7%	500	1.3%	2,540	2.7%
Rainfall	61,730	23.4%	337,460	24.6%	2,470	6.3%	60,080	62.7%
TOTAL	263,560	100.0%	1,370,260	100.0%	39,440	100.0%	95,790	100.0%
WET SEASON								
Surface Runoff	77,810	49.9%	414,240	51.2%	22,330	92.1%	17,260	29.2%
Baseflow	23,290	14.9%	77,620	9.6%	200	0.8%	3,890	6.6%
Septic Tanks	4,120	2.6%	61,740	7.6%	0	0.0%	0	0.0%
Point Source	12,680	8.1%	46,620	5.8%	190	0.8%	930	1.6%
Rainfall	38,100	24.4%	208,290	25.8%	1,520	6.3%	37,090	62.7%
TOTAL	156,000	100.0%	808,510	100.0%	24,240	100.0%	59,170	100.0%
DRY SEASON								
Surface Runoff	48,210	45.0%	256,840	45.7%	13,820	91.3%	10,690	29.1%
Baseflow	8,450	7.9%	28,270	5.0%	40	0.3%	1,420	3.9%
Septic Tanks	4,130	3.9%	61,820	11.0%	0	0.0%	0	0.0%
Point Source	22,830	21.3%	85,640	15.2%	320	2.1%	1,610	4.4%
Rainfall	23,630	22.0%	129,170	23.0%	950	6.3%	23,000	62.6%
TOTAL	107,250	100.0%	561,740	100.0%	15,130	100.0%	36,720	100.0%
WET YEAR								
Surface Runoff	161,150	46.9%	856,690	49.2%	46,240	91.6%	35,640	28.5%
Baseflow	59,800	17.4%	199,390	11.4%	580	1.1%	9,960	8.0%
Septic Tanks	8,230	2.4%	123,520	7.1%	0	0.0%	0	0.0%
Point Source	35,510	10.3%	132,270	7.6%	500	1.0%	2,540	2.0%
Rainfall	78,800	22.9%	430,790	24.7%	3,150	6.2%	76,700	61.4%
TOTAL	343,490	100.0%	1,742,660	100.0%	50,470	100.0%	124,840	100.0%
DRY YEAR								
Surface Runoff	97,610	50.1%	512,630	48.9%	27,650	92.0%	21,320	30.1%
Baseflow	6,460	3.3%	21,550	2.1%	30	0.1%	1,090	1.5%
Septic Tanks	8,230	4.2%	123,520	11.8%	0	0.0%	0	0.0%
Point Source	35,510	18.2%	132,270	12.6%	500	1.7%	2,540	3.6%
Rainfall	47,150	24.2%	257,730	24.6%	1,890	6.3%	45,890	64.8%
TOTAL	194,960	100.0%	1,047,700	100.0%	30,070	100.0%	70,840	100.0%

TABLE 3-11

LOADING BY JURISDICTION FOR 20-YEAR FUTURE LAND USE CONDITIONS

Scenario/ Jurisdiction	Total P (lb)	% of Total	Total N (lb)	% of Total	Lead (lb)	% of Total	Zinc (lb)	% of Total
AVERAGE ANNUAL								
Sarasota Co.	116,080	44.0%	622,520	45.4%	16,040	40.7%	18,660	19.5%
Sarasota City	20,660	7.8%	94,700	6.9%	5,930	15.0%	4,700	4.9%
Manatee Co.	47,470	18.0%	243,000	17.7%	12,970	32.9%	9,850	10.3%
Islands	17,620	6.7%	72,580	5.3%	2,030	5.1%	2,500	2.6%
Bay Surface	61,730	23.4%	337,460	24.6%	2,470	6.3%	60,080	62.7%
TOTAL	263,560	100.0%	1,370,260	100.0%	39,440	100.0%	95,790	100.0%
WET SEASON								
Sarasota Co.	69,570	44.6%	365,880	45.3%	9,890	40.8%	11,670	19.7%
Sarasota City	11,980	7.7%	56,360	7.0%	3,630	15.0%	2,850	4.8%
Manatee Co.	27,210	17.4%	138,350	17.1%	7,990	33.0%	6,160	10.4%
Islands	9,140	5.9%	39,630	4.9%	1,210	5.0%	1,400	2.4%
Bay Surface	38,100	24.4%	208,290	25.8%	1,520	6.3%	37,090	62.7%
TOTAL	156,000	100.0%	808,510	100.0%	24,240	100.0%	59,170	100.0%
DRY SEASON								
Sarasota Co.	46,300	43.2%	256,630	45.7%	6,150	40.6%	7,010	19.1%
Sarasota City	8,590	8.0%	38,280	6.8%	2,270	15.0%	1,870	5.1%
Manatee Co.	20,260	18.9%	104,740	18.6%	4,950	32.7%	3,710	10.1%
Islands	8,470	7.9%	32,920	5.9%	810	5.4%	1,130	3.1%
Bay Surface	23,630	22.0%	129,170	23.0%	950	6.3%	23,000	62.6%
TOTAL	107,250	100.0%	561,740	100.0%	15,130	100.0%	36,720	100.0%
WET YEAR								
Sarasota Co.	155,890	45.4%	793,500	45.5%	20,580	40.8%	25,810	20.7%
Sarasota City	25,820	7.5%	119,810	6.9%	7,550	15.0%	6,050	4.8%
Manatee Co.	61,230	17.8%	307,940	17.7%	16,600	32.9%	13,080	10.5%
Islands	21,750	6.3%	90,620	5.2%	2,590	5.1%	3,200	2.6%
Bay Surface	78,800	22.9%	430,790	24.7%	3,150	6.2%	76,700	61.4%
TOTAL	343,490	100.0%	1,742,660	100.0%	50,470	100.0%	124,840	100.0%
DRY YEAR								
Sarasota Co.	81,040	41.8%	473,240	45.2%	12,170	40.5%	12,410	17.5%
Sarasota City	16,120	8.3%	72,970	7.0%	4,550	15.1%	3,530	5.0%
Manatee Co.	35,450	18.3%	186,820	17.8%	9,890	32.9%	7,100	10.0%
Islands	13,990	7.2%	56,940	5.4%	1,570	5.2%	1,910	2.7%
Bay Surface	47,150	24.3%	257,730	24.6%	1,890	6.3%	45,890	64.8%
TOTAL	193,750	100.0%	1,047,700	100.0%	30,070	100.0%	70,840	100.0%

watershed and by source within the NEP study area, is included in Appendix C of this report.

A comparison of Tables 2-2 and 3-10 reveals that the loadings for the twenty-year future scenario exceed existing loadings for all of the pollutants analyzed. For the average annual rainfall condition, the twenty-year loadings exceed existing loadings by amounts varying from 5 percent (zinc) to 18 percent (lead). Total N and total P loadings increased by 8 percent and 7 percent, respectively.

Further comparison of the tables shows that surface runoff and point sources account for a larger percentage of the total loading for the twenty-year future scenario than for existing conditions. As development occurs, more surface runoff is generated, and this runoff from the new development typically has a higher EMC than the runoff from the existing land use. In addition, the increase in developed area results in an increase in wastewater, thus increasing the point source loading. In contrast, baseflow is expected to decrease due to the addition of impervious area. Septic tank loadings were assumed to remain the same, based on discussion presented in Section 3.1. Direct precipitation loadings to the Bay surface are also assumed to be the same as the existing loadings.

A comparison of Tables 2-3 and 3-11 shows an increase in loadings for Sarasota County, Manatee County, and the Barrier Islands, and a decrease in loadings for the City of Sarasota. In Sarasota County, the new development and the corresponding increases in surface runoff and wastewater are the reasons for the loading increases. Transition from surface water discharge to urban and agricultural reuse for the City of Sarasota wastewater treatment plant is the reason for the reduced loadings from the City. In Manatee County and the Barrier Island, increases in both surface runoff and wastewater loadings account for the overall loading increases.

3.3 BUILDOUT FUTURE LOADINGS

3.3.1 PROJECTED BUILDOUT FUTURE LAND USE

The buildout future land use distribution for the NEP study area is presented in Table 3-12. With the exception of the barrier islands, the land use distributions are the same as those established in Phase 1. For the barrier islands, land use plans for the incorporated areas were used to project the buildout conditions. These plans had not been obtained in time for consideration during the Phase 1 model development.

3.3.2 PROJECTED BUILDOUT FUTURE POINT SOURCE DISCHARGES

The buildout future point source flow rates and pollutant concentrations for the NEP study area are listed in Table 3-13. The value of 2.10 mgd for the City of Sarasota WWTP (Whitaker Bayou watershed) reflects a 13 mgd surface water discharge for a total of 59 days per year. For the Southwest WWTP in Manatee County (South Bradenton watershed), a wastewater flow rate of 19.1 mgd was estimated for buildout future conditions. The value was established assuming that the projected 55 percent growth to buildout (see Table 3-7) will result in a 55 percent increase in wastewater flow over the existing level of 12.8 mgd. The Southwest WWTP was assigned a flow rate of 4.61 mgd, which reflects estimated irrigation and deep well discharge rates of 17.0 mgd and 2.1 mgd, respectively. Discharges for Siesta Key, Phillippi Creek, Matheny Creek and Direct to Bay watersheds reflect discharges from one or more private utilities in those watersheds. The concentrations of nutrients and metals are the same as for the twenty-year future scenario.

3.3.3 PROJECTED POLLUTION LOADINGS

Tables 3-14 and 3-15 summarize the loadings for the buildout future land use conditions. Table 3-14 presents the loadings by source, and Table 3-15 presents the loadings by

TABLE 3-12

BUILDOUT FUTURE LAND USE BY JURISDICTION IN
SARASOTA BAY NEP STUDY AREA

Land Use	AREA (Acres)				
	City of Sarasota	Sarasota County	Manatee County	Barrier Islands	Total
Cropland	0	1,695	0	0	1,695
Forested Uplands	168	33	39	13	253
Rangeland/Woodlands	126	3,582	88	0	3,796
Open/Recreation	650	5,221	325	333	6,529
Wetland	0	1,449	415	403	2,267
Citrus	4	369	93	0	467
LDSF Resid (1 du/ac)	368	12,738	685	432	14,223
MDSF Resid (4.5 du/ac)	1,320	22,114	4,132	2,706	30,272
HDSF Resid (7.5 du/ac)	2,164	5,163	5,650	845	13,822
Multi-family Bldg (9 du/ac)	946	1,983	3,240	754	6,923
Mobile Home (9 du/ac)	0	1,065	862	37	1,964
Commercial/Services	926	1,775	824	173	3,697
Institutional	529	667	365	3	1,564
Industrial	521	3,186	2,452	40	6,199
Transportation	17	202	633	15	868
Waterbody	75	1,028	228	2	1,333
STP and Power Plants	30	30	195	5	260
Total	7,844	62,301	20,226	5,761	96,132

TABLE 3-13

POINT SOURCE FLOWS AND CONCENTRATIONS FOR BUILDOUT FUTURE CONDITIONS

WATERSHED	DISCHARGE (mgd)			CONCENTRATION (mg/L)			
	ANNUAL	WET SEASON	DRY SEASON	TOTAL P	TOTAL N	LEAD	ZINC
Phillippi Creek	2.62	2.62	2.62	1.03	3.78	0.015	0.076
Matheny Creek	2.45	2.45	2.45	1.05	3.44	0.019	0.094
Whitaker Bayou	2.10	2.94	1.68	1.00	3.00	0.020	0.100
Direct to Bay	0.04	0.04	0.04	1.48	7.38	0.007	0.037
Siesta Key	2.20	2.20	2.20	1.00	3.00	0.020	0.100
South Bradenton	4.61	4.61	4.61	0.74	3.69	0.004	0.018

TABLE 3-14

LOADING BY SOURCE FOR BUILDOUT FUTURE LAND USE CONDITIONS

Scenario/ Source	Total P (lb)	% of Total	Total N (lb)	% of Total	Lead (lb)	% of Total	Zinc (lb)	% of Total
AVERAGE ANNUAL								
Surface Runoff	146,050	51.3%	776,460	52.4%	43,610	93.0%	33,680	33.2%
Baseflow	29,200	10.2%	97,460	6.6%	260	0.6%	4,890	4.8%
Septic Tanks	8,270	2.9%	124,060	8.4%	0	0.0%	0	0.0%
Point Source	39,710	13.9%	147,750	10.0%	570	1.2%	2,880	2.8%
Rainfall	61,730	21.7%	337,460	22.8%	2,470	5.3%	60,080	59.2%
TOTAL	284,960	100.0%	1,483,190	100.0%	46,910	100.0%	101,530	100.0%
WET SEASON								
Surface Runoff	89,720	53.6%	478,210	54.9%	26,870	93.4%	20,780	33.3%
Baseflow	21,460	12.8%	71,530	8.2%	180	0.6%	3,570	5.7%
Septic Tanks	4,130	2.5%	61,990	7.1%	0	0.0%	0	0.0%
Point Source	14,080	8.4%	51,820	5.9%	210	0.7%	1,040	1.7%
Rainfall	38,100	22.7%	208,290	23.9%	1,520	5.3%	37,090	59.4%
TOTAL	167,490	100.0%	871,840	100.0%	28,780	100.0%	62,480	100.0%
DRY SEASON								
Surface Runoff	55,640	47.6%	296,500	48.6%	16,650	92.5%	12,880	33.0%
Baseflow	7,790	6.7%	26,060	4.3%	40	0.2%	1,310	3.4%
Septic Tanks	4,140	3.5%	62,070	10.2%	0	0.0%	0	0.0%
Point Source	25,610	21.9%	95,930	15.7%	360	2.0%	1,840	4.7%
Rainfall	23,630	20.2%	129,170	21.2%	950	5.3%	23,000	58.9%
TOTAL	116,810	100.0%	609,730	100.0%	18,000	100.0%	39,030	100.0%
WET YEAR								
Surface Runoff	185,910	50.5%	988,910	52.7%	55,540	92.9%	42,940	32.6%
Baseflow	55,120	15.0%	183,710	9.8%	530	0.9%	9,150	6.9%
Septic Tanks	8,270	2.2%	124,060	6.6%	0	0.0%	0	0.0%
Point Source	39,710	10.8%	147,750	7.9%	570	1.0%	2,880	2.2%
Rainfall	78,800	21.4%	430,790	23.0%	3,150	5.3%	76,700	58.3%
TOTAL	367,810	100.0%	1,875,220	100.0%	59,790	100.0%	131,670	100.0%
DRY YEAR								
Surface Runoff	111,270	52.4%	591,810	51.9%	33,310	93.0%	25,700	34.1%
Baseflow	5,970	2.8%	19,860	1.7%	30	0.1%	1,000	1.3%
Septic Tanks	8,270	3.9%	124,060	10.9%	0	0.0%	0	0.0%
Point Source	39,710	18.7%	147,750	12.9%	570	1.6%	2,880	3.8%
Rainfall	47,150	22.2%	257,730	22.6%	1,890	5.3%	45,890	60.8%
TOTAL	212,370	100.0%	1,141,210	100.0%	35,800	100.0%	75,470	100.0%

TABLE 3-15

LOADING BY JURISDICTION FOR BUILDOUT FUTURE LAND USE CONDITIONS

Scenario/ Jurisdiction	Total P (lb)	% of Total	Total N (lb)	% of Total	Lead (lb)	% of Total	Zinc (lb)	% of Total
AVERAGE ANNUAL								
Sarasota Co.	134,280	47.1%	714,970	48.2%	21,820	46.5%	23,180	22.8%
Sarasota City	20,660	7.3%	94,700	6.4%	5,940	12.7%	4,720	4.6%
Manatee Co.	50,070	17.6%	260,260	17.5%	14,510	30.9%	10,900	10.7%
Islands	18,220	6.4%	75,800	5.1%	2,170	4.6%	2,650	2.6%
Bay Surface	61,730	21.7%	337,460	22.8%	2,470	5.3%	60,080	59.2%
TOTAL	284,960	100.0%	1,483,190	100.0%	46,910	100.0%	101,530	100.0%
WET SEASON								
Sarasota Co.	79,600	47.5%	418,610	48.0%	13,440	46.7%	14,310	22.9%
Sarasota City	11,980	7.2%	56,360	6.5%	3,630	12.6%	2,860	4.6%
Manatee Co.	28,510	17.0%	147,970	17.0%	8,940	31.1%	6,770	10.8%
Islands	9,300	5.6%	40,610	4.7%	1,250	4.3%	1,450	2.3%
Bay Surface	38,100	22.7%	208,290	23.9%	1,520	5.3%	37,090	59.4%
TOTAL	167,490	100.0%	871,840	100.0%	28,780	100.0%	62,480	100.0%
DRY SEASON								
Sarasota Co.	54,520	46.7%	296,370	48.6%	8,390	46.6%	8,860	22.7%
Sarasota City	8,590	7.4%	38,280	6.3%	2,280	12.7%	1,880	4.8%
Manatee Co.	21,520	18.4%	112,370	18.4%	5,540	30.8%	4,140	10.6%
Islands	8,550	7.3%	33,540	5.5%	840	4.7%	1,150	2.9%
Bay Surface	23,630	20.2%	129,170	21.2%	950	5.3%	23,000	58.9%
TOTAL	116,810	100.0%	609,730	100.0%	18,000	100.0%	39,030	100.0%
WET YEAR								
Sarasota Co.	177,000	48.1%	903,920	48.2%	27,900	46.7%	31,290	23.8%
Sarasota City	25,820	7.0%	119,810	6.4%	7,560	12.6%	6,070	4.6%
Manatee Co.	64,120	17.4%	328,080	17.5%	18,520	31.0%	14,330	10.9%
Islands	22,070	6.0%	92,620	4.9%	2,660	4.4%	3,280	2.5%
Bay Surface	78,800	21.4%	430,790	23.0%	3,150	5.3%	76,700	58.3%
TOTAL	367,810	100.0%	1,875,220	100.0%	59,790	100.0%	131,670	100.0%
DRY YEAR								
Sarasota Co.	96,990	45.7%	550,570	48.2%	16,620	46.4%	16,130	21.4%
Sarasota City	16,130	7.6%	73,050	6.4%	4,580	12.8%	3,560	4.7%
Manatee Co.	37,860	17.8%	201,600	17.7%	11,080	30.9%	7,930	10.5%
Islands	14,240	6.7%	58,260	5.1%	1,630	4.6%	1,960	2.6%
Bay Surface	47,150	22.2%	257,730	22.6%	1,890	5.3%	45,890	60.8%
TOTAL	212,370	100.0%	1,141,210	100.0%	35,800	100.0%	75,470	100.0%

jurisdiction. A complete set of tables, including loading estimates by watershed in the NEP study area, are included in Appendix D of this report.

A comparison of Tables 2-2 and 3-14 reveals that the loadings for the buildout future scenario exceed existing loadings for all of the pollutants analyzed. For the average annual rainfall condition, the buildout loadings exceed existing loadings by amounts varying from 11 percent (zinc) to 40 percent (lead). Total N and total P loadings increased by 17 percent and 16 percent, respectively.

As with the twenty-year future scenario, the surface runoff and point sources account for a larger percentage of the total loading for the buildout future scenario than for existing conditions, due to development. Baseflow is expected to decrease due to the addition of impervious area. Septic tank loadings are expected to remain the same, based on the discussion presented in Section 3.1. Direct precipitation loadings to the Bay surface are also assumed to be the same as the existing loadings.

A comparison of Tables 2-3 and 3-15 shows an increase in loadings for Sarasota County, Manatee County, and the Barrier Islands, and a decrease in loadings for the City of Sarasota. In Sarasota County, the new development and the corresponding increases in surface runoff and wastewater are the reasons for the loading increases. Transition from surface water discharge to reuse for the City of Sarasota wastewater treatment plant is the reason for the reduced loadings from the City. In Manatee County and the Barrier Island, increases in both surface runoff and wastewater loadings account for the overall loading increases.

4

Section Four

4.0 ALTERNATIVE MANAGEMENT STRATEGIES FOR NONPOINT POLLUTION

The results shown in the previous chapters indicate that nonpoint pollution is responsible for a relatively large percentage of existing loadings to Sarasota Bay, and that the increase in future loadings can be attributed primarily to increases in nonpoint loadings. Consequently, the control of nonpoint pollution from new and existing development must be considered in order to protect water quality in the Bay.

4.1 STRUCTURAL BEST MANAGEMENT PRACTICES (BMPs)

The Florida Department of Environmental Regulation (FDER) requires the implementation of stormwater management measures for new development. Generally, the only exception to this requirement would be small residential development projects of less than 10 acres of total land area and less than 2 acres of impervious area. The design criteria in the regulations ensure that a water quality benefit (i.e., surface runoff pollution removal) is achieved by the stormwater facility. Stormwater facilities in areas that discharge directly to Outstanding Florida Waters (such as Sarasota Bay) have additional water quality design requirements. A summary of the types of BMPs and their application in the study area are described below.

4.1.1 BMP ALTERNATIVES

In general, there are two distinct types of structural BMPs: retention and detention. Retention controls capture stormwater runoff and divert the runoff into the soil profile where pollutant removal can occur as a result of natural processes such as filtration, adsorption and oxidation by soil microorganisms. Examples of retention BMPs include seepage basins, infiltration trenches, dry wells and porous pavement. Detention controls also capture stormwater runoff, but only detain the stormwater for a limited period of time before releasing it to the watershed conveyance system, rather than to the soil profile. These BMPs achieve removal of suspended pollutants through sedimentation processes. If

the detention control is a wet detention basin, with a permanent pool of water, dissolved pollutants may also be removed through physical, biological and chemical processes occurring within the water column of the permanent pool.

4.1.2 COMPARISON OF BMPs

The use of a specific BMP depends upon the site conditions and water quality protection requirements. The following comparison of structural BMPs focuses upon the suitability of the BMPs to the NEP study area.

Retention BMPs

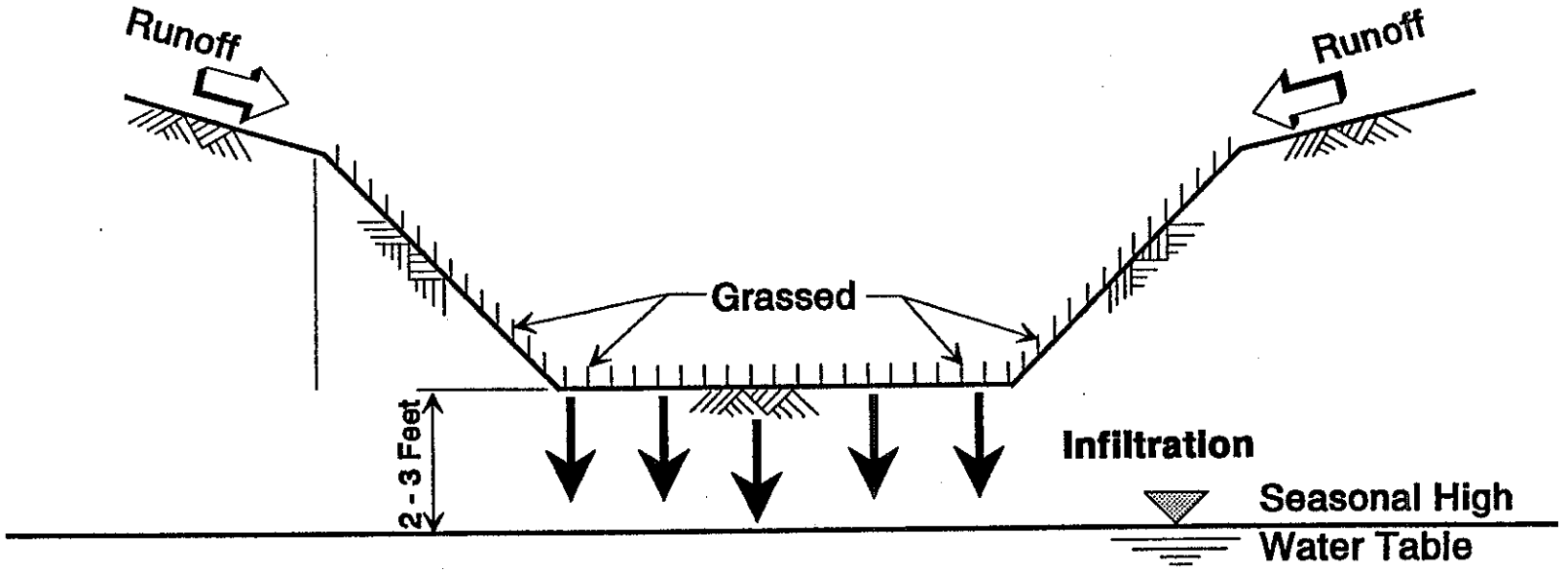
Retention controls are typically best suited for onsite applications where the water table is low, soils are highly permeable, and the contributing area is limited to a single development site or subdivision (i.e., typically less than 50 acres). A typical retention BMP facility is presented in Figure 4-1. Because virtually all of the NEP study area can be classified as B/D soils with high water tables, these BMPs would typically not be feasible in the study area.

Compared to detention pond BMPs, retention BMPs require greater maintenance costs due to more frequent major cleanouts (CDM, 1985), and tend to fail within a few years after start-up unless this maintenance is provided. Consequently, retention BMPs are not recommended for area-wide application in the NEP study area, though they may be suitable for use at certain commercial or industrial sites based on case-by-case applications. FDER requires that a retention facility must capture the runoff from the first one inch of rainfall.

CDM
environmental engineers, scientists, planners, & management consultants

Typical Retention BMP

Figure 4-1



NOTES:

1. Runoff is directed to the pond and retained without overflow or discharge to downstream.

2. The first half inch of runoff or runoff from the first inch of rainfall is typically retained for treatment.

3. Infiltration and evapotranspiration provide for recovery of storage (72 hours for treatment volume, 14 days for flood control volume).

4. Sideslopes should be no steeper than 4 horizontal to 1 vertical.

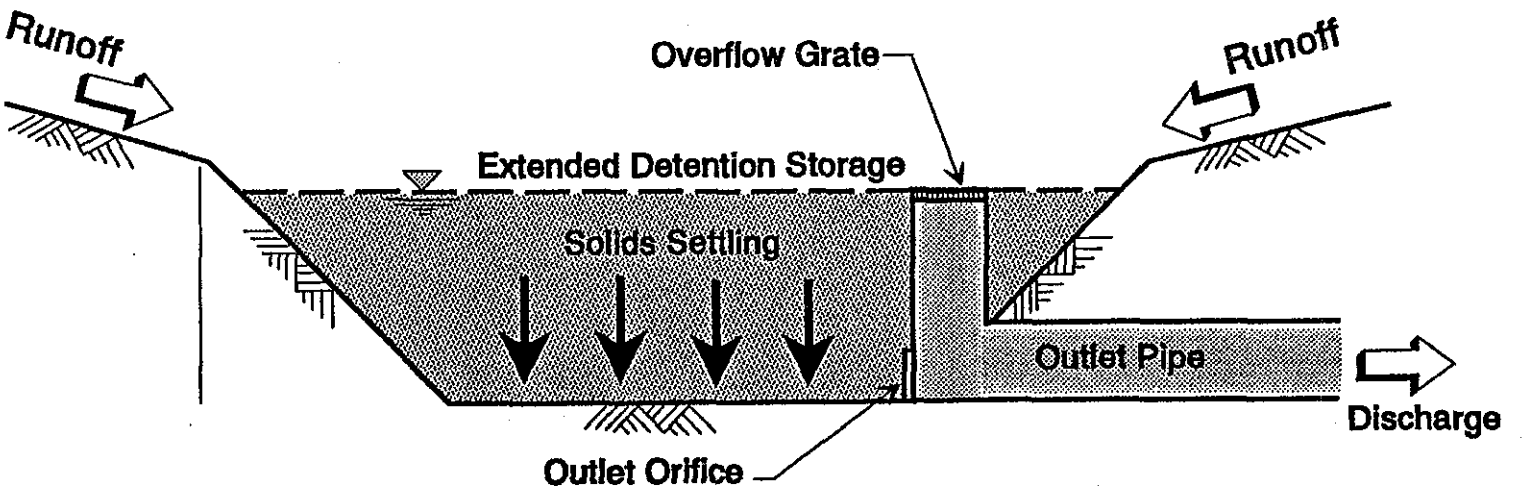
Extended Dry Detention BMPs

Extended dry detention basins provide increased detention times to provide treatment for the "first flush" of stormwater runoff (typically 0.5 to 1.0 inches of runoff over the drainage area). The increased detention time provided by the facility enhances the removal of suspended pollutants through sedimentation processes. The basin has a control structure designed to release the captured runoff at a rate that is slow enough to achieve maximum pollutant removal by sedimentation. For a detention time of 12 to 24 hours, typical removal rates are 80 percent for lead, 40 percent for zinc, 25 percent for total P and 20 percent for total N. A typical extended dry detention BMP facility is presented in Figure 4-2.

Wet Detention BMPs

In wet detention basins, pollutant removal occurs primarily within the permanent pool during the period of time between storm events. The pool is typically sized to provide a two-week hydraulic residence time during the wet season. For such a wet detention basin, expected removal efficiencies are 80 percent for lead, 50 percent for zinc, 50 percent for total P and 30 percent for total N.

A schematic of a typical wet detention basin is presented in Figure 4-3. As shown in the figure, the facility consists of a permanent storage pool and an overlying zone of temporary storage to accommodate increases in water depth due to runoff. Pollutant removal can be attributed to processes such as uptake of nutrients by algae and rooted aquatic plants, adsorption of nutrients and heavy metals onto bottom sediments, biological oxidation of organic materials, and sedimentation of suspended solids and attached pollutants. Uptake by algae and rooted aquatic plants is probably the most important process for the removal of nutrients, whereas sedimentation and adsorption onto bottom sediments is probably the most important removal mechanism for heavy metals.



NOTES:

1. Runoff is directed to the pond and detained for flood control and treatment by solids settling.

2. The first half inch of runoff or runoff from the first inch of rainfall is typically detained for treatment.

3. Recovery of extended detention storage should occur within 72 hours.

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Typical Extended-Dry Detention BMP

Figure 4-2

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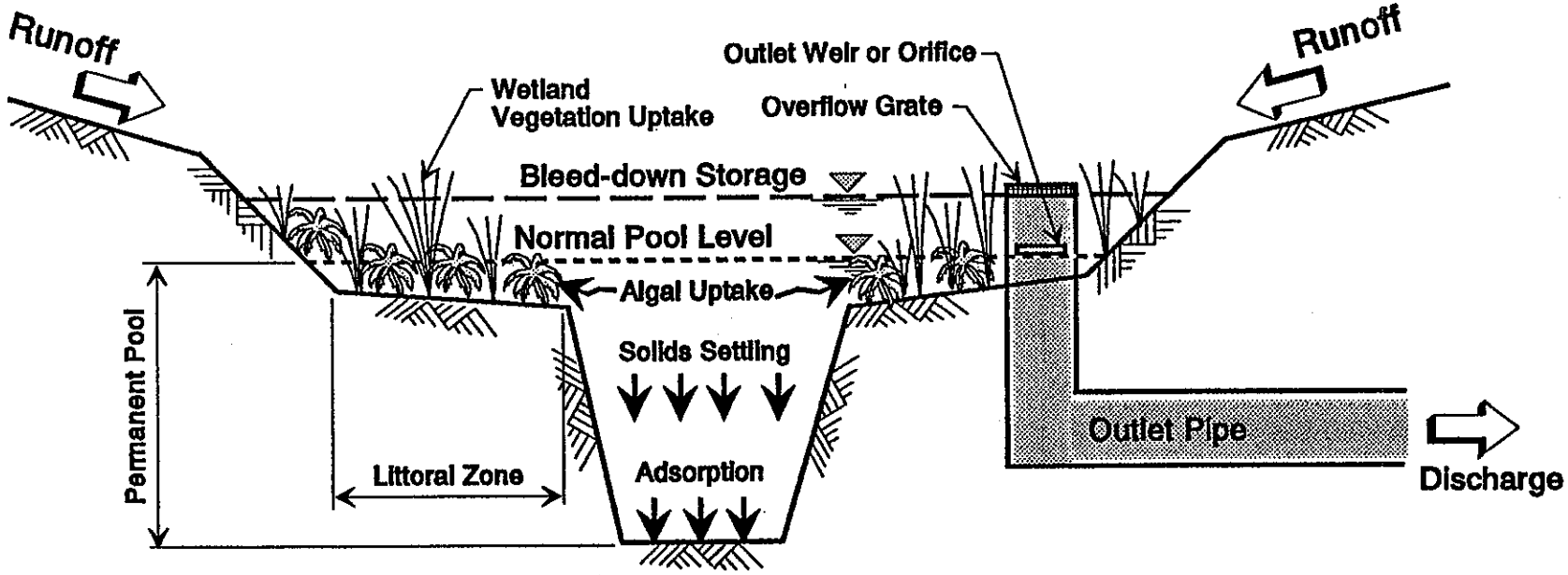
Typical Wet Detention BMP

Figure 4-3



NOTES:

1. Runoff is directed to the pond and detained for flood control and treatment by algal and vegetative uptake, solids settling, and adsorption.

2. The first inch of runoff is typically detained above a permanent pool (with a hydraulic residence time of 14 days) for treatment.

3. Storage Recovery of first 1/2 inch of runoff is required in > 60 hours.

Wet detention BMPs offer a number of advantages over extended dry detention BMPs. One is that wet detention BMPs exhibit higher removal efficiencies due to the additional removal processes occurring in the permanent pool. This is particularly true for nutrients, for which uptake by algae and rooted aquatic plants are assumed to be important processes. In addition, wet detention basins are usually more aesthetically pleasing than extended dry detention basins, particularly if there is desirable wetland vegetation around the perimeter of the permanent pool. When properly designed and constructed, wet detention basins are actually considered as property value amenities in many areas. Wet detention basins also offer the advantage of sediment and debris accumulation that is below the water level of the permanent pool. Since this accumulation is out of sight and well below the basin outlet, wet detention basins tend to require less frequent cleanouts to maintain an attractive appearance and prevent clogging.

There are also some disadvantages to selecting wet detention basins. If the contributing area is too small, storm runoff and dry weather inflows may not be sufficient to maintain the permanent pool during the dry season. This does not pose a pollution control problem, but may cause aesthetic problems. Consequently, wet detention basins may not be appropriate for relatively small drainage areas. In addition, the impacts of stormwater management structures such as inundation of native habitat must be considered. While it can be argued that wet detention basins can be designed to produce new native habitat and that the additional water quality protection justifies potential native habitat impacts, extended dry detention systems may be the preferred BMP for sites with a significant amount of existing habitat. Finally, the cost of wet detention BMPs is higher than for extended dry detention BMPs. The additional cost is associated primarily with the excavation of the permanent pool. Due to the flat topography in Florida, the permanent pool is often much larger than is required to achieve a two-week residence time, to avoid aquatic weed problems that will occur if the pool is too shallow.

Based on the advantages presented above, wet detention basins are the preferred structural BMP for the Sarasota Bay NEP study area. Wet detention systems offer significant

advantages over extended dry detention systems in terms of nutrient loading reductions, aesthetics and maintenance requirements. Further, wet detention basins are preferable to retention BMPs because they are not as constrained by soils and water table characteristics, are more easily maintained, are more reliable, and are hydrologically more like Florida's wetlands.

4.1.3 DESIGN CRITERIA FOR PREFERRED BMP

Current FDER design criteria for new developments encourage hybrid detention facilities which combine attributes of both wet detention and extended dry detention BMPs. Design guidelines currently recommended by FDER are:

- Wet detention permanent pool storage volume must provide for an average hydraulic residence time of at least 14 days. This volume may be determined by a calculation of the runoff volume during the wettest two week period during an average year.

- A bleed-down, or live storage volume, should be provided for the first inch of runoff or 2.5 inches times the percent imperviousness, whichever is greater. This bleed-down storage is to be provided in addition to the permanent pool storage.

- Wet detention pond outlets are to be designed to draw down the bleed-down storage pool such that no more than one-half of the specified stormwater treatment volume may be discharged in the first 60 hours following a storm event.

- Side slopes should be 6:1 (horizontal:vertical) or flatter to provide a littoral shelf from the side of the facility out to a point 2-3 ft below the permanent pool elevation. Side slopes above the littoral zone should be no steeper than 4:1.

- Maximum permanent pool depths of 8 to 12 feet below the invert of the extended pool drawdown structure are recommended to minimize the potential for thermal stratification and re-release of nutrients from the bottom sediments due to anaerobic conditions.

- Inlet structures should be designed to dissipate the energy of waters entering the facility to prevent short-circuiting.

- Facilities that receive stormwater from areas with greater than 50 percent impervious surface, or areas that are a potential source of oil and grease contamination must include a baffle/skimmer/grease trap to prevent these substances from being discharged from the facility.

- Wetland mitigation or vegetated littoral zones must be provided. Native plant species should be planted on 3 foot centers up to a depth of 3 feet below the permanent pool. The littoral zone planting should attain an 85 percent coverage within 3 years of planting.

Other design considerations, including length-to-width ratio, appropriate drainage areas for wet detention basins, and seasonal high water table, are discussed below.

Length-Width Ratio

Relatively high length-to-width ratios can help minimize short-circuiting, enhance sedimentation and prevent vertical stratification within the permanent pool. A minimum ratio of 2:1 is probably a reasonable planning goal for the permanent pools of wet detention basins. In addition, the location of the outlet structure should maximize travel time from the inlet(s) to the outlet. Baffles or islands can be installed within the permanent pool to increase the flow path length and minimize short-circuiting.

Minimum and Maximum Drainage Area

The minimum drainage area should permit sufficient flow to prevent severe permanent pool drawdown, with its associated aesthetic problems, during the dry season. For many areas, a drainage area of 20 to 25 acres is sufficient to ensure adequate dry weather inflows. Maximum drainage areas are a consideration primarily when the BMPs are being used to minimize erosion and flooding impacts as well as water quality impacts. When this is the case, maximum drainage areas of 100 to 300 acres are appropriate, based on previous experience. This range is considered adequate to prevent excessive streambank erosion upstream of the BMP. Highly impervious drainage areas will typically be

restricted to the lower end of the range (100 acres), whereas drainage areas with low imperviousness may have drainage areas at the high end of the range.

Seasonal High Water Table

The seasonal high water table should be carefully determined for the wet detention BMP site. The BMP design should then ensure that the permanent pool and the seasonal high water table intersect, so that the potential for severe pool drawdown is minimized.

4.1.4 MAINTENANCE REQUIREMENTS FOR PREFERRED BMP

Inspections

Inspections should be performed at regular intervals to ensure that the detention basin is operating as designed. At a minimum, the basins should be inspected once per year, with additional inspections following major storm events. At the time of all site visits, the inspector should check accumulation of debris and sediment. The control structure and the side slopes of the basin should be checked to ensure that they do not show signs of erosion, settlement, slope failure, or vehicular damage. Vegetated littoral zones should be inspected to ensure that the water elevation is appropriate to enhance vegetative growth, that acceptable survival rates for planted species are being maintained, and that vegetative cover is adequate.

Routine Maintenance

Routine maintenance refers to procedures which are to be performed on a regular basis during the year. These activities are preventive in nature, and are intended to enhance the aesthetic nature of the facility. Mowing along the basin is required at least twice a year. Debris and litter removal should be carried out in conjunction with the mowing operation.

Special attention should be given to the area around the basin outlet structure , and to objects that could clog the outlet devices.

A special consideration for maintaining wet detention basins is the handling of potential algal matting within the permanent pool. Biological processes which provide water quality benefits may also cause aesthetic problems such as algal blooms. However, for BMPs that have been designed in accordance with the guidelines presented earlier, the potential for algal matting should be minimal.

Erosion and Structural Repair

Areas of erosion and slope failure should be filled and compacted, if necessary, and reseeded (or sodded) as soon as possible. Eroded areas near the basin inlet or outlet should be revegetated and, if necessary, should be filled, compacted and revegetated or lined with riprap. Damaged side slopes and embankments should be repaired using fill dirt of adequate permeability. Any major damage to outlet structures should be repaired as soon as possible.

Sediment Removal

Sediment removal is a very important maintenance activity for a wet detention basin, which is designed to remove pollutants in part by sedimentation. Sediment that settles out in the basin reduces the storage volume of the basin and can reduce the pollutant removal efficiency of the basin. Much of this sediment is located below the water surface of the permanent pool.

Alternative methods for sediment removal include the following:

- Dewatering of permanent pool and removal using front-end loaders.
- Dragline excavation.

- Hydraulic dredge.

Dewatering does not appear to be a viable option in the study area due to the high water table. Previous experience indicates that the hydraulic dredge may be the most cost-effective removal method, if a suitable sediment dewatering basin is available at the BMP site.

Sediment Disposal

Disposal of sediments cleaned out of a wet detention basin is an important consideration for any maintenance program. Under current federal regulations (Resource Conservation and Recovery Act - RCRA), accumulated sediments in detention basins are not likely to be classified as a hazardous waste. However, the sediment should be tested periodically to determine whether or not it is subject to RCRA regulations. If so, it must be disposed of at a RCRA-approved facility, and disposal costs will be substantially higher than current disposal methods.

For sediment that is not classified as a hazardous waste, two major disposal options are available: onsite disposal or landfill disposal. The area required for onsite disposal must be determined to reserve adequate space for sediment disposal. The onsite disposal area should be large enough to stockpile two sediment clean-outs assuming the area can accept a 12-inch depth of wet sediment for each clean-out. Any onsite disposal area must be protected with sediment control measures to prevent material from washing into the stream network. To be consistent with guidelines for landfilling and land application of sludge, the disposal area should not be in the 100-year floodplain nor in wetlands.

If onsite disposal areas are unavailable or inadequate in size, then steps must be taken to transport the material to local landfills. Detention basin sediment is typically accepted at landfills as long as the material has been sufficiently dried to be a "workable material" and can pass an Extraction Procedures (EP) toxicity test.

4.1.5 BMP POLLUTANT REMOVAL EFFICIENCIES

In Section 4.1.2, typical pollutant removal efficiencies were listed for extended dry and wet detention basins. The following discussion presents the background behind the development of the removal efficiency values.

Extended Dry Detention Basins

Experimental settling column data and field monitoring data for extended dry detention basins have been used to evaluate pollutant removal performance. Settling column experiments were performed and removal efficiencies of various pollutants were determined for different settling durations (Driscoll, 1986; Grizzard et al., 1986; Occoquan Watershed Monitoring Laboratory, 1983). In addition, settling column studies were conducted as part of a recent Federal Highway Administration (FHWA) study of 13 storms monitored at six highway sites in the Virginia suburbs of Washington, D.C. (FHWA, 1989). Field studies have also been performed in northern Virginia and in Montgomery County, Maryland (Metropolitan Washington Council of Governments, 1983; Occoquan Watershed Monitoring Laboratory, 1987) during the USEPA Nationwide Urban Runoff Program (NURP).

Based on the settling column analysis results, it can be concluded that the majority of pollutant removal by settling occurs within 6 to 12 hours after the runoff enters the detention basin. This indicates that detention ponds achieving extended detention times on the order of 6 to 12 hours should maximize the removal of suspended pollutants. An extended detention basin should be designed to achieve a maximum drawdown time of 24 hours, because this will result in an average detention time of 12 hours.

Table 4-1 summarizes average pollutant removal efficiencies for extended dry detention basins based on the settling column test data and field monitoring data. The settling

TABLE 4-1

AVERAGE ANNUAL POLLUTANT REMOVAL RATES
FOR DETENTION BMPs

POLLUTANT	POLLUTANT REMOVAL RATE (%)	
	EXTENDED DRY DETENTION	WET DETENTION
Total P	25%	50%
Total N	20%	30%
Lead	80%	80%
Zinc	40%	50%

NOTES:

1. Extended dry detention efficiencies assume storage volume of at least 0.5 inch per impervious acre.

2. Wet detention efficiencies assume storage volume which achieves average hydraulic residence time of at least two weeks.

column data were used to determine the removal efficiencies for lead and zinc, whereas the field monitoring data were used to establish the removal efficiencies for total N and total P. As shown in the table, lead has the highest removal efficiency, because it is primarily associated with suspended solids. Total N, which is primarily in the dissolved form in ambient waters, has the lowest of the four removal efficiencies.

Wet Detention Basins

The USEPA NURP study monitored several wet detention basins serving small urban watersheds in various locations throughout the United States (USEPA, 1983). For basins with average hydraulic residence times of two weeks or more, average pollutant removal rates were on the order of 50 to 60 percent for total P and 30 to 40 percent for total N. For lead and zinc, the removal efficiencies were 70 to 80 percent, and 40 to 50 percent, respectively.

Table 4-1 lists the wet detention basin removal efficiencies assumed in the Sarasota Bay NEP study. The efficiencies reported for total P and total N are consistent with removal efficiencies based on an empirical lake eutrophication model developed by Walker (Hartigan, 1989; Walker, 1987). The lead and zinc removal efficiencies are consistent with projections based on the solids settling design model developed by Driscoll (Hartigan, 1989; USEPA, 1983; Driscoll, 1983).

4.1.6 ONSITE VERSUS REGIONAL DEPLOYMENT OF BMPs

Figure 4-4 illustrates two different approaches that can be taken for deployment of structural BMPs for water quality control:

1. Onsite Approach: In the case of future urban development, this option involves the delegation of responsibilities for BMP deployment to local land developers. Each developer is responsible for constructing one or more

ONSITE
(Each Developer Provides BMP on Development Site)

VS.

REGIONAL
(Strategically Located by Local Government)

Note To Reviewers - This Figure to be re-drawn for final production.

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Deployment Alternatives for Structural BMPs

Figure 4-4

- Reduction in capital costs for structural BMPs: The use of a single detention facility to control runoff from 5 to 15 development sites permits the local government to take advantage of economies-of-scale in designing and constructing the regional facility. In other words, the total capital cost (e.g., construction, land acquisition, engineering design) of several small onsite detention BMPs is greater than the cost of a single regional detention pond BMP which provides the same total storage volume in a strategic place.

- Reduction in maintenance costs: Since there are fewer detention facilities to maintain, the annual cost of maintenance programs are significantly lower. Moreover, since the regional facility can be designed to facilitate maintenance activities, annual maintenance costs are further reduced in comparison with onsite facilities. Examples of design features that are typically only feasible at regional BMP facilities to reduce maintenance costs include: access roads that facilitate the movement of equipment and work crews onto the site (by comparison, onsite detention facilities are often located in residential back yards); additional sediment storage capacity (e.g., sediment forebay) to permit an increase in the time interval between facility clean-out operations; and onsite disposal areas for sediment and debris removed during clean-out.

- Greater reliability: A regional BMP system will be more reliable than an onsite BMP system because the regional system is more likely to be maintained. With fewer facilities to maintain and design features which reduce maintenance costs, the regional BMP approach is much more likely to result in an effective long-term maintenance program. Due to the greater number of facilities, the onsite BMP approach tends to result in a large number of facilities which are not adequately maintained and therefore soon cease to function as designed. Most cities and counties who begin using the onsite approach eventually switch to the regional approach to address the lack of maintenance in onsite systems and increase the overall effectiveness of the

watershed management program. Good examples are Fairfax County, Virginia, and Montgomery County, Maryland, where problems with the effectiveness of an onsite stormwater control approach eventually led to the implementation of a regional approach.

- Opportunities to manage existing nonpoint pollution loadings: Nonpoint pollution loadings from existing developed areas can be affordably controlled at the same regional facilities which are sited to control future development. The provision of additional storage capacity to control existing development in the facility's drainage area is financially feasible due to economies of scale. By comparison, the cost of retrofitting existing development sites with onsite detention BMPs to control existing nonpoint pollution loadings may be prohibitively expensive (see Section 5.1.6).

- Popularity among land developers: Land developers recognize that economies of scale available at a single regional BMP facility should produce lower capital costs in comparison with several onsite detention facilities. They also tend to prefer the regional BMP approach because it eliminates the need to set aside acreage for an onsite facility, and therefore could permit an increase in the number of dwelling units within the development site.

While regional BMP's offer many advantages over onsite BMP's, there are some additional considerations for implementation. The jurisdiction involved must be committed to providing the administration, staffing, and "front-end" financing (see Section 6.4). Where feasible, the implementation of regional BMPs is recommended as the preferred structural BMP deployment method. For those areas that cannot be served by regional BMPs due to locational constraints, onsite BMPs are recommended.

Implementation of Regional BMP Approach

The first step in developing a regional BMP system is the preparation of a master plan which identifies the best regional BMP sites and includes conceptual designs of each facility. The BMP sites recommended in the master plan should be incorporated into each jurisdiction's comprehensive plan. Inclusion of the BMP sites in the comprehensive plan will help preserve the sites and provide a mechanism to monitor development activity which will require the construction of the associated BMP.

Jurisdictions which select the structural BMP approach should phase in the regional BMP system as future development occurs, rather than construct the entire system in advance of development. By phasing in the regional BMPs, the "front-end" costs assumed by the local jurisdiction can be minimized.

Each new development project upstream of a regional BMP should be assessed a fee (e.g., $/impervious acre) to cover its share of the total BMP cost. Once the facility fee structure has been developed and approved, the local government should begin charging the fees to all new development and start phasing in the regional BMP system. Because the regional BMP sites are shown on the comprehensive plan, it should be easy to monitor future development activity that affects each facility.

When the first major development project is proposed within the drainage area of a regional BMP, the local jurisdiction should enter into negotiations with the developer regarding site acquisition (if the BMP is not located on the proposed development site), design, and construction of the regional facility. The local jurisdiction should pay the developer a lump sum established in the BMP master plan (less the development's pro-rata share of facility costs) to acquire the necessary land, design and construct the regional BMP to local specifications. If the developer owns the property on which the BMP will be located, it would be relatively straightforward to implement the BMP project. If the first major development is located upstream of the BMP site, the local

jurisdiction may wish to acquire the BMP site itself or it may be feasible for the developer to handle the land transaction. Advance acquisition of all recommended BMP sites is another option, but this tends to be much more expensive than the "phase-in" method. The key to this implementation approach is that the first major development project handles the design and construction of the regional BMP. Experience with this type of regional BMP implementation in other areas (e.g., Montgomery County, Maryland) indicates that developers find this approach to be very desirable from a cash flow standpoint, because they receive a lump sum payment for BMP design and construction before the development project is completed.

Until sufficient facility fees are generated by new development, other sources of local funds must be used to cover the front-end costs for land acquisition, design and construction. After a few years, the fees accumulated from recent development should be sufficient to cover most of the front-end costs for the regional BMP. Sarasota County has a stormwater utility, which is a potential source of funding.

Following construction, the regional BMP should be dedicated to the local jurisdiction. As indicated above, CDM recommends that some public entity be delegated the responsibility for BMP maintenance. Facility fees charged for later development which is served by the regional BMP can be used to recover the front-end capital costs.

4.2 NONSTRUCTURAL CONTROLS

Nonstructural control strategies focus on the percent imperviousness of the study area in assessing nonpoint pollution impacts and management options. Examples of nonstructural controls include reductions in residential densities (i.e., dwelling units per acre), clustered development and buffer zones. Monitoring studies of nonpoint pollution loadings from different land uses have shown that imperviousness is the most important factor in determining "per acre" loadings of nutrients and toxics, particularly for residential land uses. Consequently, any management alternative that reduces the overall imperviousness

of future development should also reduce the future nonpoint pollution loadings. Several alternative strategies for reducing the imperviousness for future development will be discussed in this section of the report.

The discussion below of nonstructural controls focuses upon water quality protection issues. However, water quality protection is only one of several issues that local governments must consider when making land use planning/zoning decisions that affect impervious cover in the study area. The relative importance of water quality protection will ultimately determine whether maintaining lower levels of impervious cover is preferable to management approaches which rely on structural BMPs.

4.2.1 COMPARISON OF STRUCTURAL AND NONSTRUCTURAL BMPs

The major advantage of nonstructural BMPs over structural BMPs is that the nonstructural BMPs can more reliably reduce future nonpoint pollution loadings. Nonstructural controls reduce the amount of pollution generated, whereas structural controls do not. Instead, structural controls reduce future loadings within facilities that must be properly designed, constructed and maintained in order to work effectively.

Table 4-2 presents a comparison of reliability levels associated with the use of structural and nonstructural BMPs. The table compares the two types of BMPs in terms of six different reliability factors.

- Uncertainty about effectiveness: Nonstructural controls have a higher reliability level because there is substantially more monitoring data on loading reductions achieved by undeveloped land. By comparison, there is a relatively small database (only a few years at any given BMP monitoring site) on the pollutant removal efficiency of structural BMPs.

- Increased nonpoint loadings for treatment: Insofar as a structural BMP system permits increased densities compared to nonstructural controls, there is a need for increased reliability because an increased nonpoint pollution load is generated for treatment by the BMP.

TABLE 4-2

COMPARISON OF RELIABILITY LEVELS FOR
NONPOINT POLLUTION MANAGEMENT OPTIONS

ISSUE	NONSTRUCTURAL	STRUCTURAL
Uncertainty about Long-Term Effectiveness	Medium	Higher
Increased NPS Loads Generated for Treatment	Lower	Higher
Maintenance Considerations/ Requirements	Lower	Higher
Toxic Loading	Lower	Higher
Mitigation of NPS Loading Impacts	Higher	Lower - Medium
Safety Factor	Higher	Medium

Note: Structural BMP option assumes that increased densities and impervious surfaces will be permitted.

- Maintenance requirements: Nonstructural controls do not have to be maintained, whereas structural controls require regular maintenance to ensure that pollutant removal rates are maintained at design levels. Due to the greater maintenance requirements and the lack of information on how maintenance affect pollution removal efficiency, there is greater effort and cost associated with maintaining the reliability of structural BMPs.

- Toxic loading potential: Compared to structural BMPs which permit increased levels of imperviousness, nonstructural controls limit impervious cover and therefore have less toxic loading potential.

- Irreversible NPS loading impacts: Nonstructural controls offer more reliability because additional levels of control (e.g., structural BMPs) can be imposed in addition to the nonstructural control if necessary. In contrast, a structural BMP strategy offers little opportunity for cost-effective implementation of additional controls if the original structural approach is found to be inadequate.

- Factor of Safety: Because nonstructural controls offer advantages such as less uncertainty about long-term effectiveness, no maintenance requirements, and control of nonpoint pollution loads at the source, they offer a greater overall factor of safety than structural BMPs.

In summary, from the standpoint of water quality management, nonstructural controls have a number of advantages over structural controls. However, as mentioned above, it must be recognized that water quality management is only one of several factors which must be considered by local jurisdictions in arriving at local land use decisions.

4.2.2 DENSITY RESTRICTIONS

Density restrictions are the most popular type of nonstructural control for watershed management. One of the most notable examples is the previously cited 1982 downzoning of 23,000 acres in Fairfax County (Virginia) from a 1.0 dwelling unit per acre density to a 0.2 dwelling unit per acre density.

Table 4-3 presents surface runoff loadings for various land use categories in the Sarasota Bay NEP study area. The density restrictions were evaluated based on total N values,

TABLE 4-3

AVERAGE ANNUAL SURFACE RUNOFF LOADING FOR VARIOUS LAND USES
WITH AND WITHOUT STRUCTURAL BMPs

Land Use	Average Annual Surface Runoff (lb/acre/yr)							
	Without BMPs				With BMPs			
	Total P	Total N	Lead	Zinc	Total P	Total N	Lead	Zinc
Open/Recreation	0.3	2.0	0.0	0.0	---	---	---	---
Low Density (2-acre lots)	1.1	5.3	0.1	0.2	---	---	---	---
Low Density Single Family Residential (1 du/ac)	1.5	7.2	0.2	0.2	0.8	5.0	0.0	0.1
Medium Density Single Family Residential (4.5 du/ac)	1.9	9.0	0.2	0.3	0.9	6.3	0.1	0.1
High Density Single Family Residential (7.5 du/ac)	1.9	9.6	0.4	0.4	1.0	6.7	0.1	0.2
Multi-family Building (9 du/ac)	2.3	11.2	0.5	0.4	1.1	7.9	0.1	0.2
Mobile Home (9 du/ac)	2.6	12.9	0.6	0.5	1.3	9.0	0.1	0.2
Commercial/Services	1.5	12.1	2.4	1.2	0.8	8.5	0.5	0.6
Institutional	0.9	6.9	1.4	0.7	0.4	4.8	0.3	0.4
Industrial	1.3	10.4	2.1	1.1	0.7	7.3	0.4	0.5

because total N is the limiting nutrient for eutrophication impacts in the Bay. Since virtually all of the future residential land use is classified as "Medium Density Single Family" (allowable densities of 3 to 6 dwelling units per acre), the evaluation used this land use as the baseline case. The table shows annual average loadings of total N (lb/acre/yr) for the medium density single family land use, with and without a structural (wet detention) BMP. As may be seen, the average annual total N loading for the "Low Density Single Family" land use (1.0 acre lots) approaches, but still exceeds, the corresponding loading for medium or high density residential land uses with BMPs. When the lot size was increased to 2.0 acres, however, the average annual loading was less than the corresponding loading for medium or high density residential land uses with structural BMPs.

Based on the total N loading values in Table 4-3, the selected residential lot size for land use controls in the NEP study area is 1 to 2 acres. Because this restriction achieves a level of water quality control similar to the predominant residential land uses (i.e., medium and high density single family residential) with a structural BMP, a more stringent density restriction and/or the imposition of additional structural BMPs should not be necessary. In other words, because the reduced residential density alone reduces annual loadings to a level roughly equivalent to the more common higher densities with BMPs, the reduction of residential density could itself be considered a BMP. However, BMPs are required by Florida regulations, regardless of the residential density. Thus, the restricted densities will also be evaluated with BMPs.

4.2.3 CLUSTERED DEVELOPMENT

An acceptable alternative to 1-acre or 2-acre lot subdivisions is the use of clustered development, where development is concentrated on a small portion of a tract, leaving the remainder as permanent open space. To provide watershed protection benefits, cluster development should be associated with a nonpoint pollution loading target. For example, cluster development can be designed to achieve annual average nonpoint

pollution loading rates that are at least equivalent to the 2-acre zoning scenario without the use of structural BMPs.

For this study, it was assumed that either the "Medium Density Single Family" or "High Density Single Family" land use would represent the minimum lot size allowed in the cluster area. Based on the percent imperviousness assumed for the medium density land use (30%) and for the 2-acre lot land use (10%), a distribution of 30 percent medium density single family land use and 70 percent open space would have approximately the same overall imperviousness as 2-acre lots. Therefore, this distribution will be assumed for cluster development as an alternative to 2-acre lots. Based on the percent imperviousness assumed for the high density land use (40%) and for the 1-acre lot land use (20%), a distribution of 50 percent high density single family land use and 50 percent open space would have approximately the same overall imperviousness as 1-acre lots. Therefore, this distribution will be assumed for cluster development as an alternative to 1-acre lots.

An example of how the cluster development concept could be applied to a hypothetical 100-acre site is described below. A standard 2-acre lot subdivision would result in 50 dwelling units on the 100-acre site. A clustered subdivision which maintains 70 percent (70 acres) of the site in permanent open space and permits 3 dwelling units per acre on the remaining 30 percent (30 acres) of the site would result in 90 dwellings on the 100-acre site. Thus, the number of dwellings is nearly twice as high in the cluster development scenario, even though the percent imperviousness is roughly the same.

Using the values in Table 4-3, it can be shown that the pollutant loadings for the cluster development alternative are lower than for the 2-acre lot alternative. The average annual loadings for the cluster development can be calculated by multiplying the medium density single family loading by 0.3 (30%) and the open space loading by 0.7 (70%), and then adding the products. These results are listed below, along with the corresponding loads for the 2-acre lot scenario.

AVERAGE ANNUAL LOADING (LB/AC/YR)

	CLUSTER	2-ACRE LOTS
Total P	0.8	1.1
Total N	4.1	5.3
Lead	0.07	0.14
Zinc	0.08	0.15

The results show that the average annual loading for the cluster scenario is less than the average annual loading for the 2-acre lot scenario, for both the nutrients and the metals.

A critical requirement of the clustered development approach is that the required onsite open space must be permanently preserved. Development of the open space areas at some point in the future would result in nonpoint pollution loading increases which would violate the performance standard used to design the clustered development approach. Options for permanently restricting development of the open space portion of cluster sites includes deed restrictions, common ownership by the homeowner's association, and dedication of the land to the county or city. If a local government chooses to rely upon the clustered development approach, it is very important that effective provisions which restrict development of the open space areas are implemented.

In addition, a structural BMP (e.g., wet detention basin) serving the developed portion of the clustered site is also typically recommended, and is required in Florida. The purpose of this facility is to provide an additional factor of safety to protect receiving waters from slug loadings of urban runoff.

4.2.4 RESTRICTIONS FOR INDUSTRIAL/COMMERCIAL LAND USES

Stormwater runoff from highly impervious areas such as industrial and commercial sites has a high potential for transport of toxicants. Consequently, restrictions on highly impervious land uses can be an effective means of reducing pollution loadings.

Unlike residential density restrictions, the limitation of impervious area cannot feasibly be reduced to the extent that BMPs will not be required. Instead, a value must be selected that will provide a marginal benefit and can be accommodated within an industrial or commercial development. A previous study (CDM, 1991) recommended a value of 60 percent for industrial and commercial land imperviousness, and this value will be used in the Sarasota Bay NEP study. The value of 60 percent provides some reduction from the values assumed for industrial (70 percent) and commercial (85 percent) development.

4.2.5 BUFFER ZONES

At one time, buffer zones were viewed as the panacea for protecting receiving waters from nonpoint pollution. However, nonpoint pollution monitoring studies over the past 10 to 15 years have demonstrated that maintaining open space along streams and other receiving waters does not provide sufficient water quality protection. This is because urban development discharges stormwater to confined drainageways (e.g., sewers, swales) which tend to bypass most buffer zones. Further, a significant amount of urban nonpoint pollution is in a dissolved form which will not necessarily be removed by sheet flow through open space along receiving waters. Finally, monitoring studies have shown that upland areas can contribute nonpoint pollution loadings which would not be subject to the buffer zones.

Although not a panacea, buffer zones are an important part of an overall water quality protection program. If located in areas receiving sheet flow from adjoining urban development, buffer zones can achieve some reduction in suspended nonpoint pollution

loadings. Further, buffer zones can help protect natural streams by keeping development away from the channel, preventing erosion and reducing sediment buildup downstream.

4.3 AGRICULTURAL BEST MANAGEMENT PRACTICES

A review of the land use and pollution loading estimates for the study area indicate that agricultural loadings are not a major factor when considering the total pollution loading to the Bay. The land use data show that existing agricultural land uses (crop and citrus) comprise less than 5 percent of the total land area draining to the Bay, and account for only 3 to 5 percent of the total N and total P loadings to the Bay. Furthermore, a review of buildout future results shows that agricultural land uses comprise less than 2 percent of the total land area draining to the Bay, and account for 1 percent or less of the total N and total P loadings to the Bay. Thus, improved controls of agricultural runoff pollution would only marginally reduce the total loadings to the Bay, although some localized water quality benefits may occur.

4.4 MANAGEMENT STRATEGIES SELECTED FOR ANALYSIS

Based on the review of structural and nonstructural BMPs presented above, the following alternatives were selected for further consideration:

- Implementation of wet detention basin BMPs.
- Density restrictions for residential areas, with and without structural BMPs.
- Cluster development for residential areas, with and without structural BMPs.
- Imperviousness restrictions for commercial and industrial land uses, with and without BMPs.
- Combinations of alternatives listed above.

The evaluation of combined nonpoint pollution management strategies (discussed in this chapter) and point source management strategies (discussed in Chapter 5) is presented in Chapter 6 of this report.

5

Section Five

5.0 POINT SOURCE MANAGEMENT OPTIONS

The development of point source management options will consider pollution loadings delivered to the Bay that can be attributed to wastewater, whether it is discharged from wastewater treatment facilities or from onsite disposal systems (septic tanks). Because septic tanks are spread throughout much of the study area, they would typically not be considered a point source. However, the potential discontinuation of septic tank service for part or all of the area currently served by septic tanks will necessarily result in larger discharges from wastewater treatment plants. Thus, any analysis of point source alternatives must include septic tanks.

Two point source options are considered in this chapter. One is the continuation of the existing methods of treatment, expanded to include the additional flows generated from new development. The other is the implementation of a regional wastewater plan for Sarasota County, which is presently served by a combination of private wastewater utilities and septic tanks.

5.1 CONTINUATION OF EXISTING METHODS

Tables 3-9 and 3-13 present the projected future wastewater treatment plant flows and concentrations assuming a continuation of existing treatment methods. The increase in wastewater flows from existing to future scenarios is based on either flow projections obtained from the local jurisdictions or comparisons between the number of existing and future dwelling units. In addition, the calculation assumed that all new development would be sewered, rather than serviced by septic tanks, based on current development trends. Though some newly developing areas are served initially by septic tanks, they are typically connected to a central sewer system once the development has progressed sufficiently. Thus, future septic tank loadings were set equal to the existing septic tank loadings.

The estimation of existing and future loadings indicates that point sources and septic tanks are not major contributors of pollution loadings to the Bay. One reason is that very little of the wastewater treatment plant effluent is discharged directly to receiving waters. Instead, effluent is typically discharged via deep well injection, via drainfields and percolation ponds, or used for irrigation. All of these methods provide a substantial point source loading reduction. In addition, the effluent that is discharged directly to receiving waters has been treated to advanced waste treatment (AWT) standards. Septic tank loadings are limited because less than 20 percent of the dwelling units in the study area are served by septic tanks, and because the failure rate for these septic tanks is estimated to be only 8 percent. In addition, as a result of the substantial travel time from septic tanks to the Bay and its tributaries, a relatively small fraction of septic tank effluent loading reaches the Bay.

On the other hand, the treatment of wastewater through septic tanks and a number of small utilities and package plants in Sarasota County poses the same problem as the onsite BMP concept - namely, that the maintenance of the facility is the responsibility of the homeowner or utility owner. Failures of septic tanks, percolation ponds, and drainfields, are likely to cause some localized water quality problems, and may even result in a substantial impact on the Bay. A regional concept of wastewater treatment may result in a more reliable and cost-effective method of pollution control.

5.2 REGIONAL WASTEWATER PLAN

A regional wastewater plan (Dames and Moore, 1990) has been developed to help Sarasota County resolve its water supply and wastewater effluent disposal problems. The plan calls for the consolidation of the existing package plants and utility systems into a centralized wastewater treatment system, which will achieve AWT limits. The effluent would then be discharged into wetlands that are outside of the NEP study area. In addition, the plan provides for the connection of 80 percent of the existing septic tanks to the centralized sewer system. According to the plan schedule, the facets of the plan that

affect loadings in the Sarasota Bay NEP study area will be completed in the twenty-year planning horizon.

The plan described above was used as the basis for the loading evaluation of point source alternatives. The County has modified that specific plan due to various concerns, but still intends to promote regionalization through a slow and steady acquisition program. New plants will be built assuming regional reuse, rather than discharge into wetlands outside of the NEP study area. However, the consolidation of existing package plants, utilities and septic tanks into a centralized system will still be assumed.

6

Section Six

6.0 EVALUATION OF ALTERNATIVE MANAGEMENT STRATEGIES

In this section, the evaluation of the alternatives identified in Sections 4.0 and 5.0 of this report is presented. For each alternative, pollution loadings for the twenty-year future and buildout future land use scenarios are calculated, and are compared to existing loading levels. In addition, conceptual cost estimates are developed based on available data. These costs typically focus on the capital costs and operation and maintenance (O&M) costs associated with structural solutions. Finally, other qualitative factors such as feasibility and potential recreational benefits are considered.

6.1 EVALUATED ALTERNATIVES

Based on the discussions in the previous sections, the following alternatives were selected for evaluation:

1) Wet detention BMPs. The evaluation assumed that all future development would be served by onsite BMPs, with an average drainage area of 20 acres. BMPs already serving existing development are considered in the estimation of existing and future loadings, for all of the evaluated alternatives. Visual inspection of aerial photographs indicates that a relatively small fraction of the existing development (between 10 and 15 percent) is served by BMPs.

   Onsite BMPs were assumed in the analysis, even though regional BMPs offer several advantages over onsite BMPs. These advantages include reduction in capital costs, reduction in maintenance costs, greater reliability, and opportunities to manage existing nonpoint pollution loadings. Thus, the cost for a regional BMP strategy would be lower, and the pollution reduction achieved would be greater, than the correspondings values for the onsite BMP strategy. However, the regional BMP strategy was not specifically considered because the implementability of such a program in the study area is unknown, and the management of existing nonpoint pollution by regional BMPs could not be estimated without a detailed regional BMP siting and preliminary design study.

2) Residential density restrictions. The evaluation assumed that all future residential development would be restricted by a minimum lot size and associated percent imperviousness. Two different lot sizes were considered:

a) 2-acre lots (assumed 10 percent impervious)

b) 1-acre lots (assumed 20 percent impervious)

3) Residential density restrictions with BMPs. The evaluation assumed that all future development will be subject to residential density restrictions, and that the development will also be served by wet detention BMPs to further reduce surface runoff pollution loadings. The two different lot sizes are:

a) 2-acre lots

b) 1-acre lots

4) Cluster development. The evaluation assumed that all future development would use the clustered development concept. The density of the cluster areas and the distribution of developable area between cluster development and maintained open space were established such that the overall percent imperviousness was equivalent to the residential density restrictions listed above. Thus, two different cluster development alternatives were considered:

a) 30% medium density single family residential
70% open space

b) 50% high density single family residential
50% open space

5) Cluster development with BMPs. The evaluation assumed that all future development will use the clustered development concept, and that the cluster areas will be served by wet detention BMPs to further reduce surface runoff pollution loadings. The two different cluster development alternatives were:

a) 30% medium density single family residential
70% open space (3 - 6 du/acre)

b) 50% high density single family residential
50% open space (6 - 9 du/acre)

6) Restricted percent imperviousness for industrial and commercial land uses. The evaluation assumed that these land uses would limit the allowable percent imperviousness to 60 percent, maintaining the rest of the site as open space.

7) Restricted percent imperviousness for industrial and commercial land uses with BMPs. The evaluation assumed a maximum allowable imperviousness of 60 percent, and that the impervious areas will be served by wet detention BMPs.

8) Regional wastewater plan. The evaluation assumed that all wastewater effluent in the Sarasota County segment of the study area (except for the City of Sarasota plant) will be applied to land surfaces within the NEP study area, and that 80 percent of the septic tanks in the study area will be connected to centralized sewer systems.

9) Combinations of alternatives listed above. All appropriate combinations of alternatives were evaluated. The benefit (i.e., pollution loading reduction) achieved by each combination of alternatives was assumed to be equal to the sum of the benefits achieved by each alternative in the combination. For example, if two individual alternatives each provide a pollution reduction of 2,000 pounds per year, then the combination of the two alternatives is expected to provide a pollution reduction of 4,000 pounds per year.

6.2 AVERAGE ANNUAL LOADING RESULTS

Each of the selected alternatives was evaluated by applying a spreadsheet loading model to determine average annual loadings. Wet season, dry season, wet year and dry year analyses were not conducted for each alternative. Instead, the average annual loadings were estimated for each alternative to determine which alternatives were most effective in reducing long-term pollution loadings. The complete set of wet weather and dry weather analyses were then performed only for those alternatives (or combinations of alternatives) that were recommended based on the analysis loadings, costs and other factors.

The evaluations were conducted for both the twenty-year future and the buildout future land use scenarios. The five-year future scenario was not included because most of the land use changes and changes in wastewater treatment methods will not occur within a five-year period. The review of DRIs indicated that only about 3 square miles in the study area will be developed between 1990 and 1995. In addition, the regional wastewater plan will focus only on consolidation of existing wastewater plants in the five-year time frame. Construction of the new wastewater treatment facilities is expected to occur between the years 2000 and 2010. Consequently, the impact of many of the alternatives would not be apparent in the analysis of the five-year future land use scenario.

Tables 6-1 and 6-2 present the results of the analyses for the twenty-year future and buildout future scenarios, respectively. In each table, the average annual loadings of total P, total N, lead and zinc are listed for existing conditions, uncontrolled future conditions, and future conditions assuming the implementation of each alternative. In addition, results are presented for several combinations which appear to provide the best loading reductions. The values in the table reflect the pollution reduction due to existing BMPs, and do not include direct rainfall on the Bay surface.

As shown in Table 6-1, twenty-year future loadings of total P and total N can be controlled to levels below existing loadings, but loadings for lead and zinc cannot with the alternatives analyzed. Alternative 8 (Regional Wastewater Plan) is the most effective control for total P and total N, reducing the twenty-year loading by about 17,440 pounds and 137,170 pounds, respectively. In fact, Alternative 8 alone reduces the twenty-year total N loading to a level below existing loadings. Alternatives or combinations of alternatives which control pollution only via BMPs are not able to reduce the future loadings to existing levels. The combination of Alternative 8 with Alternatives 5a (or 5b) and 7 provide the maximum pollution reduction benefit. However, even these combinations cannot reduce the twenty-year lead or zinc loadings below the existing loading level. For the best combination of alternatives, the increase in loadings (excluding direct rainfall on the Bay surface) is 2 percent for lead and less than 1 percent for zinc.

The values in Table 6-2 indicate that the buildout future loadings of total P and total N can also be controlled to levels below existing loadings, but loadings for lead and zinc cannot. Alternative 5a (Cluster Development with BMPs) is the most effective control for total P, reducing the average annual buildout loading by 32,780 pounds, whereas the most effective control for total N (average annual reduction of 149,760 pounds) is Alternative 8 (Regional Wastewater Plan). However, neither alternative alone can reduce

TABLE 6-1

AVERAGE ANNUAL LOADINGS
FOR TWENTY-YEAR FUTURE LAND USE CONDITIONS
WITH MANAGEMENT ALTERNATIVES

Scenario	Average Annual Load (lb/yr)			
	Total P	Total N	Lead	Zinc
Existing Land Use	184,040	933,750	30,970	31,400
Twenty-Year Future Land Use				
Uncontrolled	201,830	1,032,800	36,970	35,710
(1) Wet Detention BMPs for All New Development	190,050	996,910	32,130	33,410
(2a) Residential Density Restrictions (1 du/ 2 ac)	194,430	995,100	35,560	34,580
(2b) Residential Density Restrictions (1 du/ac)	198,520	1,015,470	36,130	35,100
(3a) Res. Density Restrictions (1 du/2 ac) w/BMPs	187,790	975,990	34,220	33,670
(3b) Res. Density Restrictions (1 du/ac) w/BMPs	191,760	995,980	34,750	34,160
(4a) Cluster development (30% MDSF, 70% Open)	190,790	983,440	35,500	34,000
(4b) Cluster development (50% HDSF, 50 % Open)	194,900	1,002,330	36,450	34,790
(5a) Cluster development (30%/70%) with BMPs	186,890	970,030	33,780	33,110
(5b) Cluster development (50%/50%) with BMPs	188,380	982,440	34,260	33,730
(6) Restricted commercial/industrial imperv.	201,650	1,031,120	36,610	35,520
(7) Restricted comm./ind. imperv. with BMPs	200,890	1,027,500	34,680	34,900
(8) Regional wastewater plan	184,390	895,630	36,810	34,870
Combination of (1) and (8)	172,610	859,740	31,970	32,570
Combination of (3a) and (7)	186,850	970,690	31,930	32,860
Combination of (3b) and (7)	190,820	990,680	32,460	33,350
Combination of (5a) and (7)	185,950	964,730	31,490	32,300
Combination of (5b) and (7)	187,440	977,140	31,970	32,920
Combination of (3a), (7), and (8)	169,410	833,520	31,770	32,020
Combination of (3b), (7), and (8)	173,380	853,510	32,300	32,510
Combination of (5a), (7), and (8)	168,510	827,560	31,330	31,460
Combination of (5b), (7), and (8)	170,000	839,970	31,810	32,080

TABLE 6-2

AVERAGE ANNUAL LOADINGS
FOR BUILDOUT FUTURE LAND USE CONDITION
WITH MANAGEMENT ALTERNATIVES

Scenario	Average Annual Load (lb/yr)			
	Total P	Total N	Lead	Zinc
Existing Land Use	184,040	933,750	30,970	31,400
Buildout Future Land Use				
Uncontrolled	223,230	1,145,730	44,440	41,450
(1) Wet Detention BMPs for All New Development	196,540	1,064,620	33,670	36,220
(2a) Residential Density Restrictions (1 du/ 2 ac)	206,530	1,060,520	41,440	38,930
(2b) Residential Density Restrictions (1 du/ac)	215,730	1,106,810	42,750	40,170
(3a) Res. Density Restrictions (1 du/2 ac) w/BMPs	191,460	1,017,140	38,410	36,840
(3b) Res. Density Restrictions (1 du/ac) w/BMPs	196,180	1,050,270	38,810	37,470
(4a) Cluster development (30% MDSF, 70% Open)	198,030	1,029,590	39,930	37,060
(4b) Cluster development (50% HDSF, 50 % Open)	207,660	1,077,400	43,450	39,470
(5a) Cluster development (30%/70%) with BMPs	189,950	1,006,040	37,640	35,710
(5b) Cluster development (50%/50%) with BMPs	192,990	1,034,790	38,580	36,950
(6) Restricted commercial/industrial imperv.	222,840	1,142,000	43,570	41,040
(7) Restricted comm./ind. imperv. with BMPs	221,090	1,133,710	39,170	39,640
(8) Regional wastewater plan	202,390	995,970	44,220	40,310
Combination of (1) and (8)	175,700	914,860	33,450	35,080
Combination of (3a) and (7)	189,320	1,005,120	33,140	35,030
Combination of (3b) and (7)	194,040	1,038,250	33,540	35,660
Combination of (5a) and (7)	187,810	994,020	32,370	33,900
Combination of (5b) and (7)	190,850	1,022,770	33,310	35,140
Combination of (3a), (7), and (8)	168,480	855,360	32,920	33,890
Combination of (3b), (7), and (8)	173,200	888,490	33,320	34,520
Combination of (5a), (7), and (8)	166,970	844,260	32,150	32,760
Combination of (5b), (7), and (8)	170,010	873,010	33,090	34,000

the buildout nutrient loadings to levels below existing loadings. Like the twenty year results, alternatives or combinations of alternatives which control pollution only via BMPs are not able to reduce the buildout future loadings to existing levels. The combination of Alternative 8 with Alternatives 5a (or 5b) and 7 provide the maximum pollution reduction benefit. However, even these combinations cannot reduce the buildout lead or zinc loadings below the existing loading level. For the best combination of alternatives, the increase in loadings are 7 percent for lead and 8 percent for zinc.

6.3 CONCEPTUAL COSTS FOR MANAGEMENT ALTERNATIVES

Conceptual cost estimates were developed for the management alternatives discussed above. The analysis focused on structural measures, such as wet detention BMPs and the facilities associated with the regional wastewater plan. For the structural measures, both capital costs and operation and maintenance (O&M) costs were considered. Annualized costs were developed assuming an interest rate of 8 percent and a planning period of 30 years. This planning period is consistent with the wastewater master plan, and the data presented in Table 3-7 indicate that the majority of the future development will occur within a thirty-year time frame.

Table 6-3 presents the cost estimates associated with the wastewater master plan (alternative 8). As shown in the table, the capital costs are subdivided into categories which include wastewater collection, transfer, treatment, transmission, reuse facilities, sewer extension to septic tanks and franchise acquisition. Values are listed for all of Sarasota County, and for the part of Sarasota County within the NEP study area, to show the relative contribution from the study area. The O&M costs (not shown in table) were estimated based on values of projected wastewater flows and unit O&M cost values ($/1000 gallons of wastewater) presented in the master plan. Because estimated future regional O&M costs are similar to existing utility O&M costs, these costs will not be included in the analysis, which focuses on additional costs associated with the plan.

TABLE 6-3

COSTS FOR REGIONAL WASTEWATER PLAN

COST CATEGORY	CAPITAL COST (1989 DOLLARS) SARASOTA COUNTY	SARASOTA BAY NEP STUDY AREA
Collection	46,314,000	24,194,000
Transfer	59,878,000	40,662,000
Treatment	119,070,000	76,847,000
Transmission	26,000,000	16,780,000
Reuse	31,566,000	20,372,000
Sewer Extension to Septic Tanks	56,000,000	33,523,000
Franchise Acquisition	50,000,000	33,333,000
TOTAL	388,828,000	245,711,000

For the NEP study area, a total capital cost of about $245 million and an annual O&M cost of $20 million were established for the wastewater master plan. The NEP study area accounts for about 63 percent of the County-wide cost. When these values were annualized, assuming an interest rate of 8 percent and a design period of 30 years, an annual cost of $41.9 million was calculated. It should be noted, however, that existing O&M costs for the existing franchises are roughly the same as that projected for the regional facility. Thus, the cost of implementing this alternative, above and beyond existing annual costs, is $21.9 million per year over the design period.

Capital costs of onsite structural BMPs for various land uses are presented in Table 6-4. For the calculations, an average onsite BMP drainage area of 20 acres was assumed. Included with the table is a list of assumptions regarding the development of the cost estimate. These assumptions include unit costs for excavation, outlet structure construction, wetland creation and land acquisition, as well as design considerations which influence the size of the BMP.

The values in Table 6-4 indicate that annualized costs for an onsite BMP with a 20-acre drainage area are expected to range from $24,300 to $48,800. The capital costs range from $240,000 for medium density single family residential to $510,000 for commercial land use. For the land uses with high imperviousness (> 50%), the capital cost increases as the percent imperviousness increases, because the permanent pool must be larger in order to maintain the desired two-week residence time. For the land uses with relatively low imperviousness, the capital costs are the same, because the size of the permanent pool is dictated by the minimum pool depth required to avoid excessive cattail growth, rather than the two-week permanent pool detention time. Maintenance costs are also expected to be greater for facilities serving land uses with higher imperviousness, because these facilities tend to be larger.

TABLE 6-4

COSTS FOR ONSITE WET DETENTION BMPs

LAND USE	ONSITE BMP CAPITAL COST	ONSITE BMP O&M COST	ANNUALIZED CAPITAL + O&M COST
Medium Density Single Family Residential	$240,000	$3,000	$24,300
High Density Single Family Residential	$240,000	$3,000	$24,300
Institutional	$240,000	$3,000	$24,300
Multifamily Residential	$300,000	$3,000	$29,600
Industrial	$420,000	$3,500	$40,800
Commercial	$510,000	$3,500	$48,800
Industrial/Commercial with Reduced Percent Imperviousness	$360,000	$3,500	$35,500

Assumptions made in developing cost estimates:

1. Drainage area = 20 acres.
2. Average two-week detention time for permanent pool during the wet season.
3. 1.5 inches of storage above permanent pool for extended detention.
4. Total land area = 110% of required treatment area to account for land easements.
5. Wetlands constructed over 35 percent of permanent pool area.
6. Costs:
   a) Dry excavation = $4/cu yd
   b) Wet excavation = $6/cu yd
   c) Outlet structure cost = $5,000 lump sum.
   d) Wetlands creation = $8,000/acre
   e) Land acquisition = $15,000/acre
7. Permanent pool mean depth = 6 ft to avoid excessive cattail growth
8. Engineering, surveying, permits = 15% of 6(a) through 6(d).
9. Contingency = 30% of 6(a) through 6(d).
10. O&M costs based on local data.

Table 6-5 lists the total annualized cost for the buildout future land use scenario for each management alternative that includes BMP deployment. These values were developed by estimating the number of required BMP facilities, and multiplying that number by the facility costs presented in Table 6-4. The number of facilities associated with a given land use was determined by dividing the area of future development by the assumed average drainage area for the BMPs (20 acres). For example, a residential land use that will increase by 200 acres due to future development will require 10 onsite BMPs.

The total annualized costs for the alternatives that include wet detention BMPs range from $5.4 million to $39.7 million. Alternative 1, the implementation of wet detention BMPs on all new development, was the most expensive BMP alternative. Assuming a typical drainage area of 20 acres for onsite BMPs, a total of about 1,500 BMPs would be required to cover more than 30,000 acres of land expected to be developed by the time buildout conditions are reached. The cluster alternatives, which account for BMPs only on the cluster development and not on industrial or commercial development, require fewer BMPs and are therefore less costly. Similarly, the reduced commercial/industrial imperviousness alternative with BMPs provides for BMP coverage only on commercial and industrial development, which explains why the number of facilities and associated costs are much less than alternative 1.

As discussed in Section 4.1.6, the costs for wet detention BMPs would be lower if a regional BMP implementation was implemented. Typically, a regional BMP would serve several developments, and have a drainage area on the order of 100 to 300 acres, in contrast to a typical onsite BMP drainage area of 20 acres. Because the regional BMP may be sited in a location where the existing topography provides substantial storage capacity, the costs of excavation, land acquisition and wetland creation may be lower for the regional BMP in comparison to the multiple onsite BMPs designed to serve the same area. In addition, the costs of project start-up, erosion and sediment control, and outlet structure construction will be lower for one regional facility than for a number of onsite

TABLE 6-5

COSTS FOR ALTERNATIVES WITH BMPs FOR BUILDOUT FUTURE LAND USE CONDITIONS

ALTERNATIVE	NUMBER OF BMP FACILITIES	CAPITAL COST	O&M COST	ANNUALIZED CAPITAL + O&M COST
(1) Wet Detention BMPs	1514	$394,620,000	$4,618,000	$39,660,000
(3a) Res. Density Restrictions with BMPs	1514	$392,880,000	$4,618,000	$39,506,000
(3b) Res. Density Restrictions with BMPs	1514	$392,880,000	$4,618,000	$39,506,000
(5a) Cluster Development with BMPs	408	$97,920,000	$1,224,000	$9,919,000
(5b) Cluster Development with BMPs	824	$197,760,000	$2,472,000	$20,033,000
(7) Restricted Comm./Ind. Imperv. with BMPs	152	$54,720,000	$532,000	$5,391,000

facilities. The regional approach also offers savings in O&M costs due to economies-of-scale.

6.4 OTHER IMPACTS

Previous sections of this report have considered the alternative management strategies from two perspectives: the amount of pollution reduction achieved, and the capital and O&M costs associated with the alternatives. Other considerations in the selection of appropriate management strategies include feasibility, environmental impacts and other potential benefits (e.g., recreational potential, water supply augmentation).

Implementability considers the likelihood that the strategy can be adopted by the jurisdictions. Alternative 1 (onsite wet detention BMPs for new development) is likely to be implemented because existing FDER regulations require such facilities. However, the implementation of regional BMPs may or may not be feasible, depending upon the jurisdictions' interest in the concept, their ability to provide staff and funding to the initiation of the program and funding of the initial facilities, and the attitudes of the local developers. The implementation of residential density restrictions (Alternatives 2 and 3) will depend upon local perspectives on land use controls. This alternative would require the alteration of the jurisdiction's comprehensive plan and zoning, and it is likely to be opposed by developers and other landowners who feel that the restrictions unjustly and unreasonably restrict their rights to use their land as they see fit. In addition, the alternatives without BMPs are not permittable under existing FDER regulations. Similar considerations will affect the implementation of cluster development with and without BMPs (Alternatives 4 and 5), and restricted industrial/commercial imperviousness with and without BMPs (Alternatives 6 and 7). The feasibility of Alternative 8, the regional wastewater plan, may be limited by regulatory agency requirements.

Included among the environmental impacts (other than reductions in pollution loadings) that may be affected by the alternative management strategies are streambank erosion and

wildlife habitat. It was assumed that wet detention BMPs would be designed to include wetland vegetation over 35 percent of the permanent pool surface, which will provide excellent wildlife habitat. In addition, the BMPs may be used for the dual purpose of stormwater management, thus reducing the potential for streambank erosion downstream of the new development. All of the alternatives that reduce the extent of new development (e.g., residential density restrictions, cluster development, restricted commercial/ industrial percent imperviousness) will also reduce the potential for streambank erosion by reducing the quantity of surface runoff during storm events. Furthermore, reduction of impervious area promotes recharge to the groundwater aquifer. For the regional wastewater plan, the reuse of treated wastewater may serve to restore wetlands and to replenish the groundwater aquifer.

Several of the alternatives provide additional benefits. The regional wastewater plan may augment the County's water supply by reducing the amount of potable water used for irrigation. In addition, the cluster development and wet detention BMP alternatives provide some potential for recreational use. Particularly in the case of regional BMPs, the facilities can often be landscaped to offer recreational and aesthetic benefits. Jogging and walking trails, picnic areas, ballfields, and canoeing or boating are some possible uses. In the case of cluster development, permanent open space could be dedicated to the jurisdiction, who could then convert the open space into a recreational area.

6.5 RANKING OF ALTERNATIVES

Using the information presented earlier in this section, a matrix was created to compare and rank the evaluated alternatives. This matrix is presented as Figure 6-1.

Figure 6-1 includes five evaluation categories. These include annualized cost, pollution benefit, feasibility, other environmental benefits, and additional benefits. The first three categories were considered to be the most important, and were each assigned a maximum

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Evaluation Matrix for Alternative Management Strategies

Figure 6-1

ALTERNATIVE	ANNUALIZED COST	POLLUTION REMOVAL BENEFIT		IMPLEMENT-ABILITY	OTHER ENVIRONMENTAL BENEFITS	ADDITIONAL BENEFITS	TOTAL	RANK
		TOTAL N	LEAD					
(1) Wet detention BMPs	10	4	11	21	10	5	61	5
(2a) Residential density restrictions	25	4	3	6	5	0	43	19
(2b) Residential density restrictions	25	2	2	7	5	0	41	20
(3a) Resid. density restrictions with BMPs	10	6	6	11	10	5	48	17
(3b) Resid. density restrictions with BMPs	10	4	6	12	10	5	47	18
(4a) Cluster development	25	5	5	9	5	5	54	10
(4b) Cluster development	25	3	1	11	5	5	50	13
(5a) Cluster development with BMPs	21	6	6	15	10	5	63	3
(5b) Cluster development with BMPs	19	4	5	17	10	5	60	6
(6) Restricted comm./ind. imperviousness	25	0	1	9	5	0	40	21
(7) Restricted comm./ind. imperv. w/BMPs	23	1	5	15	5	0	49	15
(8) Regional wastewater plan	17	6	0	21	10	5	59	9
Combination of (1) and (8)	2	10	11	21	10	5	59	7
Combination of (3a) and (7)	8	6	12	12	8	3	49	14
Combination of (3b) and (7)	8	5	11	13	8	3	48	16
Combination of (5a) and (7)	19	7	12	15	8	3	64	2
Combination of (5b) and (7)	17	5	10	16	8	3	59	8
Combination of (3a), (7) and (8)	0	13	12	15	9	4	53	11
Combination of (3b), (7) and (8)	0	11	11	15	9	4	50	12
Combination of (5a), (7) and (8)	11	13	12	17	9	4	66	1
Combination of (5b), (7) and (8)	9	11	10	18	9	4	61	4
MAXIMUM POSSIBLE POINTS	25	13	12	25	15	10	100	

value of 25 points. The remaining two categories were given maximum values of 15 and 10 points, respectively. Thus, the maximum score that could be achieved by an alternative was 100, with a higher total score considered to be better than a lower score. The rank indicates how the strategies compare to one another, with the highest score receiving a ranking of 1, the second highest score receiving a ranking of 2, and so on. When two alternatives received the same total score, the pollution benefit value was used to assign ranks, such that the alternative with the higher pollution benefit score received the better (i.e., lower number) rank.

For annualized costs, the alternative with the lowest cost was assigned a value of 25, the alternative with the highest cost was assigned a value of 0, and the other alternatives were given a value based on their cost relative to the maximum and minimum costs. As shown in the figure, the residential density restrictions (without BMPs), cluster development (without BMPs) and restricted commercial/industrial imperviousness (without BMPs) alternatives were given the maximum score. This is because there is no structural or land acquisition cost associated with these alternatives. Wet detention BMPs had the highest annualized cost for a single alternative. The combination of alternatives 3 (a or b), 7 and 8 was the most expensive set of alternative, and therefore received a cost score of 0. The values for cluster development with BMPs and for the regional wastewater plan are in the mid-range of values for single alternatives. Again, as discussed in the previous section, the value for the regional treatment plant alternative is based on capital costs only, because future O&M costs are expected to be roughly equivalent to existing O&M costs for the franchises currently in operation.

The evaluation of pollution benefit focused on total N and lead. Total N was chosen because Sarasota Bay and its tributaries are typically nitrogen-limited (i.e., eutrophication impacts are limited by the amount of nitrogen present in the water), which means that total N loadings are more critical than total P loadings. Of the two analyzed metals, lead was chosen over zinc because results indicate that much of the zinc loading to the Bay

can be attributed to rainfall, whereas over 90 percent of the lead loading is attributable to controllable sources such as surface runoff and point source discharges.

For the two pollutants, the alternatives were given a value between 0 and 13 (total N) or 0 and 12 (lead), with the highest value assigned to the alternative that achieves the most benefit (i.e., largest reduction in annual average loading). As shown in the figure, the combination of alternatives 5a, 7, and 8, and the combination of alternatives 3a, 7, and 8 were assigned the highest point totals for both total N and lead. These combinations of alternatives will reduce loadings below existing levels. None of the single alternatives alone were able to reduce total N and lead loadings to the existing levels. For total N, the more effective single alternatives include residential density restrictions with BMPs (Alternative 3a), cluster development with BMPs, (Alternative 5a) and the regional wastewater plan (Alternative 8). The most effective single alternative for lead reduction is wet detention BMPs for all new development. A combination of cluster development with BMPs and reduced commercial/industrial imperviousness with BMPs would also be highly effective for reducing lead loadings.

In contrast to annualized cost and pollution benefit, the assignment of values for implementability was more qualitative. The wet detention BMP alternative was assigned the highest value, because the implementation of BMPs for new development is already required under existing regulations, and programs for BMP plan review and inspection are already in place. The regional wastewater plan also received a relatively high score because it is based on a planning framework already developed by Sarasota County. Alternatives that received low scores for implementability include residential density restrictions without BMPs and cluster development without BMPs. Residential density restrictions and cluster development, especially the more restrictive "(a)" alternatives, may not be popular with developers and landowners. In addition, the alternatives do not include BMPs, which are currently required for new development regardless of the dwelling unit density or percent imperviousness. These regulations would have to be modified before the alternatives without BMPs could be implemented.

Values for the "other environmental benefits" category were assigned based on the alternative's potential for wetland habitat enhancement, minimization of stormwater impacts such as streambank erosion, and groundwater recharge. The alternatives were given five points for each benefit achieved, up to a total of fifteen points. Figure 6-1 shows that none of the alternatives provide benefits in all three categories, and that all of the alternatives provide benefits in at least one category. Options with BMPs were assumed to provide wetland habitat and stormwater management benefits, whereas the options with reduced imperviousness were assumed to provide groundwater recharge benefits.

Other potential benefits such as recreational opportunities and water supply were considered in evaluating the "additional benefits" category. The alternatives with wet detention BMPs and/or permanent open space were given credit for potential recreational benefits. Residential density restrictions alone provided no other potential benefits.

6.6 SELECTED MANAGEMENT STRATEGY

Based on the evaluation matrix, the combination of alternatives 5a, 7, and 8 achieved the highest score, and is therefore selected as the recommended management strategy. This strategy includes cluster development (30 percent medium density residential, 70 percent open space) with BMPs for residential development, reduced imperviousness (60 percent) with BMPs for commercial and industrial development, and a regional wastewater plan for Sarasota County. The combination achieved high scores in all of the benefit categories, a relatively low score for annualized cost, and a moderate score for implementability. A detailed evaluation of the selected strategy, including seasonal, wet year and dry year analyses as well as a discussion of receiving water impacts, is presented in Section 7.0.

7

Section Seven

7.0 DETAILED EVALUATION OF SELECTED MANAGEMENT STRATEGY

Loading results for the selected management strategy (Alternatives 5a, 7, and 8) are presented for various rainfall conditions, including wet season, dry season, wet year, dry year and average annual conditions. Loading reductions achieved by the management strategy are presented by source, by jurisdiction and by individual watersheds. The evaluation also considers the discharge location of each watershed in presenting the spatial distribution of loadings to the Bay. Model results with and without the management strategy are compared in order to assess how the loadings will increase or decrease in the future at various Bay locations. Additional management strategies (such as BMP retrofitting of existing development) that may be implemented to further reduce pollution loadings also are discussed.

7.1 LOADING RESULTS FOR VARIOUS RAINFALL SCENARIOS

7.1.1 TWENTY-YEAR FUTURE

Tables 7-1 and 7-2 show the loading results for the twenty-year future land use analysis with the selected management strategy. The results are presented by source in Table 7-1 and by jurisdiction in Table 7-2. In both tables, results are presented for the average annual, wet season, dry season, wet year and dry year conditions.

A comparison of Table 7-1 and Table 2-2 (existing land use conditions) reveals a decrease in overall total P and total N loadings, and an increase in lead and zinc loadings. A reduction in nutrient loadings is projected for baseflow, point sources and septic tanks. The point source and septic tank loading reductions can be attributed to the regional wastewater management plan, and the reduction in baseflow loadings reflects the decrease in baseflow quantity as a result of future development in the study area. With the management strategy, future point sources of lead and zinc are also lower than existing point source loadings. Future surface runoff loadings exceed existing loadings for all of

TABLE 7-1

LOADING BY SOURCE FOR 20-YEAR FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

Scenario/ Source	Total P (lb)	% of Total	Total N (lb)	% of Total	Lead (lb)	% of Total	Zinc (lb)	% of Total
AVERAGE ANNUAL								
Surface Runoff	109,300	47.5%	599,150	51.4%	30,710	90.9%	24,280	26.5%
Baseflow	32,920	14.3%	109,800	9.4%	290	0.9%	5,480	6.0%
Septic Tanks	1,680	0.7%	25,240	2.2%	0	0.0%	0	0.0%
Point Source	24,610	10.7%	93,370	8.0%	330	1.0%	1,700	1.9%
Rainfall	61,730	26.8%	337,460	29.0%	2,470	7.3%	60,080	65.6%
TOTAL	230,240	100.0%	1,165,020	100.0%	33,800	100.0%	91,540	100.0%
WET SEASON								
Surface Runoff	67,440	48.3%	370,260	52.5%	19,060	91.2%	15,040	26.5%
Baseflow	24,160	17.3%	80,500	11.4%	200	1.0%	4,030	7.1%
Septic Tanks	850	0.6%	12,590	1.8%	0	0.0%	0	0.0%
Point Source	9,040	6.5%	33,650	4.8%	130	0.6%	640	1.1%
Rainfall	38,100	27.3%	208,290	29.5%	1,520	7.3%	37,090	65.3%
TOTAL	139,590	100.0%	705,290	100.0%	20,910	100.0%	56,800	100.0%
DRY SEASON								
Surface Runoff	41,740	46.1%	229,560	49.9%	11,790	90.8%	9,300	26.7%
Baseflow	8,770	9.7%	29,320	6.4%	40	0.3%	1,480	4.3%
Septic Tanks	860	0.9%	12,670	2.8%	0	0.0%	0	0.0%
Point Source	15,570	17.2%	59,720	13.0%	210	1.6%	1,040	3.0%
Rainfall	23,630	26.1%	129,170	28.1%	950	7.3%	23,000	66.1%
TOTAL	90,570	100.0%	460,440	100.0%	12,990	100.0%	34,820	100.0%
WET YEAR								
Surface Runoff	139,690	45.5%	765,660	50.3%	39,410	90.6%	31,120	26.0%
Baseflow	62,030	20.2%	206,790	13.6%	620	1.4%	10,320	8.6%
Septic Tanks	1,680	0.5%	25,240	1.7%	0	0.0%	0	0.0%
Point Source	24,610	8.0%	93,370	6.1%	330	0.8%	1,700	1.4%
Rainfall	78,800	25.7%	430,790	28.3%	3,150	7.2%	76,700	64.0%
TOTAL	306,810	100.0%	1,521,850	100.0%	43,510	100.0%	119,840	100.0%
DRY YEAR								
Surface Runoff	83,600	51.1%	458,180	53.5%	23,600	91.3%	18,620	27.6%
Baseflow	6,690	4.1%	22,340	2.6%	40	0.2%	1,140	1.7%
Septic Tanks	1,680	1.0%	25,240	2.9%	0	0.0%	0	0.0%
Point Source	24,610	15.0%	93,370	10.9%	330	1.3%	1,700	2.5%
Rainfall	47,150	28.8%	257,730	30.1%	1,890	7.3%	45,890	68.1%
TOTAL	163,730	100.0%	856,860	100.0%	25,860	100.0%	67,350	100.0%

TABLE 7-2

LOADING BY JURISDICTION FOR 20-YEAR LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

Scenario/ Jurisdiction	Total P (lb)	% of Total	Total N (lb)	% of Total	Lead (lb)	% of Total	Zinc (lb)	% of Total
AVERAGE ANNUAL								
Sarasota Co.	87,850	38.2%	439,650	37.7%	12,440	36.8%	15,590	17.0%
Sarasota City	20,440	8.9%	93,970	8.1%	5,770	17.1%	4,630	5.1%
Manatee Co.	43,420	18.9%	224,780	19.3%	11,270	33.3%	8,860	9.7%
Islands	16,800	7.3%	69,160	5.9%	1,850	5.5%	2,380	2.6%
Bay Surface	61,730	26.8%	337,460	29.0%	2,470	7.3%	60,080	65.6%
TOTAL	230,240	100.0%	1,165,020	100.0%	33,800	100.0%	91,540	100.0%
WET SEASON								
Sarasota Co.	56,140	40.2%	275,870	39.1%	7,720	36.9%	10,010	17.6%
Sarasota City	11,980	8.6%	56,360	8.0%	3,630	17.4%	2,850	5.0%
Manatee Co.	24,720	17.7%	127,220	18.0%	6,940	33.2%	5,550	9.8%
Islands	8,650	6.2%	37,550	5.3%	1,100	5.3%	1,300	2.3%
Bay Surface	38,100	27.3%	208,290	29.5%	1,520	7.3%	37,090	65.3%
TOTAL	139,590	100.0%	705,290	100.0%	20,910	100.0%	56,800	100.0%
DRY SEASON								
Sarasota Co.	31,550	34.8%	163,790	35.6%	4,720	36.3%	5,560	16.0%
Sarasota City	8,590	9.5%	38,280	8.3%	2,270	17.5%	1,870	5.4%
Manatee Co.	18,660	20.6%	97,580	21.2%	4,300	33.1%	3,320	9.5%
Islands	8,140	9.0%	31,620	6.9%	750	5.8%	1,070	3.1%
Bay Surface	23,630	26.1%	129,170	28.1%	950	7.3%	23,000	66.1%
TOTAL	90,570	100.0%	460,440	100.0%	12,990	100.0%	34,820	100.0%
WET YEAR								
Sarasota Co.	125,130	40.8%	599,470	39.4%	16,020	36.8%	22,210	18.5%
Sarasota City	25,820	8.4%	119,810	7.9%	7,550	17.4%	6,050	5.0%
Manatee Co.	56,300	18.4%	285,360	18.8%	14,430	33.2%	11,860	9.9%
Islands	20,760	6.8%	86,420	5.7%	2,360	5.4%	3,020	2.5%
Bay Surface	78,800	25.7%	430,790	28.3%	3,150	7.2%	76,700	64.0%
TOTAL	306,810	100.0%	1,521,850	100.0%	43,510	100.0%	119,840	100.0%
DRY YEAR								
Sarasota Co.	54,970	33.6%	299,770	35.0%	9,380	36.3%	9,820	14.6%
Sarasota City	16,120	9.8%	72,970	8.5%	4,550	17.6%	3,530	5.2%
Manatee Co.	32,140	19.6%	172,180	20.1%	8,590	33.2%	6,320	9.4%
Islands	13,350	8.2%	54,210	6.3%	1,450	5.6%	1,790	2.7%
Bay Surface	47,150	28.8%	257,730	30.1%	1,890	7.3%	45,890	68.1%
TOTAL	163,730	100.0%	856,860	100.0%	25,860	100.0%	67,350	100.0%

the constituents, even though BMPs are implemented on all new development. The BMP efficiencies are not sufficient to reduce constituent loadings to pre-development levels.

Table 7-2 lists by jurisdiction the twenty-year future loadings with the selected management strategy. A comparison to the results for the existing land use condition (see Table 2-3) shows an increase in loadings for Manatee County and the Barrier Islands, and a decrease in loadings for the City of Sarasota and Sarasota County. The load to the Bay surface due to rainfall was not expected to change. In Sarasota County, the pollution reduction due to the regional wastewater plan and due to BMP implementation on new development exceeds the loading increase due to the new development. Transition from surface water discharge to reuse for the City of Sarasota wastewater treatment plant is the reason for reduced loadings from the City. In Manatee County and the Barrier Islands, increased wastewater flows and surface runoff loadings account for the loading increases.

The wet season and dry season results show the same trends that were identified in the Phase I analysis for existing land use conditions. About 60 percent of the annual loading occurs during the wet season, and 40 percent occurs during the dry season for both nutrients and metals. Surface runoff and rainfall on the Bay surface are the major loading sources for all of the pollutants. Surface runoff tends to provide a larger percentage of loading during the wet season than during the dry season, whereas point sources and septic tanks provide a larger percentage of the total loading during the dry season than during the wet season. However, the total contribution due to point sources and septic tanks is less than contributions due to surface runoff or rainfall. The distribution of loadings by jurisdiction for the wet and the dry seasons are only slightly different than the distributions for the average annual loadings.

Wet year and dry year results also show the same trends as for existing land use conditions. Results indicate that the loadings for all pollutants will be 29 to 33 percent higher during the wet year, and 26 to 29 percent lower during the dry year. The wet year and dry year distributions by source are similar to the distribution for the average rainfall

year. Similarly, the wet year and dry year distributions by jurisdictions are virtually the same as for the average rainfall year.

7.1.2 BUILDOUT FUTURE

Tables 7-3 and 7-4 show the loading results for the buildout future land use analysis with the selected management strategy. The results are presented by source in Table 7-3 and by jurisdiction in Table 7-4. In both tables, results are presented for the average annual, wet season, dry season, wet year and dry year conditions.

The results for the buildout future scenario with the selected management alternatives tend to follow the same trends as the twenty-year future scenario with the alternatives. A comparison of existing loadings and buildout future loadings with the alternatives reveals a decrease in overall total P and total N loadings, and an increase in lead and zinc loadings. Again, reduction in nutrient loadings is projected for baseflow, point sources and septic tanks. Future point source and baseflow loadings of lead and zinc are also lower than existing loadings. Surface runoff loadings exceed existing loadings for all of the constituents, even though BMPs are implemented on all new development. With respect to existing loadings, the results show an increase in loadings for Manatee County and the Barrier Islands, and a decrease in loadings for the City of Sarasota and Sarasota County. In addition, the loadings distributions by source and by jurisdiction for the wet season, dry season, wet year and dry year conditions do not vary significantly from the distributions for the average annual rainfall condition.

7.2 SPATIAL DISTRIBUTION OF LOADINGS TO SARASOTA BAY

Figure 7-1 shows the segmentation of the Bay that was established by the Sarasota Bay NEP office. The same segmentation scheme was used to present the spatial distribution of loadings to Sarasota Bay. Each watershed in the study area was assigned to one of the Bay segments, depending on the location of the watershed outlet. In some cases, such as

TABLE 7-3

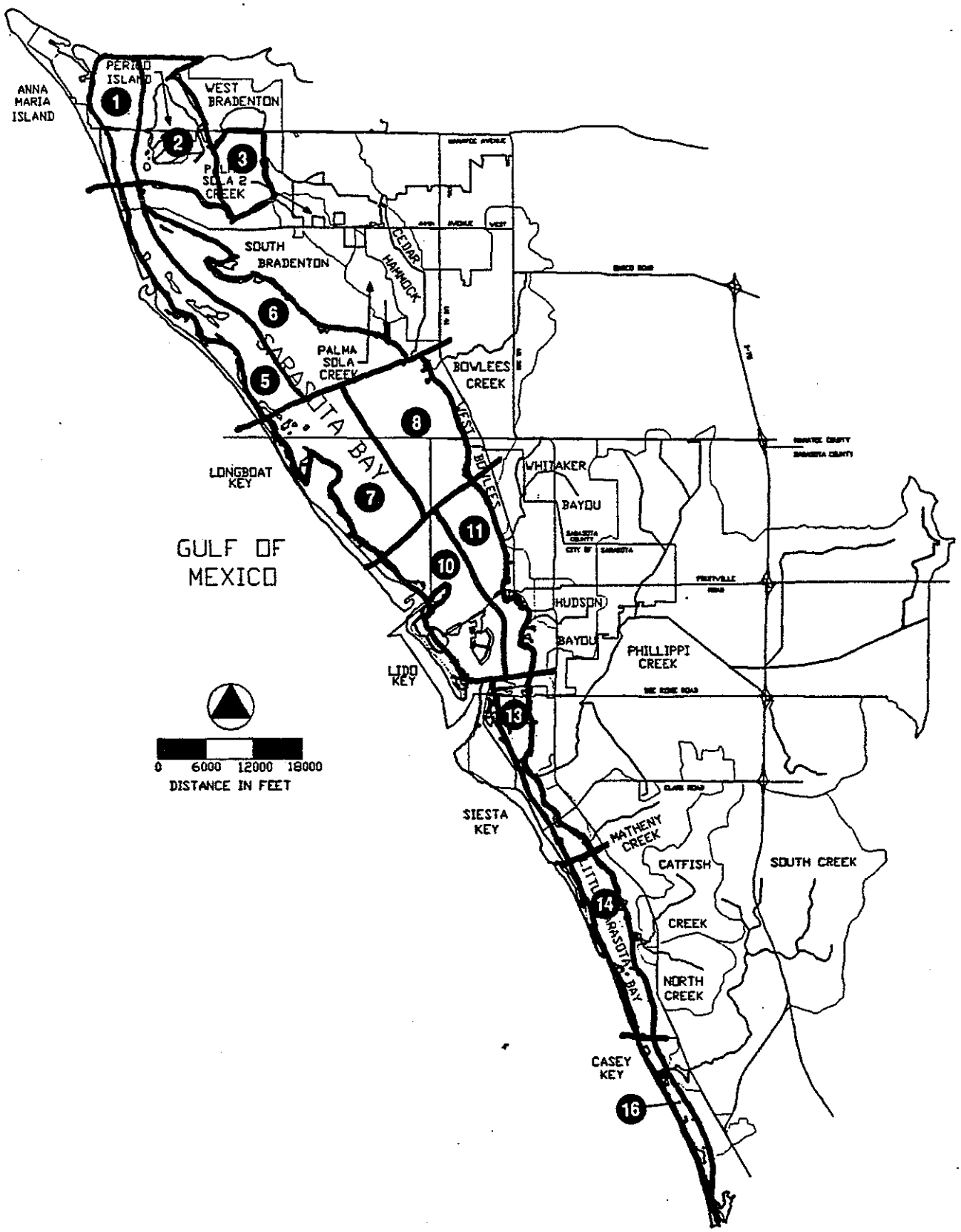
LOADING BY SOURCE FOR BUILDOUT FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

Scenario/ Source	Total P (lb)	% of Total	Total N (lb)	% of Total	Lead (lb)	% of Total	Zinc (lb)	% of Total
AVERAGE ANNUAL								
Surface Runoff	107,960	47.2%	615,660	52.1%	31,540	91.1%	25,710	27.7%
Baseflow	31,840	13.9%	106,140	9.0%	280	0.8%	5,310	5.7%
Septic Tanks	1,680	0.7%	25,240	2.1%	0	0.0%	0	0.0%
Point Source	25,490	11.1%	97,220	8.2%	330	1.0%	1,740	1.9%
Rainfall	61,730	27.0%	337,460	28.6%	2,470	7.1%	60,080	64.7%
TOTAL	228,700	100.0%	1,181,720	100.0%	34,620	100.0%	92,840	100.0%
WET SEASON								
Surface Runoff	66,630	47.9%	380,500	53.1%	19,570	91.3%	15,940	27.6%
Baseflow	23,360	16.8%	77,810	10.9%	200	0.9%	3,900	6.8%
Septic Tanks	850	0.6%	12,590	1.8%	0	0.0%	0	0.0%
Point Source	10,030	7.2%	37,010	5.2%	150	0.7%	720	1.2%
Rainfall	38,100	27.4%	208,290	29.1%	1,520	7.1%	37,090	64.3%
TOTAL	138,970	100.0%	716,200	100.0%	21,440	100.0%	57,650	100.0%
DRY SEASON								
Surface Runoff	41,330	46.0%	235,920	50.6%	12,090	91.1%	9,860	27.9%
Baseflow	8,500	9.5%	28,310	6.1%	40	0.3%	1,430	4.1%
Septic Tanks	860	1.0%	12,670	2.7%	0	0.0%	0	0.0%
Point Source	15,470	17.2%	60,220	12.9%	190	1.4%	1,010	2.9%
Rainfall	23,630	26.3%	129,170	27.7%	950	7.2%	23,000	65.2%
TOTAL	89,790	100.0%	466,290	100.0%	13,270	100.0%	35,300	100.0%
WET YEAR								
Surface Runoff	138,030	45.4%	786,810	51.1%	40,500	90.9%	32,980	27.2%
Baseflow	59,930	19.7%	199,880	13.0%	570	1.3%	9,990	8.2%
Septic Tanks	1,680	0.6%	25,240	1.6%	0	0.0%	0	0.0%
Point Source	25,490	8.4%	97,220	6.3%	330	0.7%	1,740	1.4%
Rainfall	78,800	25.9%	430,790	28.0%	3,150	7.1%	76,700	63.2%
TOTAL	303,930	100.0%	1,539,940	100.0%	44,550	100.0%	121,410	100.0%
DRY YEAR								
Surface Runoff	82,590	50.5%	470,810	54.0%	24,260	91.5%	19,700	28.8%
Baseflow	6,490	4.0%	21,600	2.5%	30	0.1%	1,090	1.6%
Septic Tanks	1,680	1.0%	25,240	2.9%	0	0.0%	0	0.0%
Point Source	25,490	15.6%	97,220	11.1%	330	1.2%	1,740	2.5%
Rainfall	47,150	28.9%	257,730	29.5%	1,890	7.1%	45,890	67.1%
TOTAL	163,400	100.0%	872,600	100.0%	26,510	100.0%	68,420	100.0%

TABLE 7-4

LOADING BY JURISDICTION FOR BUILDOUT FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

Scenario/ Jurisdiction	Total P (lb)	% of Total	Total N (lb)	% of Total	Lead (lb)	% of Total	Zinc (lb)	% of Total
AVERAGE ANNUAL								
Sarasota Co.	87,050	38.1%	453,370	38.4%	13,100	37.8%	16,620	17.9%
Sarasota City	20,440	8.9%	93,970	8.0%	5,770	16.7%	4,630	5.0%
Manatee Co.	42,800	18.7%	227,660	19.3%	11,420	33.0%	9,120	9.8%
Islands	16,680	7.3%	69,260	5.9%	1,860	5.4%	2,390	2.6%
Bay Surface	61,730	27.0%	337,460	28.6%	2,470	7.1%	60,080	64.7%
TOTAL	228,700	100.0%	1,181,720	100.0%	34,620	100.0%	92,840	100.0%
WET SEASON								
Sarasota Co.	56,200	40.4%	285,870	39.9%	8,150	38.0%	10,680	18.5%
Sarasota City	11,980	8.6%	56,360	7.9%	3,630	16.9%	2,850	4.9%
Manatee Co.	24,130	17.4%	128,070	17.9%	7,040	32.8%	5,710	9.9%
Islands	8,560	6.2%	37,610	5.3%	1,100	5.1%	1,320	2.3%
Bay Surface	38,100	27.4%	208,290	29.1%	1,520	7.1%	37,090	64.3%
TOTAL	138,970	100.0%	716,200	100.0%	21,440	100.0%	57,650	100.0%
DRY SEASON								
Sarasota Co.	30,800	34.3%	167,610	35.9%	4,950	37.3%	5,910	16.7%
Sarasota City	8,590	9.6%	38,280	8.2%	2,270	17.1%	1,870	5.3%
Manatee Co.	18,670	20.8%	99,590	21.4%	4,350	32.8%	3,440	9.7%
Islands	8,100	9.0%	31,640	6.8%	750	5.7%	1,080	3.1%
Bay Surface	23,630	26.3%	129,170	27.7%	950	7.2%	23,000	65.2%
TOTAL	89,790	100.0%	466,290	100.0%	13,270	100.0%	35,300	100.0%
WET YEAR								
Sarasota Co.	123,510	40.6%	615,040	39.9%	16,850	37.8%	23,430	19.3%
Sarasota City	25,820	8.5%	119,810	7.8%	7,550	16.9%	6,050	5.0%
Manatee Co.	55,210	18.2%	287,820	18.7%	14,630	32.8%	12,170	10.0%
Islands	20,590	6.8%	86,480	5.6%	2,370	5.3%	3,060	2.5%
Bay Surface	78,800	25.9%	430,790	28.0%	3,150	7.1%	76,700	63.2%
TOTAL	303,930	100.0%	1,539,940	100.0%	44,550	100.0%	121,410	100.0%
DRY YEAR								
Sarasota Co.	54,980	33.6%	312,080	35.8%	9,910	37.4%	10,670	15.6%
Sarasota City	16,120	9.9%	72,970	8.4%	4,550	17.2%	3,530	5.2%
Manatee Co.	31,870	19.5%	175,490	20.1%	8,700	32.8%	6,520	9.5%
Islands	13,280	8.1%	54,330	6.2%	1,460	5.5%	1,810	2.6%
Bay Surface	47,150	28.9%	257,730	29.5%	1,890	7.1%	45,890	67.1%
TOTAL	163,400	100.0%	872,600	100.0%	26,510	100.0%	68,420	100.0%



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Segmentation of Sarasota Bay for Water Quality Analysis

Figure 7-1

Longboat Key, the watershed discharges into more than one segment. The loadings for these watersheds were typically split between segments according to the relative amount of area contributing to each segment.

Table 7-5 presents the watershed(s), total drainage area, Bay surface area and Florida Trophic State Index (TSI) value associated with each of the segments. The TSI ratings were developed by the Florida Department of Environmental Regulation based on STORET data from 1980 to 1989 (FDER, 1990). The TSI ratings are best viewed in a relative sense, because of the limitations associated with the TSI methodology. There is some question about the validity of applying a lake eutrophication index to an estuary such as Sarasota Bay. In addition, ongoing NEP monitoring programs have shown that the TSI rating is insensitive to parameters such as dissolved oxygen. Finally, the ratings do not account for the impacts due to toxics such as metals.

The table shows that the drainage area contributing to Segment 13 is over 44 percent of the land area draining to the Bay (96,132 acres), whereas the surface area of Segment 13 is only about 4 percent of the total Bay surface area (33,280 acres). Consequently, one would expect that Segment 13 is receiving a disproportionately large percentage of the pollution loading to the Bay, and that water quality in this segment would be worse than in other Bay segments. In contrast, relatively good water quality would be expected in large Bay segments with relatively small drainage areas. As shown in the table, the TSI values are consistent with the expectations described above. The segments with a relatively moderate to high ratio of drainage area to surface area typically have "Fair" ratings, whereas the segments with a relatively low ratio of drainage area to surface area typically have "Good" ratings.

The average annual land-based loadings for existing and for twenty-year future land use conditions (with and without the selected management strategy) are listed by segment in Table 7-6. The loading totals include surface runoff, baseflow, point sources and septic

TABLE 7-5
SUMMARY OF BAY SEGMENT DRAINAGE AREAS, SURFACE AREAS
AND FLORIDA TSI CLASSIFICATIONS

Segment Number	Watershed(s)	Total Drainage Area (ac.)	Bay Surface Area (ac.)	Florida Trophic State Index
1	Anna Maria Island	919	1,934	Good
2	Perico Island, West Bradenton	5,255	2,156	Fair
3	Palma Sola 2	1,120	1,382	Fair
5	Longboat Key (40%)	679	3,400	Good
6	Palma Sola Creek, South Bradenton	5,535	4,948	Fair
7	Longboat Key (40%)	679	4,368	Good
8	Cedar Hammock, Bowlees Creek, West Bowlees	9,978	4,423	Fair
10	Longboat Key (20%), Other Islands (50%)	789	3,980	Good
11	Hudson Bayou, Whitaker Bayou, Direct to Bay	7,793	2,294	Fair
13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	42,805	1,438	Fair
14	Catfish Creek, North Creek, Direct to Bay	6,410	1,880	Fair
16	Other Islands (50%), South Creek, Direct to Bay	14,170	1,077	Fair
TOTAL		96,132	33,280	

TABLE 7-6

AVERAGE ANNUAL DIRECT DISCHARGES BY BAY SEGMENT
FOR EXISTING AND 20-YEAR FUTURE LAND USE CONDITIONS
WITH AND WITHOUT SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

Segment Number	Watershed(s)	Total Drainage Area (acres)	Average Annual Loadings (lb/yr)			
			Total P	Total N	Lead	Zinc
	EXISTING					
1	Anna Maria Island	919	1,740	8,660	450	360
2	Perico Island, West Bradenton	5,255	8,290	40,660	1,540	1,510
3	Palma Sola 2	1,120	1,640	8,340	350	320
5	Longboat Key (40%)	679	1,092	5,200	176	180
6	Palma Sola Creek, South Bradenton	5,535	14,260	63,750	820	1,340
7	Longboat Key (40%)	679	1,092	5,200	176	180
8	Cedar Hammock, Bowlees Creek, West Bowlees	9,978	18,180	99,950	8,960	5,830
10	Longboat Key (20%), Other Islands (50%)	789	1,366	6,780	243	235
11	Hudson Bayou, Whitaker Bayou, Direct to Bay	7,793	25,590	118,600	6,120	5,260
13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	42,805	89,440	468,530	10,700	13,130
14	Catfish Creek, North Creek, Direct to Bay	6,410	8,100	43,720	840	1,270
16	Other Islands (50%), South Creek, Direct to Bay	14,170	13,250	64,360	595	1,785
	Total	96,132	184,040	933,750	30,970	31,400
	20-YEAR					
1	Anna Maria Island	919	1,890	9,400	500	390
2	Perico Island, West Bradenton	5,255	8,750	43,210	1,720	1,650
3	Palma Sola 2	1,120	2,020	10,290	490	420
5	Longboat Key (40%)	679	1,292	6,120	212	212
6	Palma Sola Creek, South Bradenton	5,535	20,390	97,960	1,700	2,090
7	Longboat Key (40%)	679	1,292	6,120	212	212
8	Cedar Hammock, Bowlees Creek, West Bowlees	9,978	18,770	103,920	9,590	6,170
10	Longboat Key (20%), Other Islands (50%)	789	1,551	7,615	271	266
11	Hudson Bayou, Whitaker Bayou, Direct to Bay	7,793	21,480	105,330	6,140	4,920
13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	42,805	98,540	513,290	13,670	15,440
14	Catfish Creek, North Creek, Direct to Bay	6,410	10,260	54,250	1,460	1,740
16	Other Islands (50%), South Creek, Direct to Bay	14,170	15,595	75,295	1,005	2,200
	Total	96,132	201,830	1,032,800	36,970	35,710
	20-YEAR WITH SELECTED MANAGEMENT STRATEGY					
1	Anna Maria Island	919	1,760	8,780	450	360
2	Perico Island, West Bradenton	5,255	8,160	40,800	1,560	1,540
3	Palma Sola 2	1,120	1,680	8,700	360	340
5	Longboat Key (40%)	679	1,112	5,364	176	184
6	Palma Sola Creek, South Bradenton	5,535	17,810	86,510	910	1,550
7	Longboat Key (40%)	679	1,112	5,364	176	184
8	Cedar Hammock, Bowlees Creek, West Bowlees	9,978	18,110	100,930	9,000	5,910
10	Longboat Key (20%), Other Islands (50%)	789	1,386	6,927	243	242
11	Hudson Bayou, Whitaker Bayou, Direct to Bay	7,793	20,720	96,740	6,000	4,840
13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	42,805	74,950	361,490	10,910	13,030
14	Catfish Creek, North Creek, Direct to Bay	6,410	8,010	39,870	900	1,390
16	Other Islands (50%), South Creek, Direct to Bay	14,170	13,700	66,085	645	1,890
	Total	96,132	168,510	827,560	31,330	31,460

tanks, but do not include rainfall loadings which are assumed to be uncontrollable. As shown in the table, segments 8, 11 and 13 receive the largest loadings of all four pollutants evaluated. These three segments comprise only 23 percent of the total Bay surface area, but account for 63 percent of the total drainage area. About 72 percent of the total P, 74 percent of the total N, 83 percent of the lead and 77 percent of the zinc loading for existing land use conditions is discharged to the three segments.

For the twenty-year future land use scenarios, Bay segments 8, 11 and 13 still receive the majority of the loadings, and segments 14 and 16 exhibit substantial increases in loadings for the future scenario without management controls. These increases range from 24 percent (total N) to 74 percent (lead) for segment 14, and from 17 percent (total N) to 69 percent (lead) for segment 16, when comparing existing and twenty year future loadings. However, the table shows a substantial reduction in the loadings to segments 8, 11 and 13 as a result of the selected management strategy. In fact, the loadings of total P, total N and zinc to segment 13, and the loadings of all four constituents to segment 11, are less than the existing loadings to those segment. Twenty-year future increases in loadings to segment 8 are generally limited to 1 percent or less. Thus, it appears that the selected management strategy will improve water quality or at least minimize further degradation in the segments that currently receive the largest pollution loadings.

The average annual land-based loadings for existing and for buildout future land use conditions (with and without the selected management strategy) are listed by segment in Table 7-7. Segments 8, 11 and 13 generally receive the largest pollution loadings for the uncontrolled future scenario, although segments 6 and 16 have nutrient loadings that approach or exceed the loads to the other three segments. Segments 6, 14 and 16 exhibit substantial increases in loadings for the future scenario without management controls. These increases range from 53 percent (total P) to 191 percent (lead) for segment 6, from 59 percent (total N) to 180 percent (lead) for segment 14, and from 41 percent (total N) to 169 percent (lead) for segment 16, when comparing existing and buildout future loadings.

TABLE 7-7

AVERAGE ANNUAL DIRECT DISCHARGES BY BAY SEGMENT
FOR EXISTING AND BUILDOUT FUTURE LAND USE CONDITIONS
WITH AND WITHOUT SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

Segment Number	Watershed(s)	Total Drainage Area (acres)	Average Annual Loadings (lb/yr)			
			Total P	Total N	Lead	Zinc
	EXISTING					
1	Anna Maria Island	919	1,740	8,660	450	360
2	Perico Island, West Bradenton	5,255	8,290	40,660	1,540	1,510
3	Palma Sola 2	1,120	1,640	8,340	350	320
5	Longboat Key (40%)	679	1,092	5,200	176	180
6	Palma Sola Creek, South Bradenton	5,535	14,260	63,750	820	1,340
7	Longboat Key (40%)	679	1,092	5,200	176	180
8	Cedar Hammock, Bowlees Creek, West Bowlees	9,978	18,180	99,950	8,960	5,830
10	Longboat Key (20%), Other Islands (50%)	789	1,366	6,780	243	235
11	Hudson Bayou, Whitaker Bayou, Direct to Bay	7,793	25,590	118,600	6,120	5,260
13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	42,805	89,440	468,530	10,700	13,130
14	Catfish Creek, North Creek, Direct to Bay	6,410	8,100	43,720	840	1,270
16	Other Islands (50%), South Creek, Direct to Bay	14,170	13,250	64,360	595	1,785
	Total	96,132	184,040	933,750	30,970	31,400
	BUILDOUT					
1	Anna Maria Island	919	1,890	9,400	500	390
2	Perico Island, West Bradenton	5,255	9,470	47,310	1,960	1,860
3	Palma Sola 2	1,120	2,340	11,880	610	510
5	Longboat Key (40%)	679	1,380	6,548	228	232
6	Palma Sola Creek, South Bradenton	5,535	21,820	108,160	2,390	2,630
7	Longboat Key (40%)	679	1,380	6,548	228	232
8	Cedar Hammock, Bowlees Creek, West Bowlees	9,978	19,250	107,150	10,090	6,440
10	Longboat Key (20%), Other Islands (50%)	789	1,595	7,829	279	276
11	Hudson Bayou, Whitaker Bayou, Direct to Bay	7,793	21,870	107,370	6,300	5,040
13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	42,805	109,950	573,200	17,890	18,590
14	Catfish Creek, North Creek, Direct to Bay	6,410	13,360	69,340	2,360	2,450
16	Other Islands (50%), South Creek, Direct to Bay	14,170	18,925	90,995	1,605	2,800
	Total	96,132	223,230	1,145,730	44,440	41,450
	BUILDOUT WITH SELECTED MANAGEMENT STRATEGY					
1	Anna Maria Island	919	1,760	8,780	450	360
2	Perico Island, West Bradenton	5,255	8,000	41,400	1,590	1,600
3	Palma Sola 2	1,120	1,720	8,960	370	360
5	Longboat Key (40%)	679	1,124	5,448	176	184
6	Palma Sola Creek, South Bradenton	5,535	17,170	87,430	950	1,640
7	Longboat Key (40%)	679	1,124	5,448	176	184
8	Cedar Hammock, Bowlees Creek, West Bowlees	9,978	18,090	101,730	9,070	6,000
10	Longboat Key (20%), Other Islands (50%)	789	1,392	6,969	243	242
11	Hudson Bayou, Whitaker Bayou, Direct to Bay	7,793	20,750	97,150	6,010	4,870
13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	42,805	73,460	368,650	11,450	13,800
14	Catfish Creek, North Creek, Direct to Bay	6,410	8,320	43,050	1,000	1,540
16	Other Islands (50%), South Creek, Direct to Bay	14,170	14,060	69,245	665	1,980
	Total	96,132	166,970	844,260	32,150	32,760

However, the table shows a substantial reduction in the loadings to segments 8, 11 and 13 as a result of the selected management measures. In fact, the loadings of total P and total N to segment 13, and the loadings of all four constituents to segment 11, are less than the existing loadings to those segment. Buildout future increases in loadings to segment 8 are limited to 3 percent or less. Again, it appears that the selected management strategy will improve water quality or at least minimize further degradation in the segments that currently receive the largest pollution loadings.

7.3 POTENTIAL FOR ADDITIONAL POLLUTION CONTROL

The discussion in previous sections indicates that substantial pollution removal is achieved by the management alternatives selected for detailed analysis. As a result of the management practices, overall loadings of total N and total P for twenty-year future and buildout future land use conditions are less than the loadings for existing conditions. For lead and zinc, the increases in future loadings are limited to 6 percent or less.

Even though the management alternatives provide substantial reductions in future pollution loadings to the Bay, it is not known whether or not the reductions will be sufficient to protect the water quality within the Bay. A goal for pollution loadings, based on a relationship between loadings and water quality impacts in the Bay, has not been established. Typically, such a goal may be developed through the application of a water quality model, which represents the fate and transport of pollutants in the receiving water. The development of a water quality model for the Bay was beyond the scope of this study.

If further reduction of pollution loadings is required, additional controls must be implemented. Some potential alternatives are discussed below. In some cases, the discussion includes a theoretical example of how the controls could be applied to part of the study area. Ultimately, the estimated costs and pollution control benefits for the controls were developed for comparative purposes only.

7.3.1 RETROFIT BMPs

Retrofitting developed areas with BMPs would be required to reduce surface runoff loadings in watersheds such as Whitaker Bayou within the City of Sarasota, in which the land is completely developed. Implementation of BMPs in developed areas would require condemnation of existing development, which would be costly and may result in extensive legal efforts and/or public rejection of the BMP implementation.

For illustrative purposes, cost estimates for retrofitting the portion of Whitaker Bayou watershed within the City of Sarasota were calculated. An estimate of developed land costs ($500,000 per acre) was taken from estimates developed for Hudson Bayou, (PBSJ, 1992, draft). It was further assumed that the existing development would be served by a number of regional BMPs, strategically placed to treat runoff from several developments. The existing development comprises a total of about 2,100 acres, which is about 50 percent impervious. Assuming a reasonable regional BMP drainage area of 300 acres, the retrofit would require a total of 7 regional BMPs. Other assumptions for variables such as unit costs and design criteria are the same as those shown in Table 6-4.

Estimated costs and pollution removal benefits for hypothetical retrofit regional wet detention BMPs in the Whitaker Bayou watershed are presented in Table 7-8. Actual land costs may vary by an order of magnitude depending on the proximity to the Bay and the amount of existing development. As shown in the table, estimated annualized costs (capital and O&M) for the regional BMPs range from $5 million to $20 million. The actual cost would depend upon the size of bleed-down pool specified for the BMPs. If no bleed-down pool is included, then the cost of the BMPs would be in the $5 million range, with major costs savings in land acquisition and wet excavation. However, if the same bleed-down pool requirement for new development is also applied to retrofitting of existing development, then the cost of the BMPs will be in the $10 million to $20 million range. The topography of the BMP sites would determine where the actual costs would fall within the range. For areas with relatively flat topography, more land must be

TABLE 7-8

COSTS AND POLLUTION BENEFITS FOR ADDITIONAL MANAGEMENT ALTERNATIVES

Management Alternative	Annualized Cost Estimate (millions)	Annual Loading Reduction (lb/yr)			
		Total P	Total N	Lead	Zinc
Retrofit BMPs (Hypothetical Regional BMPs for Whitaker Bayou Watershed in City of Sarasota)	5 - 20	1,700	5,910	1,630	600
Further Wastewater Treatment Improvements	2 - 3	2,020 - 7,760	6,070 - 43,990	0 - 130	0 - 640
Wetland Treatment of Stormwater (Hypothetical 1000 Acres of Wetland)	1 - 2	6,000	35,000	N/A	N/A

NOTES:

1. N/A = not available
2. Annualized costs based on 8% interest rate, 30-year design life
3. Urban reuse for Siesta Key limited by land availability to 0.7 mgd
4. Wetland treatment cost does not include cost of upstream BMP for pretreatment of toxics.

acquired to accommodate the bleed-down requirements, resulting in higher costs relative to areas with more topographic relief. Average annual pollution reductions would range from 600 lb/yr of zinc to 5,910 lb/yr of total N.

7.3.2 FURTHER IMPROVEMENT OF WASTEWATER TREATMENT SYSTEMS

In the management alternatives selected for detailed analysis, wastewater treatment plants with advanced waste treatment (AWT) standards include the City of Sarasota plant, a future regional wastewater plant in Sarasota County, and the Siesta Key Utilities Authority. The only plant not fully achieving AWT standards in the buildout future scenario is the Southwest Wastewater Treatment Plant (SWWWTP) in Manatee County, which disposes of effluent via reuse and deep well injection.

Further improvements in wastewater treatment effectiveness could include the following:

- Improvement of SWWWTP from secondary to AWT standards. This may not be cost-effective from a loading reduction standpoint because the effluent is already used for irrigation purposes, and it is assumed that only 5 percent of the wastewater loadings used for irrigation actually reach the Bay.
- Alternative discharge technique for the Siesta Key Utilities Authority plant. Irrigation, percolation ponds, drainfields or deep-well injection are alternatives that would reduce the wastewater loadings reaching the Bay. However, the plant discharges only 2.2 mgd, and it is already treated to AWT standards.
- No surface discharge for the City of Sarasota plant. It is assumed that the City plant will discharge to Whitaker Bayou for a total of 59 days per year, particularly under wet conditions. Alternatively, storage facilities could be provided such that surface discharge would not be necessary, or the excess effluent could be discharged via deep well injection. However, the feasibility of either alternative is questionable.

The estimated costs and pollution removal benefits for the additional wastewater alternatives are also shown in Table 7-8. Based on the values in the table, it appears that the retrofit BMP option is more effective than the wastewater alternative for treatment of

toxics such as lead. In addition, the wetland stormwater treatment alternative (discussed in Section 7.3.3) appears more cost-effective for nutrient control.

7.3.3 WETLAND CONTROL OF NONPOINT POLLUTION LOADING

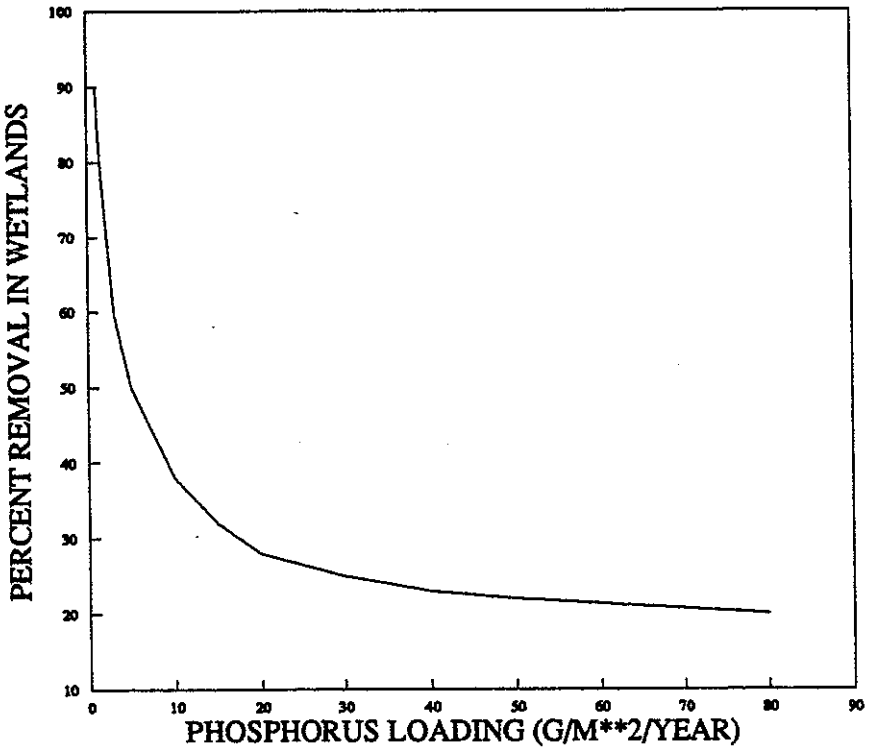
A relatively new concept in water quality management is the utilization of wetland areas for surface runoff pollution control. The concept has been used extensively for the treatment of wastewater discharges across the United States, but application of the concept for nonpoint source pollution control has been limited.

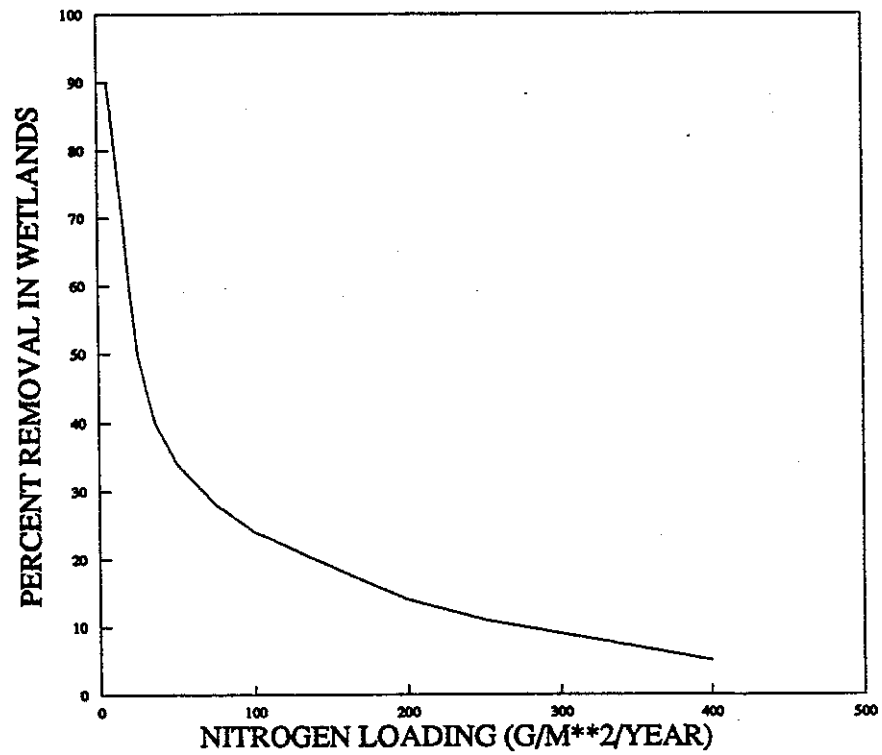
State of Florida stormwater regulations include provisions for wetland stormwater management systems. Wetlands to be used for stormwater treatment are those that are either connected to other waters by an artificial watercourse, or are connected to other waters solely by an intermittent watercourse. Monitoring of the wetland system is required to ensure that the ecological characteristics of the wetland are not adversely affected by the stormwater, and to ensure that water quality standards will not be violated by discharges from the wetland system. In addition, the normal range of water level fluctuations in the wetland must not be altered due to stormwater inflows, and the wetland facility must be part of a comprehensive stormwater management system including other best management practices.

Much of the available information on pollution removal in wetlands comes from application of constructed wetlands for wastewater treatment. Generally, the focus has been on removal of pollutants such as sediment, biochemical oxygen demand, and nutrients (e.g., total N, total P). Few data regarding removal of toxics (e.g., heavy metals) are available. For nitrogen, nitrification/denitrification is the key process that accounts for removal in wetlands. In contrast, soil sorption processes determine the removal of phosphorus in wetlands (Baker, 1991).

Factors that influence the efficiency of the wetland in removing nutrients include pollution loading rate and detention time. Nichols (1983) used data from several wetlands to graphically present the relationship between loading ($g/m^2/yr$) and percent removal for both nitrogen and phosphorus, as shown in Figure 7-2. For both pollutants, the removal efficiency decreased as the loading increased, suggesting that there may be an upper limit of pollution removal (in terms of $g/m^2/yr$) for wetland systems. This idea is consistent with findings by Mitsch (1991), who compared phosphorus assimilation in natural riparian and created wetlands. Mitsch found that the removal efficiency (i.e., percent removed) was substantially higher in the created wetland, that the phosphorus loading was substantially higher in the riparian wetland, and that the two systems had comparable assimilation rates (1-4 $g/m^2/yr$ of P). Another review of literature data (CDM, 1992) indicated that maximum phosphorus assimilation in wetlands is achieved only if the detention time within the wetland is about 10 days or more. For wetlands in the watersheds north of Lake Okeechobee, the CDM study indicated that a value of 6 $g/m^2/yr$ may be a reasonable long-term estimate for total P assimilation if detention times are 10 days or more. Total nitrogen assimilation rates presented in the literature for wetlands vary from 0 to over 90 $g/m^2/yr$ (Knight, 1991). The relationship between nitrogen loading and percent removal presented by Nichols (1983) suggests a maximum assimilation rate of 20 to 30 $g/m^2/yr$.

Estimates of nitrogen and phosphorus removal in wetland areas are presented in Table 7-9. For each land use, the table provides an estimate of nutrient assimilation in units of pounds per year per acre of wetland. Values of areal nutrient loadings to the wetlands were calculated based on the design criteria shown in the table, and the loading data from the spreadsheet model (see Table 4-3). In turn, the areal loading values were used as input to the equations shown in the table, producing estimates of areal nutrient assimilation. Values are listed with and without BMP implementation, to account for the fact that wetlands treating the discharge from areas with BMPs will be subject to lower nutrient loadings than wetlands receiving stormwater that has not been subject to BMP control.





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Relationship between Nutrient Loading and Percent Removal in Wetlands Receiving Wastewater Discharges

Figure 7-2

TABLE 7-9

ESTIMATION OF NITROGEN AND PHOSPHORUS REMOVAL
IN WETLANDS USED FOR STORMWATER RUNOFF CONTROL

Land Use	Wetland Assimilation (lb/ac/yr)			
	Without BMPs		With BMPs	
	Total P	Total N	Total P	Total N
Open/Recreation	7	31	---	---
Agricultural	20	69	13	54
Low Density Single Family	12	48	7	37
Medium Density Single Family	12	49	7	38
High Density Single Family	10	46	6	35
Multi-Family Building	11	46	6	35
Mobile Home	11	47	6	35
Commercial/Services	5	36	3	27
Industrial	6	36	3	27
Institutional	6	36	4	28

Notes:

1. Calculations for each land use are based on a mean wetland residence time of 10 days and a mean water depth of 1 foot.

2. Surface runoff flows and loadings for each land use were taken from Table 4-3.

3. Wetland assimilation was estimated using on the following equations:

$$\text{Total P: ASSIMILATION (lb/ac/yr)} = 0.68 * \text{LOAD (lb/ac/yr)}^{0.86}$$

$$\text{Total N: ASSIMILATION (lb/ac/yr)} = 0.81 * \text{LOAD (lb/ac/yr)}^{0.83}$$

based on Nichols (1983) and CDM (1992).

There is little available information regarding the fate of metals and other toxics in wetlands. Since wetlands are typically successful at trapping sediment, and toxics such as metals are often attached to suspended particles, wetlands appear to have the potential for a high degree of removal. However, the potential bioaccumulation of toxics in the wetland food chain is a concern. Thus, it seems appropriate to use wetlands in conjunction with other BMPs (as described in the Florida regulations) to limit the loading of toxics to the wetlands.

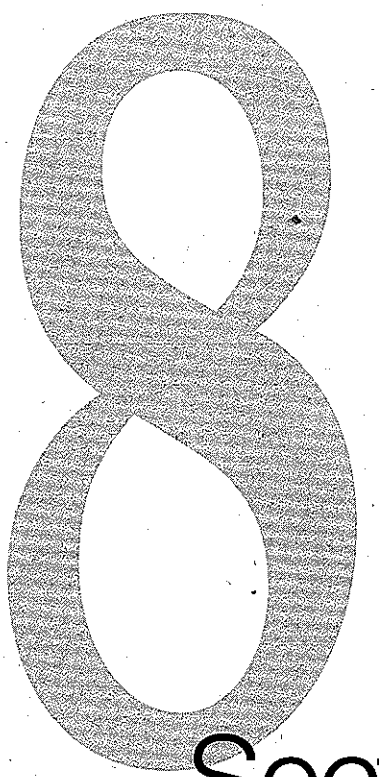
The construction and O&M costs associated with wetland stormwater treatment systems may vary widely from one project to another. Knight (1991) indicates that construction costs may range from $4,000 to $20,000 per acre, depending upon the size of the constructed wetland. Because of economies of scale, the lower end of the range would be applicable to large wetlands (greater than 250 acres) and the high end of the range would be more appropriate for small wetlands. Hey (1988) estimated that a comprehensive wetland restoration project for the Mississippi River watershed would incur construction and land costs of $4,000 per acre, and O&M costs of $26/acre. The O&M costs for a particular wetland may be substantially higher than estimated by Hey if the O&M program will include pumping of flow or harvesting of vegetation. Water quality monitoring of the wetland will also be required for applications in Florida.

Table 7-8 lists estimated costs and pollution removal benefits for the creation or restoration of a hypothetical 1000 acres of wetlands. The costs were calculated assuming a wetland construction cost of $8,000 per acre and a land acquisition cost of $15,000 per acre, as assumed in the cost estimates for BMP construction. These values are expected to be conservatively high especially for restored wetlands where land costs may be less than the average and some wetland vegetation may already exist. Pollution removal estimates were determined based on the values in Table 7-9. The median assimilation rate for the various land uses, assuming BMP implementation, was used as the basis for removal estimates. BMP implementation was assumed because FDER regulations

encourage use of wetlands as part of a stormwater management system that includes BMPs. However, the cost estimate does not include the cost of the BMP implementation.

According to the values in Table 7-8, the implementation of 1000 acres of wetlands will result in average annual total P and total N loading reductions of 6,000 lb/yr and 35,000 lb/yr, respectively. The estimated annualized cost for the wetland implementation is about $2 million. In comparison with the other alternatives shown in Table 7-8, the wetland alternative appears to be relatively cost-effective for nutrient removal.

In summary, potential pollution control measures beyond those that are part of selected management strategy include retrofit BMPs, additional wastewater treatment controls and wetland stormwater treatment. Of these alternatives, retrofit BMPs appear to be the most appropriate for control of toxics such as lead, whereas wetland treatment appears to be most appropriate for nutrient control. Because of the uncertainty regarding the costs and implementability of these measures, actual implementation should be considered on a site-specific basis.



Section Eight

8.0 CONCLUSIONS AND RECOMMENDATIONS

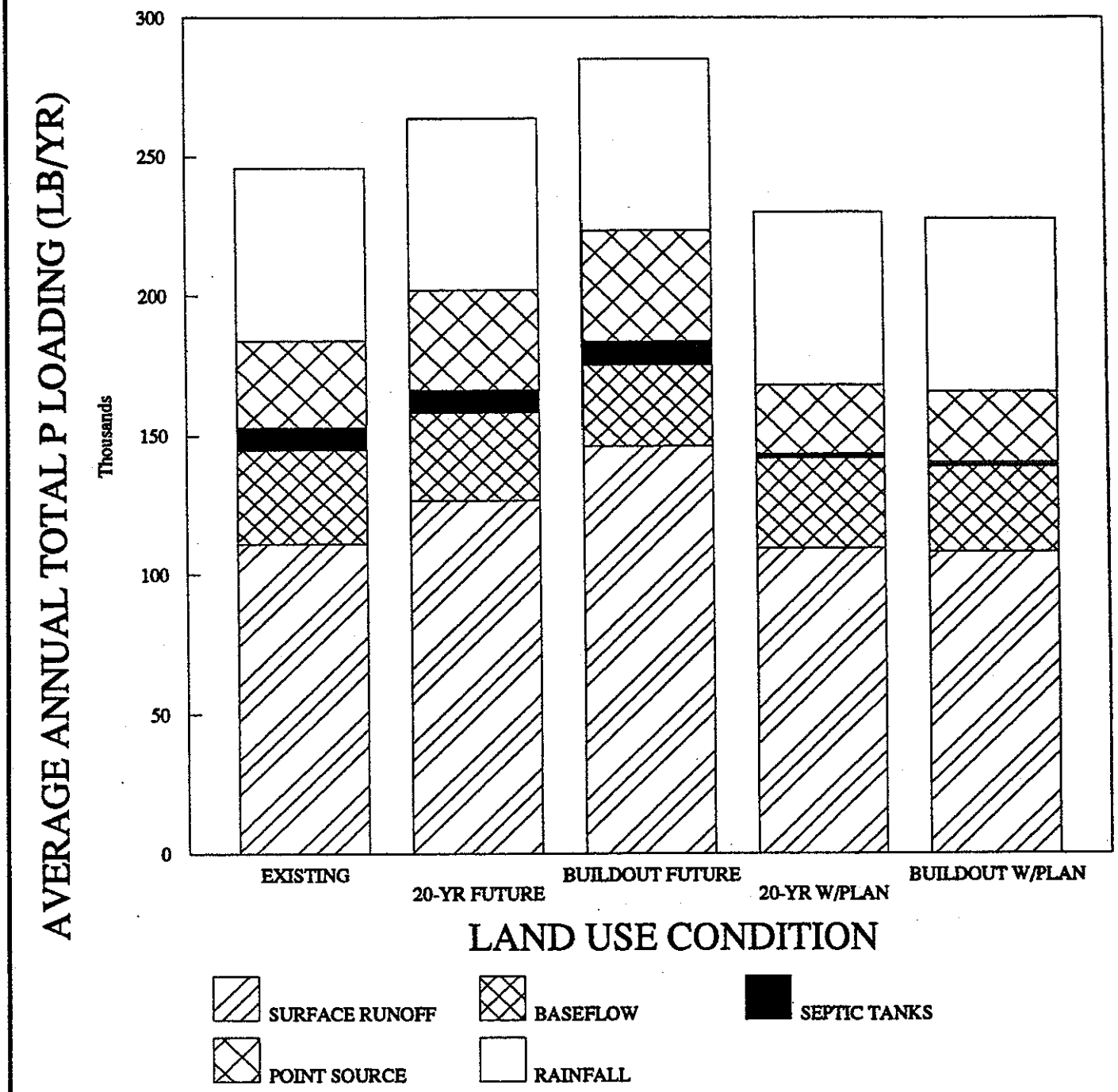
In this report, existing and future pollution loadings to Sarasota Bay have been examined, and future alternative management strategies designed to protect the water quality of Sarasota Bay have been evaluated. A summary of the study findings, including conclusions and recommendations, is presented below.

Figures 8-1 through 8-4 show average annual loadings of total P, total N, lead and zinc for existing land use, twenty-year future land use and buildout future land use. For both of the future land use conditions, loadings are presented with and without the plan selected for detailed analysis in Section 7.0 of this report. In the figures, the total loading is subdivided to show the relative impacts of various sources of pollution.

8.1 EXISTING CONDITIONS

The figures show that surface runoff and direct rainfall on the Bay surface are the dominant sources of total P, total N, lead and zinc. These two sources account for 71 percent of the total P, 73 percent of the total N, 98 percent of the lead and 91 percent of the zinc loading to the Bay. Surface runoff is typically the largest single source of pollution, particularly for lead, whereas rainfall is the major source of zinc. The combination of point sources, septic tanks and baseflow has a greater impact on nutrient loadings than on metals loadings.

Monitoring data indicates that Sarasota Bay has water quality that can be classified as "fair" to "good" using the State's TSI classification system. This classification is based on measurements of total P and total N, among other water quality constituents, but does not include disolved oxygen.



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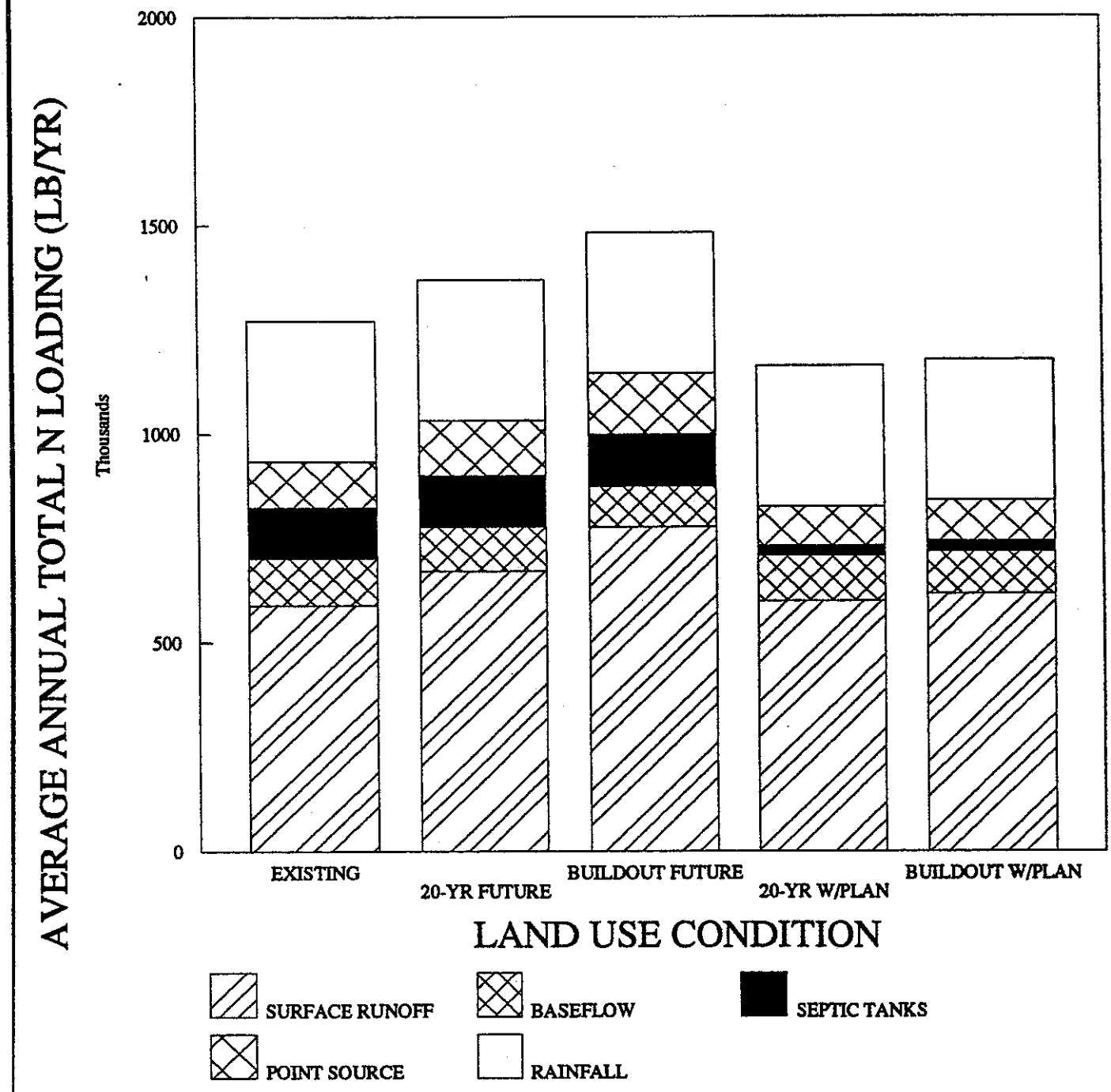
Total P Distribution by Source In Sarasota Bay NEP Study Area

Figure 8-1



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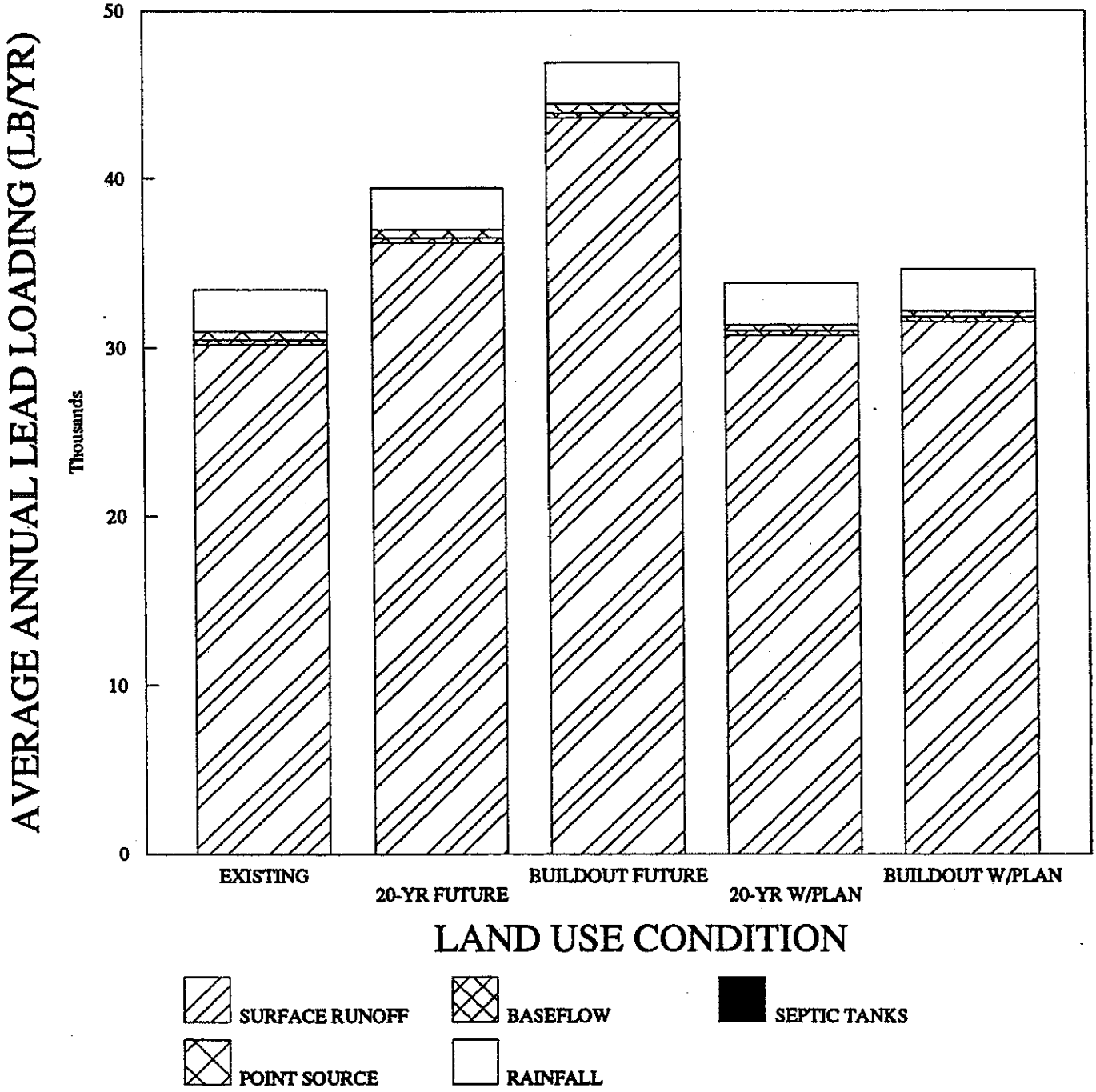
Total N Distribution by Source In Sarasota Bay NEP Study Area

Figure 8-2



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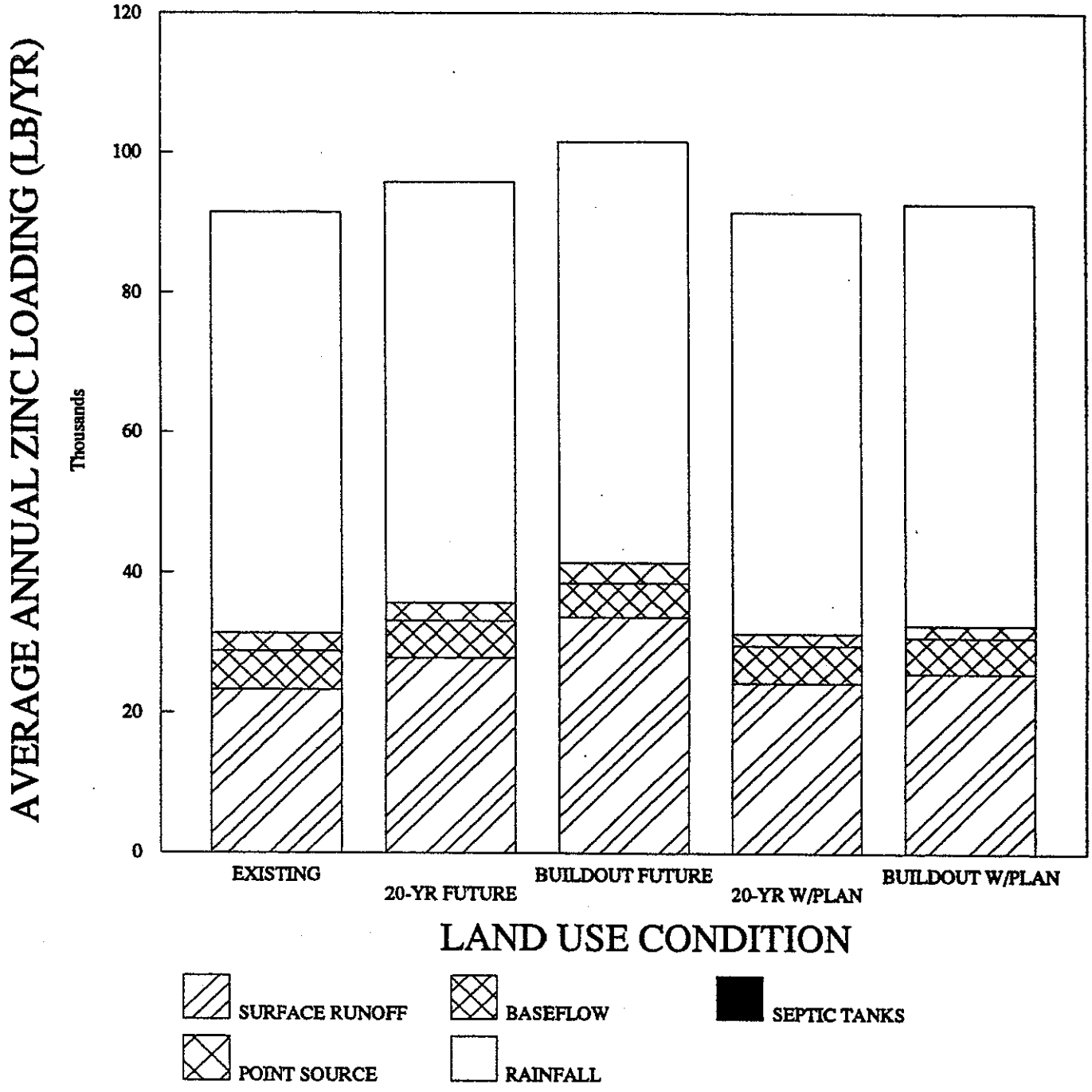
Lead Distribution by Source In Sarasota Bay NEP Study Area

Figure 8-3



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Zinc Distribution by Source In Sarasota Bay NEP Study Area

Figure 8-4

8.2 FUTURE CONDITIONS (UNCONTROLLED)

As shown in Figures 8-1 through 8-4, future development is characterized by an increase in pollution loadings to the Bay, relative to existing loadings. For the twenty-year future land use condition, the percent increase in pollution loading ranges from 5 percent (zinc) to 16 percent (lead). The increase in loading ranges from 11 percent (zinc) to 36 percent (lead) percent for the buildout future land use condition. Surface runoff and point sources are responsible for the increase in loadings. Baseflow loadings decrease in the future, and septic tank and rainfall loadings are expected to remain the same.

8.3 FUTURE CONDITIONS (CONTROLLED)

Alternative management strategies, designed to reduce pollution loadings to the Bay, were analyzed. These alternatives included both nonpoint source and point source controls. The nonpoint source alternatives included structural and nonstructural controls. Wet detention basins, in which pollution removal occurs within the permanent pool, were selected as the structural control option. Nonstructural control options generally included methods that maximized the amount of maintained open space in new development. Density restrictions and cluster development for residential areas, and restricted imperviousness for commercial and industrial areas, were included in the analysis. In addition, combinations of structural and nonstructural nonpoint controls (e.g., cluster development with BMPs applied to developed areas) were also considered. A regional wastewater plan for Sarasota County was also analyzed. This proposed alternative would divert flows from many small private utilities and package plants, and from 80 percent of the septic tanks in the County, to a regional wastewater treatment plant. The plant was assumed to treat the wastewater to AWT levels, with the reclaimed water used for urban irrigation within the County.

A comparison matrix was developed to compare the various alternatives. Considerations in the matrix include reduction in pollution loadings, capital and O&M costs, feasibility,

other environmental impacts (e.g., erosion reduction, establishment of wildlife habitat) and additional benefits such as recreational opportunities. Each alternative (or combination of alternatives) was assigned a score in each category based on results generated by the loading model or subjective evaluation. The alternatives with the highest score were identified as those most appropriate for implementation in the study area.

The evaluation matrix indicated that a combination of cluster development with BMPs, restricted imperviousness with BMPs for commercial/industrial land use, and a regional wastewater plan for Sarasota County represents the most effective management plan. Cluster development reduces the number of BMPs required to serve new development and provides a substantial water quality benefit because of the BMPs on developed areas and maintenance of permanent open space. Similarly, restricted imperviousness for commercial/industrial land uses also reduces surface runoff loadings because more open space is maintained. The regional wastewater plans includes the consolidation of the many private utilities and package plants in Sarasota County into a single regional facility. In addition, 80 percent of the septic tanks in the area will be connected to a centralized sewer system which will carry flows to the regional plant for treatment. Full use of the effluent for irrigation was assumed. The permanent open space resulting from the cluster development would be appropriate sites for irrigation with the reuse water.

Figures 8-1 through 8-4 show that the future loadings of total P and total N are less than existing loadings, and future loadings of lead and zinc are greater than existing loadings, for both the twenty-year and buildout future land use conditions. The regional wastewater plan is the major factor in the nutrient loading reduction. As shown in the figures, both point source and septic tank loadings are reduced considerably as a result of the plan. Though surface runoff loadings are noticeably lower with controls than without controls, the future surface runoff loadings still exceed existing surface runoff loadings. BMP efficiencies are not sufficiently high to reduce surface runoff pollution loading to pre-development levels.

8.4 WATER QUALITY IMPACTS

The analysis of water quality impacts on Sarasota Bay, caused by the delivery of pollution loadings from the watersheds in the study area, was limited to the estimation of average annual loadings to various segments of the Bay. The results indicated that several Bay segments receive a disproportionately large amount of loading, and are therefore expected to have the most adverse water quality impacts. TSI values for the Bay segments tend to confirm that expectation. Evaluation of loading values with and without the selected management strategy show that the strategy would effectively reduce the loadings to the most heavily impacted Bay segments, or at least would minimize the increase of loadings to the segments.

In the absence of a Sarasota Bay receiving water model, however, there is a rather limited basis for the management recommendations made in this study. In order to justify the substantial costs associated with the selected management strategy, the local jurisdictions and property owners who will eventually absorb the costs will need information that supports the recommended controls. Without a receiving water model of Sarasota Bay, it will be difficult to supply local decision-makers and the general public with sufficient justification for the recommended management measures.

Similar problems have been encountered in other studies, such as the EPA Chesapeake Bay Program (completed in 1983). Like the Sarasota Bay NEP study, the Chesapeake Bay Program initially focused on nonpoint pollution loadings for watersheds tributary to the Bay. Management recommendations for both point and nonpoint source pollution were based on loading projections only, with no management tools to quantify the water quality benefits of the plan. As a result, an across-the-board nutrient loading reduction target of 40 percent by the year 2000 was established, without regard to watershed location or receiving water assimilative capacity. At the same time, a decision was made to develop a 3-dimensional water quality model of the Chesapeake Bay system, in order to confirm the benefits of the loading reduction target and to evaluate management strategies

which reflect locational differences in water quality impacts. The water quality model has been completed in 1992, nine years after the original management plan was completed. Hopefully, the model will demonstrate that the recommended controls were necessary and appropriate, but there is some risk that the model may show that some capital expenditures for management facilities were unnecessary and/or that the reductions were inadequate.

In summary, the results of this study show that the selected management strategy will either reduce or minimize the increase in pollution loadings to Sarasota Bay, particularly in the areas that are currently receiving the greatest pollution loadings. However, the actual water quality benefit that will be achieved by the management strategy cannot be quantified without the development of a Sarasota Bay water quality model. The development of such a model is recommended, to make the selected management strategy more defensible.

8.5 IMPLEMENTATION OF MANAGEMENT STRATEGIES

The selected management strategy includes cluster development consisting of 30 percent medium density residential (with an assumed residential density of 4.5 dwelling units per acre) and 70 percent permanent open space. It was assumed that the development areas would be served by wet detention BMPs, in accordance with FDER regulations. In other areas of the country (e.g., the Chesapeake Bay Basin), land use management options such as cluster development or reduced residential densities are recognized as BMPs. It is recommended that FDER consider the authorization of land use controls as a BMP which satisfies Chapter 17-25 of the Florida Administrative Code.

Because the cluster alternative includes an overall residential density that is less than the jurisdiction's comprehensive plans, changes to the plans will be required. At 30 percent residential development, having an assumed density of 4.5 dwelling units per acre

(du/acre), an overall residential density of 1.35 du/acre is established. In contrast, much of the future residential area in the Manatee and Sarasota County comprehensive plans allow densities of 3 du/acre. The 3 du/acre is more consistent with the other cluster alternative (5b), which included 50 percent high density residential (assumed 7.5 du/acre) and 50 percent permanent open space.

Implementation of structural BMPs for new development is already required under existing regulations. The FDER requires the implementation of stormwater management measures for new development. The design criteria in the regulations ensure that surface runoff pollution removal is achieved in the stormwater management facilities. Additional design requirements are specified for areas that discharge to Outstanding Florida Waters (such as Sarasota Bay). For the Sarasota Bay NEP study area, the Southwest Florida Water Management District (SWFWMD) is responsible for permitting construction and operation of surface water management systems.

BMP implementation may be achieved using a combination of onsite and regional BMPs. In this study, costs were developed assuming the implementation of onsite BMPs for all new development. However, the regional BMP approach can offer cost savings due to economies-of-scale, and would result in lower O&M costs because there would be less facilities to maintain. In addition, a regional BMP may serve some existing development in addition to future development, thereby providing a greater water quality benefit than onsite BMPs.

One way of developing a regional stormwater BMP system is through master planning studies conducted using funds generated by a stormwater utility. The creation of a stormwater utility currently is being used in many urban areas around the U.S. as an alternative to the use of general fund revenue for financing the construction and maintenance of drainage projects. It involves creating a continuing funding source by designating stormwater management as a utility, much like sanitary sewers, gas and electricity are considered public utilities. Sarasota County already has a stormwater

utility, and has used the revenue in part to fund stormwater master plan studies for several watersheds in the NEP study area. Manatee County has been exploring the possibility of creating a stormwater utility, and legislation enabling the County to establish a utility has recently been passed.

8.6 ADDITIONAL CONTROL MEASURES

Control measures beyond those included in the recommended management plan were also analyzed. These measures include improvements in wastewater treatment for the jurisdictions other than Sarasota County, retrofit BMPs for areas of existing development, and use of created or restored wetlands for pollution removal.

Of the analyzed alternatives, the most effective include retrofit BMPs and use of wetlands for pollution removal. Retrofit BMPs are costly, particularly because of the high land costs in existing urban areas. However, the overall cost of retrofit BMPs may be reduced considerably if the design criteria are not as restrictive as those applied to BMPs for new development. The retrofit option is the only one which provides a substantial amount of lead and zinc loading reduction. The wetland alternative also is capable of effectively reducing total P and total N loadings. However, there is concern regarding the bioaccumulation of metals and other toxics in wetland areas, and associated impacts on the food chain. Consequently, FDER regulations specify that wetlands should be used only as part of a stormwater system that includes BMPs.

9

Section Nine

9.0 REFERENCES

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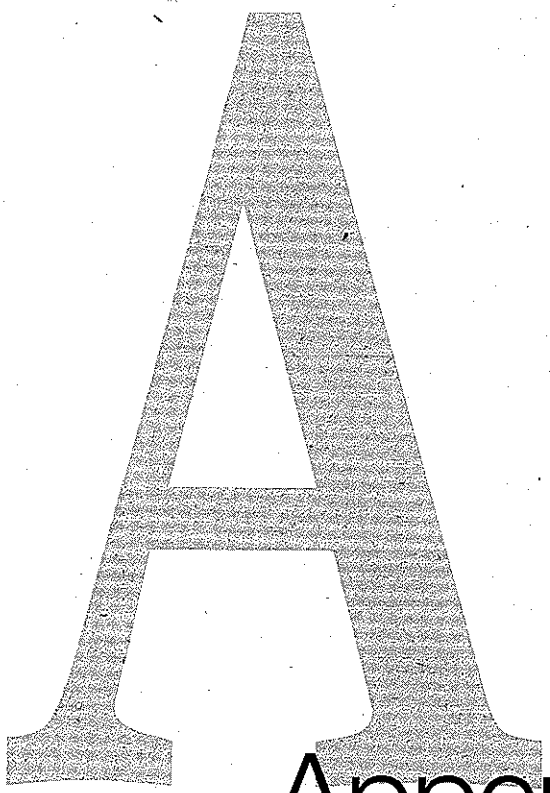
Appendices



Appendix A

TABLE A-1

AVERAGE ANNUAL LOADINGS BY WATERSHED
FOR EXISTING LAND USE CONDITIONS

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	25.24	66,860	1.84	0.32	362,950	9.97	1.74	7,410	0.20	0.036	9,450	0.26	0.045
PALMA SOLA 2	1,120	25.12	1,640	1.46	0.26	8,340	7.45	1.31	350	0.31	0.055	320	0.29	0.050
BOWLEES CREEK	6,489	33.61	11,100	1.71	0.22	64,320	9.91	1.30	6,970	1.07	0.141	4,270	0.66	0.086
WEST BRADENTON	4,395	28.94	7,250	1.65	0.25	35,910	8.17	1.25	1,490	0.34	0.052	1,410	0.32	0.049
CEDAR HAMMOCK	1,930	32.35	4,090	2.12	0.29	20,830	10.79	1.47	1,280	0.66	0.090	970	0.50	0.069
WEST BOWLEES	1,559	27.93	2,990	1.92	0.30	14,800	9.49	1.50	710	0.46	0.072	590	0.38	0.060
PALMA SOLA	900	23.47	1,710	1.90	0.36	7,490	8.32	1.56	230	0.26	0.048	220	0.24	0.046
SOUTH BRADENTON	4,635	27.87	12,550	2.71	0.43	56,260	12.14	1.92	590	0.13	0.020	1,120	0.24	0.038
WHITAKER BAYOU	5,015	40.74	20,270	4.04	0.44	89,870	17.92	1.94	3,630	0.72	0.078	3,630	0.72	0.078
MATHENY CREEK	3,800	35.96	11,390	3.00	0.37	57,290	15.08	1.85	2,040	0.54	0.066	2,100	0.55	0.068
CATFISH CREEK	3,360	21.73	3,590	1.07	0.22	18,640	5.55	1.13	240	0.07	0.015	560	0.17	0.034
NORTH CREEK	1,920	20.60	2,160	1.13	0.24	11,170	5.82	1.25	220	0.11	0.025	350	0.18	0.039
SOUTH CREEK	12,995	18.79	11,050	0.85	0.20	53,190	4.09	0.96	250	0.02	0.005	1,400	0.11	0.025
HUDSON BAYOU	1,595	32.58	3,070	1.92	0.26	16,570	10.39	1.41	1,440	0.90	0.122	930	0.58	0.079
SIESTA KEY	1,385	45.94	8,410	6.07	0.58	30,230	21.83	2.10	580	0.42	0.040	1,030	0.74	0.071
ANNA MARIA	919	28.32	1,740	1.89	0.29	8,660	9.42	1.47	450	0.49	0.076	360	0.39	0.061
PERICO	860	33.12	1,040	1.21	0.16	4,750	5.52	0.74	50	0.06	0.008	100	0.12	0.015
LONGBOAT KEY	1697	23.62	2,730	1.61	0.30	13,000	7.66	1.43	440	0.26	0.048	450	0.27	0.050
OTHER ISLANDS	900	27.94	1,640	1.82	0.29	8,360	9.29	1.47	310	0.34	0.054	290	0.32	0.051
DIRECT TO BAY	4,241	31.85	8,760	2.07	0.29	51,120	12.05	1.67	2,290	0.54	0.075	1,850	0.44	0.060
BAY SURFACE	33,280	54.60	61,730	1.85	0.15	337,460	10.14	0.82	2,470	0.07	0.006	60,080	1.81	0.146
TOTAL	129,412	34.26	245,770	2.09	0.30	1,271,210	10.05	1.44	33,440	0.38	0.054	91,480	0.44	0.058

TABLE A-2

AVERAGE ANNUAL LOADINGS BY SOURCE
FOR EXISTING LAND USE CONDITIONS

SOURCE	RUNOFF (in)	% OF TOTAL	AVERAGE YEAR POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	14.58	42.6%	110,870	45.1%	588,210	46.3%	30,180	90.3%	23,260	25.4%
BASEFLOW	3.84	11.2%	33,800	13.8%	112,690	8.9%	300	0.9%	5,620	6.1%
SEPTIC	0.70	2.0%	8,230	3.3%	123,520	9.7%	0	0.0%	0	0.0%
POINT SOURCE	1.10	3.2%	31,140	12.7%	109,330	8.6%	490	1.5%	2,520	2.8%
RAINFALL	14.04	41.0%	61,730	25.1%	337,460	26.5%	2,470	7.4%	60,080	65.7%
TOTAL	34.26		245,770		1,271,210		33,440		91,480	

TABLE A-3

AVERAGE ANNUAL LOADINGS BY JURISDICTION
FOR EXISTING LAND USE CONDITIONS

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	AVERAGE YEAR POLLUTANT LOADING							
				Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	11.94	34.8%	103,510	42.1%	559,270	44.0%	12,100	36.2%	15,590	17.0%
SARASOTA CITY	7,844	2.20	6.4%	25,040	10.2%	109,340	8.6%	6,010	18.0%	5,110	5.6%
MANATEE CO.	20,226	4.66	13.6%	39,930	16.2%	200,140	15.7%	11,030	33.0%	8,470	9.3%
ISLANDS	5,761	1.42	4.1%	15,560	6.3%	65,000	5.1%	1,830	5.5%	2,230	2.4%
BAY SURFACE	33,280	14.04	41.0%	61,730	25.1%	337,460	26.5%	2,470	7.4%	60,080	65.7%
TOTAL	129,412	34.26		245,770		1,271,210		33,440		91,480	

TABLE A-4

WET SEASON LOADINGS BY WATERSHED
FOR EXISTING LAND USE CONDITIONS

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	15.53	40,660	1.12	0.32	213,570	5.86	1.67	4,560	0.13	0.036	6,000	0.16	0.047
PALMA SOLA 2	1,120	16.06	1,050	0.94	0.26	5,290	4.72	1.30	220	0.20	0.054	200	0.18	0.049
BOWLEES CREEK	6,489	21.12	7,000	1.08	0.23	40,270	6.21	1.30	4,310	0.66	0.139	2,670	0.41	0.086
WEST BRADENTON	4,395	18.41	4,640	1.06	0.25	22,700	5.16	1.24	920	0.21	0.050	900	0.20	0.049
CEDAR HAMMOCK	1,930	20.38	2,570	1.33	0.29	13,060	6.77	1.47	790	0.41	0.089	610	0.32	0.068
WEST BOWLEES	1,559	17.73	1,880	1.21	0.30	9,320	5.98	1.49	440	0.28	0.070	370	0.24	0.059
PALMA SOLA	900	15.08	1,080	1.20	0.35	4,750	5.28	1.54	140	0.16	0.046	150	0.17	0.049
SOUTH BRADENTON	4,635	16.16	6,640	1.43	0.39	28,780	6.21	1.70	360	0.08	0.021	700	0.15	0.041
WHITAKER BAYOU	5,015	23.52	10,570	2.11	0.40	48,540	9.68	1.82	2,200	0.44	0.082	2,060	0.41	0.077
MATHENY CREEK	3,800	20.63	5,720	1.51	0.32	30,090	7.92	1.69	1,240	0.33	0.070	1,200	0.32	0.068
CATFISH CREEK	3,360	13.98	2,370	0.71	0.22	11,770	3.50	1.11	150	0.04	0.014	370	0.11	0.035
NORTH CREEK	1,920	13.26	1,420	0.74	0.25	7,040	3.67	1.22	140	0.07	0.024	230	0.12	0.040
SOUTH CREEK	12,995	12.32	7,470	0.57	0.21	34,910	2.69	0.96	160	0.01	0.004	970	0.07	0.027
HUDSON BAYOU	1,595	20.51	1,930	1.21	0.26	10,370	6.50	1.40	890	0.56	0.120	590	0.37	0.080
SIESTA KEY	1,385	23.89	3,670	2.65	0.49	14,090	10.17	1.88	330	0.24	0.044	480	0.35	0.064
ANNA MARIA	919	17.97	1,120	1.22	0.30	5,450	5.93	1.46	280	0.30	0.075	230	0.25	0.061
PERICO	860	21.16	650	0.76	0.16	3,080	3.58	0.75	30	0.03	0.007	70	0.08	0.017
LONGBOAT KEY	1,697	15.17	1,750	1.03	0.30	8,270	4.87	1.42	260	0.15	0.045	280	0.16	0.048
OTHER ISLANDS	900	17.71	1,030	1.14	0.29	5,150	5.72	1.43	190	0.21	0.053	190	0.21	0.053
DIRECT TO BAY	4,241	19.61	5,390	1.27	0.29	30,590	7.21	1.62	1,420	0.33	0.075	1,170	0.28	0.062
BAY SURFACE	33,280	33.70	38,100	1.14	0.15	208,290	6.26	0.82	1,520	0.05	0.006	37,090	1.11	0.146
TOTAL	129,412	21.12	146,710	1.21	0.29	755,380	5.90	1.39	20,550	0.23	0.054	56,530	0.27	0.058

TABLE A-5

DRY SEASON LOADINGS BY WATERSHED
FOR EXISTING LAND USE CONDITIONS

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	0	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	9.71	26,190	0.72	0.33	149,390	4.10	1.86	2,830	0.08	0.035	3,460	0.10	0.043
PALMA SOLA 2	1,120	9.06	590	0.53	0.26	3,040	2.71	1.32	130	0.12	0.057	120	0.11	0.052
BOWLEES CREEK	6,489	12.48	4,030	0.62	0.22	24,070	3.71	1.31	2,660	0.41	0.145	1,600	0.25	0.087
WEST BRADENTON	4,395	10.52	2,620	0.60	0.25	13,180	3.00	1.26	570	0.13	0.054	510	0.12	0.049
CEDAR HAMMOCK	1,930	11.97	1,500	0.78	0.29	7,790	4.04	1.49	490	0.25	0.094	360	0.19	0.069
WEST BOWLEES	1,559	10.22	1,100	0.71	0.30	5,490	3.52	1.52	270	0.17	0.075	220	0.14	0.061
PALMA SOLA	900	8.39	620	0.69	0.36	2,750	3.06	1.61	90	0.10	0.053	80	0.09	0.047
SOUTH BRADENTON	4,635	11.71	5,920	1.28	0.48	27,500	5.93	2.24	230	0.05	0.019	420	0.09	0.034
WHITAKER BAYOU	5,015	17.23	9,650	1.92	0.49	41,160	8.21	2.10	1,420	0.28	0.073	1,550	0.31	0.079
MATHENY CREEK	3,800	15.33	5,670	1.49	0.43	27,200	7.16	2.06	800	0.21	0.061	900	0.24	0.068
CATFISH CREEK	3,360	7.75	1,240	0.37	0.21	6,870	2.04	1.16	90	0.03	0.015	180	0.05	0.031
NORTH CREEK	1,920	7.34	730	0.38	0.23	4,150	2.16	1.30	80	0.04	0.025	120	0.06	0.038
SOUTH CREEK	12,995	6.46	3,580	0.28	0.19	18,300	1.41	0.96	90	0.01	0.005	420	0.03	0.022
HUDSON BAYOU	1,595	12.07	1,140	0.71	0.26	6,190	3.88	1.42	550	0.34	0.126	360	0.23	0.082
SIESTA KEY	1,385	22.05	4,740	3.42	0.68	16,090	11.62	2.32	250	0.18	0.036	550	0.40	0.079
ANNA MARIA	919	10.35	640	0.70	0.30	3,210	3.49	1.49	170	0.18	0.079	130	0.14	0.060
PERICO	860	11.96	330	0.38	0.14	1,670	1.94	0.72	20	0.02	0.009	40	0.05	0.017
LONGBOAT KEY	1,697	8.45	970	0.57	0.30	4,760	2.80	1.46	160	0.09	0.049	160	0.09	0.049
OTHER ISLANDS	900	10.23	610	0.68	0.29	3,200	3.56	1.53	120	0.13	0.058	100	0.11	0.048
DIRECT TO BAY	4,241	12.24	3,310	0.78	0.28	20,520	4.84	1.74	880	0.21	0.075	700	0.17	0.060
BAY SURFACE	33,280	20.90	23,630	0.71	0.15	129,170	3.88	0.82	950	0.03	0.006	23,000	0.69	0.146
TOTAL	129,412	13.15	98,810	0.87	0.31	515,700	4.15	1.51	12,850	0.15	0.055	34,980	0.17	0.058

TABLE A-6

WET SEASON AND DRY SEASON LOADINGS BY SOURCE
FOR EXISTING LAND USE CONDITIONS

SOURCE	RUNOFF (in)	% OF TOTAL	WET SEASON POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	9.00	42.6%	68,290	46.5%	363,100	48.1%	18,640	90.7%	14,390	25.5%
BASEFLOW	2.82	13.4%	24,790	16.9%	82,590	10.9%	200	1.0%	4,110	7.3%
SEPTIC	0.23	1.1%	4,120	2.8%	61,740	8.2%	0	0.0%	0	0.0%
POINT SOURCE	0.40	1.9%	11,410	7.8%	39,660	5.3%	190	0.9%	940	1.7%
RAINFALL	8.67	41.1%	38,100	26.0%	208,290	27.6%	1,520	7.4%	37,090	65.6%
TOTAL	21.12		146,710		755,380		20,550		56,530	

SOURCE	RUNOFF (in)	% OF TOTAL	DRY SEASON POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	5.58	42.4%	42,330	42.8%	225,090	43.6%	11,540	89.8%	8,900	25.4%
BASEFLOW	1.03	7.8%	9,030	9.1%	30,090	5.8%	50	0.4%	1,510	4.3%
SEPTIC	0.47	3.6%	4,130	4.2%	61,820	12.0%	0	0.0%	0	0.0%
POINT SOURCE	0.70	5.3%	19,690	19.9%	69,530	13.5%	310	2.4%	1,570	4.5%
RAINFALL	5.37	40.8%	23,630	23.9%	129,170	25.0%	950	7.4%	23,000	65.8%
TOTAL	13.15		98,810		515,700		12,850		34,980	

TABLE A-7

WET SEASON AND DRY SEASON LOADINGS BY JURISDICTION
FOR EXISTING LAND USE CONDITIONS

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	WET SEASON POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	7.39	35.0%	62,720	42.8%	329,860	43.7%	7,460	36.3%	9,850	17.4%
SARASOTA CITY	7,844	1.32	6.3%	13,620	9.3%	61,920	8.2%	3,660	17.8%	3,000	5.3%
MANATEE CO.	20,226	2.90	13.7%	24,030	16.4%	119,270	15.8%	6,820	33.2%	5,340	9.4%
ISLANDS	5,761	0.85	4.0%	8,240	5.6%	36,040	4.8%	1,090	5.3%	1,250	2.2%
BAY SURFACE	33,280	8.67	41.0%	38,100	26.0%	208,290	27.6%	1,520	7.4%	37,090	65.6%
TOTAL	129,412	21.12		146,710		755,380		20,550		56,530	

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	DRY SEASON POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	4.55	34.6%	40,660	41.1%	229,470	44.5%	4,640	36.1%	5,740	16.4%
SARASOTA CITY	7,844	0.88	6.7%	11,300	11.4%	47,240	9.2%	2,320	18.1%	2,120	6.1%
MANATEE CO.	20,226	1.77	13.4%	15,900	16.1%	80,890	15.7%	4,220	32.8%	3,140	9.0%
ISLANDS	5,761	0.57	4.3%	7,320	7.4%	28,930	5.6%	720	5.6%	980	2.8%
BAY SURFACE	33,280	5.37	40.9%	23,630	23.9%	129,170	25.0%	950	7.4%	23,000	65.8%
TOTAL	129,412	13.14		98,810		515,700		12,850		34,980	

TABLE A-8

WET YEAR LOADINGS BY WATERSHED
FOR EXISTING LAND USE CONDITIONS

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	34.86	90,500	2.49	0.31	461,060	12.66	1.60	9,510	0.26	0.033	13,330	0.37	0.046
PALMA SOLA 2	1,120	34.98	2,310	2.06	0.26	11,380	10.16	1.28	460	0.41	0.052	440	0.39	0.050
BOWLEES CREEK	6,489	44.90	15,060	2.32	0.23	85,060	13.11	1.29	8,920	1.37	0.135	5,620	0.87	0.085
WEST BRADENTON	4,395	39.83	10,110	2.30	0.25	48,680	11.08	1.23	1,920	0.44	0.048	1,950	0.44	0.049
CEDAR HAMMOCK	1,930	43.45	5,500	2.85	0.29	27,550	14.27	1.45	1,640	0.85	0.086	1,290	0.67	0.068
WEST BOWLEES	1,559	38.24	4,090	2.62	0.30	19,830	12.72	1.47	910	0.58	0.067	810	0.52	0.060
PALMA SOLA	900	33.05	2,350	2.61	0.35	10,180	11.31	1.51	310	0.34	0.046	320	0.36	0.047
SOUTH BRADENTON	4,635	37.46	15,850	3.42	0.40	69,070	14.90	1.76	750	0.16	0.019	1,580	0.34	0.040
WHITAKER BAYOU	5,015	51.55	23,560	4.70	0.40	105,580	21.05	1.80	4,580	0.91	0.078	4,470	0.89	0.076
MATHENY CREEK	3,800	46.57	13,720	3.61	0.34	68,170	17.94	1.70	2,590	0.68	0.065	2,680	0.71	0.067
CATFISH CREEK	3,360	31.34	5,390	1.60	0.23	26,000	7.74	1.09	320	0.10	0.013	840	0.25	0.035
NORTH CREEK	1,920	29.87	3,210	1.67	0.25	15,450	8.05	1.19	290	0.15	0.022	530	0.28	0.041
SOUTH CREEK	12,995	27.85	17,510	1.35	0.21	79,060	6.08	0.96	360	0.03	0.004	2,360	0.18	0.029
HUDSON BAYOU	1,595	43.68	4,140	2.60	0.26	21,920	13.74	1.39	1,850	1.16	0.117	1,240	0.78	0.079
SIESTA KEY	1,385	56.49	9,460	6.83	0.53	34,830	25.15	1.96	720	0.52	0.041	1,200	0.87	0.068
ANNA MARIA	919	38.71	2,410	2.62	0.30	11,600	12.62	1.44	580	0.63	0.072	490	0.53	0.061
PERICO	860	46.02	1,570	1.83	0.18	6,800	7.91	0.76	80	0.09	0.009	160	0.19	0.018
LONGBOAT KEY	1,697	33.25	3,840	2.26	0.30	17,800	10.49	1.39	550	0.32	0.043	630	0.37	0.049
OTHER ISLANDS	900	38.53	2,260	2.51	0.29	11,090	12.32	1.41	400	0.44	0.051	400	0.44	0.051
DIRECT TO BAY	4,241	42.75	11,670	2.75	0.28	64,690	15.25	1.57	2,930	0.69	0.071	2,490	0.59	0.061
BAY SURFACE	33,280	69.70	78,800	2.37	0.15	430,790	12.94	0.82	3,150	0.09	0.006	76,700	2.30	0.146
TOTAL	129,412	45.57	323,310	2.73	0.29	1,626,590	12.93	1.38	42,820	0.49	0.051	119,530	0.59	0.058

TABLE A-9

DRY YEAR LOADINGS BY WATERSHED
FOR EXISTING LAND USE CONDITIONS

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	16.79	46,110	1.27	0.33	277,180	7.61	2.00	5,610	0.15	0.040	6,050	0.17	0.044
PALMA SOLA 2	1,120	16.49	1,040	0.93	0.25	5,680	5.07	1.36	270	0.24	0.064	210	0.19	0.050
BOWLEES CREEK	6,489	23.81	7,660	1.18	0.22	46,400	7.15	1.33	5,320	0.82	0.152	3,130	0.48	0.089
WEST BRADENTON	4,395	19.43	4,710	1.07	0.24	24,740	5.63	1.28	1,130	0.26	0.058	950	0.22	0.049
CEDAR HAMMOCK	1,930	22.72	2,850	1.48	0.29	15,070	7.81	1.52	980	0.51	0.099	710	0.37	0.071
WEST BOWLEES	1,559	18.93	2,030	1.30	0.30	10,460	6.71	1.56	550	0.35	0.082	420	0.27	0.063
PALMA SOLA	900	15.06	1,100	1.22	0.36	5,140	5.71	1.67	180	0.20	0.059	140	0.16	0.046
SOUTH BRADENTON	4,635	19.43	9,680	2.09	0.47	45,050	9.72	2.21	440	0.09	0.022	710	0.15	0.035
WHITAKER BAYOU	5,015	31.33	17,380	3.47	0.49	76,200	15.20	2.14	2,810	0.56	0.079	2,870	0.57	0.081
MATHENY CREEK	3,800	26.71	9,360	2.46	0.41	47,800	12.58	2.08	1,570	0.41	0.068	1,600	0.42	0.070
CATFISH CREEK	3,360	13.25	2,000	0.60	0.20	12,130	3.61	1.20	170	0.05	0.017	290	0.09	0.029
NORTH CREEK	1,920	12.42	1,230	0.64	0.23	7,380	3.84	1.37	160	0.08	0.030	200	0.10	0.037
SOUTH CREEK	12,995	10.77	5,290	0.41	0.17	30,270	2.33	0.95	160	0.01	0.005	540	0.04	0.017
HUDSON BAYOU	1,595	22.95	2,140	1.34	0.26	11,950	7.49	1.44	1,100	0.69	0.133	680	0.43	0.082
SIESTA KEY	1,385	36.74	7,500	5.42	0.65	26,220	18.93	2.27	470	0.34	0.041	870	0.63	0.075
ANNA MARIA	919	19.27	1,180	1.28	0.29	6,130	6.67	1.53	350	0.38	0.087	250	0.27	0.062
PERICO	860	21.83	580	0.67	0.14	2,970	3.45	0.70	40	0.05	0.009	40	0.05	0.009
LONGBOAT KEY	1,697	15.18	1,750	1.03	0.30	8,850	5.22	1.52	320	0.19	0.055	280	0.16	0.048
OTHER ISLANDS	900	18.68	1,100	1.22	0.29	6,000	6.67	1.57	240	0.27	0.063	200	0.22	0.052
DIRECT TO BAY	4,241	22.35	6,210	1.46	0.29	39,410	9.29	1.83	1,740	0.41	0.081	1,290	0.30	0.060
BAY SURFACE	33,280	41.70	47,150	1.42	0.15	257,730	7.74	0.82	1,890	0.06	0.006	45,890	1.38	0.146
TOTAL	129,412	24.44	178,050	1.52	0.30	962,760	7.54	1.54	25,500	0.29	0.060	67,320	0.32	0.058

TABLE A-10

WET YEAR AND DRY YEAR LOADINGS BY SOURCE
FOR EXISTING LAND USE CONDITIONS

SOURCE	RUNOFF (in)	% OF TOTAL	WET YEAR POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	18.62	40.9%	141,510	43.8%	750,770	46.2%	38,540	90.0%	29,700	24.8%
BASEFLOW	7.23	15.9%	63,630	19.7%	212,180	13.0%	640	1.5%	10,610	8.9%
SEPTIC	0.70	1.5%	8,230	2.5%	123,520	7.6%	0	0.0%	0	0.0%
POINT SOURCE	1.10	2.4%	31,140	9.6%	109,330	6.7%	490	1.1%	2,520	2.1%
RAINFALL	17.92	39.3%	78,800	24.4%	430,790	26.5%	3,150	7.4%	76,700	64.2%
TOTAL	45.57		323,310		1,626,590		42,820		119,530	

SOURCE	RUNOFF (in)	% OF TOTAL	DRY YEAR POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	11.14	45.6%	84,660	47.5%	449,260	46.7%	23,080	90.5%	17,760	26.4%
BASEFLOW	0.78	3.2%	6,870	3.9%	22,920	2.4%	40	0.2%	1,150	1.7%
SEPTIC	0.70	2.9%	8,230	4.6%	123,520	12.8%	0	0.0%	0	0.0%
POINT SOURCE	1.10	4.5%	31,140	17.5%	109,330	11.4%	490	1.9%	2,520	3.7%
RAINFALL	10.72	43.9%	47,150	26.5%	257,730	26.8%	1,890	7.4%	45,890	68.2%
TOTAL	24.44		178,050		962,760		25,500		67,320	

TABLE A-11

WET YEAR AND DRY YEAR LOADINGS BY JURISDICTION
FOR EXISTING LAND USE CONDITIONS

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	WET YEAR POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	16.58	36.4%	141,380	43.7%	717,840	44.1%	15,560	36.3%	22,070	18.5%
SARASOTA CITY	7,844	2.86	6.3%	30,200	9.3%	134,450	8.3%	7,630	17.8%	6,460	5.4%
MANATEE CO.	20,226	6.31	13.9%	53,400	16.5%	261,390	16.1%	14,150	33.0%	11,420	9.6%
ISLANDS	5,761	1.89	4.1%	19,530	6.0%	82,120	5.0%	2,330	5.4%	2,880	2.4%
BAY SURFACE	33,280	17.92	39.3%	78,800	24.4%	430,790	26.5%	3,150	7.4%	76,700	64.2%
TOTAL	129,412	45.56		323,310		1,626,590		42,820		119,530	

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	DRY YEAR POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	7.86	32.1%	70,150	39.4%	420,330	43.7%	9,150	35.9%	9,900	14.7%
SARASOTA CITY	7,844	1.64	6.7%	20,500	11.5%	87,610	9.1%	4,630	18.2%	3,940	5.9%
MANATEE CO.	20,226	3.22	13.2%	28,130	15.8%	146,920	15.3%	8,410	33.0%	5,950	8.8%
ISLANDS	5,761	1.00	4.1%	12,120	6.8%	50,170	5.2%	1,420	5.6%	1,640	2.4%
BAY SURFACE	33,280	10.72	43.9%	47,150	26.5%	257,730	26.8%	1,890	7.4%	45,890	68.2%
TOTAL	129,412	24.44		178,050		962,760		25,500		67,320	

TABLE A-12

AVERAGE ANNUAL LOADINGS BY SOURCE AND SEGMENT
FOR EXISTING LAND USE

Constituent	Segment Number	Watershed(s)	Average Annual Loadings (lb/yr) Surface Runoff	Baseflow	Septic Tanks	Point Source	Rainfall	Total
Total P								
	1	Anna Maria Island	1,480	260	0	0	3,587	5,327
	2	Perico Island, West Bradenton	6,500	1,790	0	0	3,999	12,289
	3	Palma Sola 2	1,270	370	0	0	2,563	4,203
	5	Longboat Key (40%)	856	236	0	0	6,307	7,399
	6	Palma Sola Creek, South Bradenton	7,410	2,160	0	4,690	9,179	23,439
	7	Longboat Key (40%)	856	236	0	0	8,102	9,194
	8	Cedar Hammock, Bowlees Creek, West Bowlees	15,800	2,380	0	0	8,204	26,384
	10	Longboat Key (20%), Other Islands (50%)	1,073	268	25	0	7,382	8,748
	11	Hudson Bayou, Whitaker Bayou, Direct to Bay	12,130	2,060	620	10,780	4,255	29,845
	13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	51,620	15,380	6,930	15,510	2,667	92,107
	14	Catfish Creek, North Creek, Direct to Bay	4,850	2,590	500	160	3,487	11,587
	16	Other Islands (50%), South Creek, Direct to Bay	7,025	6,070	155	0	1,998	15,248
		Total	110,870	33,800	8,230	31,140	61,730	245,770
Total N								
	1	Anna Maria Island	7,780	880	0	0	19,611	28,271
	2	Perico Island, West Bradenton	34,710	5,950	0	0	21,862	62,522
	3	Palma Sola 2	7,120	1,220	0	0	14,014	22,354
	5	Longboat Key (40%)	4,412	788	0	0	34,476	39,676
	6	Palma Sola Creek, South Bradenton	33,170	7,200	0	23,380	50,173	113,923
	7	Longboat Key (40%)	4,412	788	0	0	44,292	49,492
	8	Cedar Hammock, Bowlees Creek, West Bowlees	92,030	7,920	0	0	44,849	144,799
	10	Longboat Key (20%), Other Islands (50%)	5,546	894	340	0	40,357	47,137
	11	Hudson Bayou, Whitaker Bayou, Direct to Bay	68,600	6,900	9,270	33,830	23,261	141,861
	13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	261,810	51,290	104,100	51,330	14,581	483,111
	14	Catfish Creek, North Creek, Direct to Bay	26,750	8,650	7,530	790	19,063	62,783
	16	Other Islands (50%), South Creek, Direct to Bay	41,870	20,210	2,280	0	10,921	75,281
		Total	588,210	112,690	123,520	109,330	337,460	1,271,210

TABLE A-12 (CONTINUED)

AVERAGE ANNUAL LOADINGS BY SOURCE AND SEGMENT
FOR EXISTING LAND USE

Constituent	Segment Number	Watershed(s)	Average Annual Loadings (lb/yr) Surface Runoff	Baseflow	Septic Tanks	Point Source	Rainfall	Total
Lead								
	1	Anna Maria Island	450	0	0	0	144	594
	2	Perico Island, West Bradenton	1,530	10	0	0	160	1,700
	3	Palma Sola 2	350	0	0	0	103	453
	5	Longboat Key (40%)	172	4	0	0	252	428
	6	Palma Sola Creek, South Bradenton	780	20	0	20	367	1,187
	7	Longboat Key (40%)	172	4	0	0	324	500
	8	Cedar Hammock, Bowlees Creek, West Bowlees	8,950	10	0	0	328	9,288
	10	Longboat Key (20%), Other Islands (50%)	241	2	0	0	295	538
	11	Hudson Bayou, Whitaker Bayou, Direct to Bay	5,900	20	0	200	170	6,290
	13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	10,280	150	0	270	107	10,807
	14	Catfish Creek, North Creek, Direct to Bay	820	20	0	0	140	980
	16	Other Islands (50%), South Creek, Direct to Bay	535	60	0	0	80	675
		Total	30,180	300	0	490	2,470	33,440
Zinc								
	1	Anna Maria Island	320	40	0	0	3,491	3,851
	2	Perico Island, West Bradenton	1,210	300	0	0	3,892	5,402
	3	Palma Sola 2	260	60	0	0	2,495	2,815
	5	Longboat Key (40%)	140	40	0	0	6,138	6,318
	6	Palma Sola Creek, South Bradenton	860	360	0	120	8,933	10,273
	7	Longboat Key (40%)	140	40	0	0	7,886	8,066
	8	Cedar Hammock, Bowlees Creek, West Bowlees	5,440	390	0	0	7,985	13,815
	10	Longboat Key (20%), Other Islands (50%)	190	45	0	0	7,185	7,420
	11	Hudson Bayou, Whitaker Bayou, Direct to Bay	3,880	350	0	1,030	4,141	9,401
	13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	9,200	2,560	0	1,370	2,596	15,726
	14	Catfish Creek, North Creek, Direct to Bay	840	430	0	0	3,394	4,664
	16	Other Islands (50%), South Creek, Direct to Bay	780	1,005	0	0	1,944	3,729
		Total	23,260	5,620	0	2,520	60,080	91,480

TABLE A-13

AVERAGE ANNUAL LOADINGS BY WATERSHED AND SOURCE
FOR EXISTING LAND USE

Constituent	Watershed	Average Annual Loadings (lb/yr) Surface Runoff	Baseflow	Septic Tanks	Point Source	Rainfall	Total
Total P							
	Phillippi Creek	42,430	13,470	5,850	5,110	0	66,860
	Palma Sola 2	1,270	370	0	0	0	1,640
	Bowlees Creek	9,640	1,460	0	0	0	11,100
	West Bradenton	5,820	1,430	0	0	0	7,250
	Cedar Hammock	3,620	470	0	0	0	4,090
	West Bowlees	2,540	450	0	0	0	2,990
	Palma Sola Creek	1,400	310	0	0	0	1,710
	South Bradenton	6,010	1,850	0	4,690	0	12,550
	Whitaker Bayou	7,470	1,400	620	10,780	0	20,270
	Matheny Creek	4,680	1,160	690	4,860	0	11,390
	Catfish Creek	2,030	1,410	150	0	0	3,590
	North Creek	1,260	800	100	0	0	2,160
	South Creek	5,310	5,670	70	0	0	11,050
	Hudson Bayou	2,700	370	0	0	0	3,070
	Siesta Key	2,450	420	0	5,540	0	8,410
	Anna Maria Island	1,480	260	0	0	0	1,740
	Perico Island	680	360	0	0	0	1,040
	Longboat Key	2,140	590	0	0	0	2,730
	Other Islands	1,290	300	50	0	0	1,640
	Direct to Bay	6,650	1,250	700	160	0	8,760
	Bay Surface	0	0	0	0	61,730	61,730
	Total	110,870	33,800	8,230	31,140	61,730	245,770
Total N							
	Phillippi Creek	211,520	44,910	87,750	18,770	0	362,950
	Palma Sola 2	7,120	1,220	0	0	0	8,340
	Bowlees Creek	59,460	4,860	0	0	0	64,320
	West Bradenton	31,160	4,750	0	0	0	35,910
	Cedar Hammock	19,280	1,550	0	0	0	20,830
	West Bowlees	13,290	1,510	0	0	0	14,800
	Palma Sola Creek	6,450	1,040	0	0	0	7,490
	South Bradenton	26,720	6,160	0	23,380	0	56,260
	Whitaker Bayou	42,090	4,680	9,270	33,830	0	89,870
	Matheny Creek	27,130	3,850	10,380	15,930	0	57,290
	Catfish Creek	11,620	4,710	2,310	0	0	18,640
	North Creek	6,950	2,680	1,540	0	0	11,170
	South Creek	33,270	18,890	1,030	0	0	53,190
	Hudson Bayou	15,330	1,240	0	0	0	16,570
	Siesta Key	12,190	1,410	0	16,630	0	30,230
	Anna Maria Island	7,780	880	0	0	0	8,660
	Perico Island	3,550	1,200	0	0	0	4,750
	Longboat Key	11,030	1,970	0	0	0	13,000
	Other Islands	6,680	1,000	680	0	0	8,360
	Direct to Bay	35,590	4,180	10,560	790	0	51,120
	Bay Surface	0	0	0	0	337,460	337,460
	Total	588,210	112,690	123,520	109,330	337,460	1,271,210

TABLE A-13 (CONTINUED)

AVERAGE ANNUAL LOADINGS BY WATERSHED AND SOURCE
FOR EXISTING LAND USE

Constituent	Watershed	Average Annual Loadings (lb/yr) Surface Runoff	Baseflow	Septic Tanks	Point Source	Rainfall	Total
Lead							
	Phillippi Creek	7,200	140	0	70	0	7,410
	Palma Sola 2	350	0	0	0	0	350
	Bowlees Creek	6,960	10	0	0	0	6,970
	West Bradenton	1,480	10	0	0	0	1,490
	Cedar Hammock	1,280	0	0	0	0	1,280
	West Bowlees	710	0	0	0	0	710
	Palma Sola Creek	230	0	0	0	0	230
	South Bradenton	550	20	0	20	0	590
	Whitaker Bayou	3,410	20	0	200	0	3,630
	Matheny Creek	1,940	10	0	90	0	2,040
	Catfish Creek	230	10	0	0	0	240
	North Creek	210	10	0	0	0	220
	South Creek	190	60	0	0	0	250
	Hudson Bayou	1,440	0	0	0	0	1,440
	Siesta Key	470	0	0	110	0	580
	Anna Maria Island	450	0	0	0	0	450
	Perico Island	50	0	0	0	0	50
	Longboat Key	430	10	0	0	0	440
	Other Islands	310	0	0	0	0	310
	Direct to Bay	2,290	0	0	0	0	2,290
	Bay Surface	0	0	0	0	2,470	2,470
	Total	30,180	300	0	490	2,470	33,440
Zinc							
	Phillippi Creek	6,830	2,240	0	380	0	9,450
	Palma Sola 2	260	60	0	0	0	320
	Bowlees Creek	4,030	240	0	0	0	4,270
	West Bradenton	1,170	240	0	0	0	1,410
	Cedar Hammock	890	80	0	0	0	970
	West Bowlees	520	70	0	0	0	590
	Palma Sola Creek	170	50	0	0	0	220
	South Bradenton	690	310	0	120	0	1,120
	Whitaker Bayou	2,360	240	0	1,030	0	3,630
	Matheny Creek	1,470	190	0	440	0	2,100
	Catfish Creek	320	240	0	0	0	560
	North Creek	220	130	0	0	0	350
	South Creek	460	940	0	0	0	1,400
	Hudson Bayou	870	60	0	0	0	930
	Siesta Key	410	70	0	550	0	1,030
	Anna Maria Island	320	40	0	0	0	360
	Perico Island	40	60	0	0	0	100
	Longboat Key	350	100	0	0	0	450
	Other Islands	240	50	0	0	0	290
	Direct to Bay	1,640	210	0	0	0	1,850
	Bay Surface	0	0	0	0	60,080	60,080
	Total	23,260	5,620	0	2,520	60,080	91,480

Appendix B

TABLE B-1

AVERAGE ANNUAL LOADINGS BY WATERSHED
FOR FIVE - YEAR FUTURE LAND USE CONDITIONS

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	25.45	67,510	1.85	0.32	366,890	10.07	1.75	7,750	0.21	0.037	9,670	0.27	0.046
PALMA SOLA 2	1,120	25.12	1,640	1.46	0.26	8,340	7.45	1.31	350	0.31	0.055	320	0.29	0.050
BOWLEES CREEK	6,489	33.61	11,100	1.71	0.22	64,320	9.91	1.30	6,970	1.07	0.141	4,270	0.66	0.086
WEST BRADENTON	4,395	28.94	7,250	1.65	0.25	35,910	8.17	1.25	1,490	0.34	0.052	1,410	0.32	0.049
CEDAR HAMMOCK	1,930	32.35	4,090	2.12	0.29	20,830	10.79	1.47	1,280	0.66	0.090	970	0.50	0.069
WEST BOWLEES	1,559	27.93	2,990	1.92	0.30	14,800	9.49	1.50	710	0.46	0.072	590	0.38	0.060
PALMA SOLA	900	23.47	1,710	1.90	0.36	7,490	8.32	1.56	230	0.26	0.048	220	0.24	0.046
SOUTH BRADENTON	4,635	29.55	13,860	2.99	0.45	62,780	13.54	2.02	600	0.13	0.019	1,150	0.25	0.037
WHITAKER BAYOU	5,015	35.76	14,640	2.92	0.36	72,910	14.54	1.79	3,520	0.70	0.087	3,060	0.61	0.075
MATHENY CREEK	3,800	37.25	11,710	3.08	0.36	59,280	15.60	1.85	2,330	0.61	0.073	2,260	0.59	0.070
CATFISH CREEK	3,360	25.42	4,800	1.43	0.25	24,880	7.40	1.29	750	0.22	0.039	900	0.27	0.046
NORTH CREEK	1,920	20.60	2,160	1.13	0.24	11,170	5.82	1.25	220	0.11	0.025	350	0.18	0.039
SOUTH CREEK	12,995	18.79	11,050	0.85	0.20	53,190	4.09	0.96	250	0.02	0.005	1,400	0.11	0.025
HUDSON BAYOU	1,595	32.58	3,070	1.92	0.26	16,570	10.39	1.41	1,440	0.90	0.122	930	0.58	0.079
SIESTA KEY	1,385	45.94	8,410	6.07	0.58	30,230	21.83	2.10	580	0.42	0.040	1,030	0.74	0.071
ANNA MARIA	919	28.32	1,740	1.89	0.29	8,660	9.42	1.47	450	0.49	0.076	360	0.39	0.061
PERICO	860	33.12	1,040	1.21	0.16	4,750	5.52	0.74	50	0.06	0.008	100	0.12	0.015
LONGBOAT KEY	1,697	23.62	2,730	1.61	0.30	13,000	7.66	1.43	440	0.26	0.048	450	0.27	0.050
OTHER ISLANDS	900	27.94	1,640	1.82	0.29	8,360	9.29	1.47	310	0.34	0.054	290	0.32	0.051
DIRECT TO BAY	4,241	31.85	8,760	2.07	0.29	51,120	12.05	1.67	2,290	0.54	0.075	1,850	0.44	0.060
BAY SURFACE	33,280	54.60	61,730	1.85	0.15	337,460	10.14	0.82	2,470	0.07	0.006	60,080	1.81	0.146
TOTAL	129,412	34.32	243,630	2.07	0.29	1,272,940	10.07	1.45	34,480	0.39	0.056	91,660	0.44	0.059

TABLE B-2

AVERAGE ANNUAL LOADINGS BY SOURCE
FOR FIVE - YEAR FUTURE LAND USE CONDITIONS

SOURCE	RUNOFF (in)	% OF TOTAL	AVERAGE YEAR POLLUTANT LOADING							
			TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	14.81	43.1%	113,340	46.5%	601,050	47.2%	31,320	90.8%	24,030	26.2%
BASEFLOW	3.81	11.1%	33,480	13.7%	111,650	8.8%	300	0.9%	5,570	6.1%
SEPTIC	0.70	2.0%	8,260	3.4%	123,890	9.7%	0	0.0%	0	0.0%
POINT SOURCE	0.96	2.8%	26,820	11.0%	98,890	7.8%	390	1.1%	1,980	2.2%
RAINFALL	14.04	40.9%	61,730	25.3%	337,460	26.5%	2,470	7.2%	60,080	65.5%
TOTAL	34.32		243,630		1,272,940		34,480		91,660	

TABLE B-3

AVERAGE ANNUAL LOADINGS BY JURISDICTION
FOR FIVE - YEAR FUTURE LAND USE CONDITIONS

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	AVERAGE YEAR POLLUTANT LOADING							
				Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	12.13	35.3%	105,690	43.4%	571,440	44.9%	13,240	38.4%	16,310	17.8%
SARASOTA CITY	7,844	2.01	5.9%	19,410	8.0%	92,380	7.3%	5,900	17.1%	4,540	5.0%
MANATEE CO.	20,226	4.72	13.8%	41,240	16.9%	206,660	16.2%	11,040	32.0%	8,500	9.3%
ISLANDS	5,761	1.42	4.1%	15,560	6.4%	65,000	5.1%	1,830	5.3%	2,230	2.4%
BAY SURFACE	33,280	14.04	40.9%	61,730	25.3%	337,460	26.5%	2,470	7.2%	60,080	65.5%
TOTAL	129,412	34.32		243,630		1,272,940		34,480		91,660	

TABLE B-4

WET SEASON LOADINGS BY WATERSHED
FOR FIVE-YEAR LAND USE CONDITIONS

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	15.66	41,070	1.13	0.32	215,900	5.93	1.67	4,780	0.13	0.037	6,130	0.17	0.047
PALMA SOLA 2	1,120	16.06	1,050	0.94	0.26	5,290	4.72	1.30	220	0.20	0.054	200	0.18	0.049
BOWLEES CREEK	6,489	21.12	7,000	1.08	0.23	40,270	6.21	1.30	4,310	0.66	0.139	2,670	0.41	0.086
WEST BRADENTON	4,395	18.41	4,640	1.06	0.25	22,700	5.16	1.24	920	0.21	0.050	900	0.20	0.049
CEDAR HAMMOCK	1,930	20.38	2,570	1.33	0.29	13,060	6.77	1.47	790	0.41	0.089	610	0.32	0.068
WEST BOWLEES	1,559	17.73	1,880	1.21	0.30	9,320	5.98	1.49	440	0.28	0.070	370	0.24	0.059
PALMA SOLA	900	15.08	1,080	1.20	0.35	4,750	5.28	1.54	140	0.16	0.046	150	0.17	0.049
SOUTH BRADENTON	4,635	16.73	7,080	1.53	0.40	30,990	6.69	1.76	360	0.08	0.020	710	0.15	0.040
WHITAKER BAYOU	5,015	21.45	8,270	1.65	0.34	41,670	8.31	1.71	2,150	0.43	0.088	1,830	0.36	0.075
MATHENY CREEK	3,800	21.40	5,910	1.56	0.32	31,310	8.24	1.70	1,420	0.37	0.077	1,290	0.34	0.070
CATFISH CREEK	3,360	16.18	3,070	0.91	0.25	15,570	4.63	1.26	460	0.14	0.037	580	0.17	0.047
NORTH CREEK	1,920	13.26	1,420	0.74	0.25	7,040	3.67	1.22	140	0.07	0.024	230	0.12	0.040
SOUTH CREEK	12,995	12.32	7,470	0.57	0.21	34,910	2.69	0.96	160	0.01	0.004	970	0.07	0.027
HUDSON BAYOU	1,595	20.51	1,930	1.21	0.26	10,370	6.50	1.40	890	0.56	0.120	590	0.37	0.080
SIESTA KEY	1,385	23.86	3,670	2.65	0.49	14,090	10.17	1.88	330	0.24	0.044	480	0.35	0.064
ANNA MARIA	919	17.97	1,120	1.22	0.30	5,450	5.93	1.46	280	0.30	0.075	230	0.25	0.061
PERICO	860	21.16	650	0.76	0.16	3,080	3.58	0.75	30	0.03	0.007	70	0.08	0.017
LONGBOAT KEY	1,697	15.17	1,750	1.03	0.30	8,270	4.87	1.42	260	0.15	0.045	280	0.16	0.048
OTHER ISLANDS	900	17.71	1,030	1.14	0.29	5,150	5.72	1.43	190	0.21	0.053	190	0.21	0.053
DIRECT TO BAY	4,241	19.61	5,390	1.27	0.29	30,590	7.21	1.62	1,420	0.33	0.075	1,170	0.28	0.062
BAY SURFACE	33,280	33.70	38,100	1.14	0.15	208,290	6.26	0.82	1,520	0.05	0.006	37,090	1.11	0.146
TOTAL	129,412	21.17	146,150	1.21	0.29	758,070	5.93	1.40	21,210	0.24	0.055	56,740	0.27	0.059

TABLE B-5

DRY SEASON LOADINGS BY WATERSHED
FOR FIVE-YEAR LAND USE CONDITIONS

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	9.80	26,450	0.73	0.33	150,960	4.15	1.87	2,960	0.08	0.037	3,550	0.10	0.044
PALMA SOLA 2	1,120	9.06	590	0.53	0.26	3,040	2.71	1.32	130	0.12	0.057	120	0.11	0.052
BOWLEES CREEK	6,489	12.48	4,030	0.62	0.22	24,070	3.71	1.31	2,660	0.41	0.145	1,600	0.25	0.087
WEST BRADENTON	4,395	10.52	2,620	0.60	0.25	13,180	3.00	1.26	570	0.13	0.054	510	0.12	0.049
CEDAR HAMMOCK	1,930	11.97	1,500	0.78	0.29	7,790	4.04	1.49	490	0.25	0.094	360	0.19	0.069
WEST BOWLEES	1,559	10.19	1,100	0.71	0.31	5,490	3.52	1.52	270	0.17	0.075	220	0.14	0.061
PALMA SOLA	900	8.39	620	0.69	0.36	2,750	3.06	1.61	90	0.10	0.053	80	0.09	0.047
SOUTH BRADENTON	4,635	12.81	6,780	1.46	0.50	31,780	6.86	2.36	230	0.05	0.017	440	0.09	0.033
WHITAKER BAYOU	5,015	14.32	6,370	1.27	0.39	31,260	6.23	1.92	1,360	0.27	0.084	1,220	0.24	0.075
MATHENY CREEK	3,800	15.85	5,810	1.53	0.43	27,970	7.36	2.05	910	0.24	0.067	970	0.26	0.071
CATFISH CREEK	3,360	9.24	1,710	0.51	0.24	9,320	2.77	1.32	290	0.09	0.041	320	0.10	0.045
NORTH CREEK	1,920	7.34	730	0.38	0.23	4,150	2.16	1.30	80	0.04	0.025	120	0.06	0.038
SOUTH CREEK	12,995	6.46	3,580	0.28	0.19	18,300	1.41	0.96	90	0.01	0.005	420	0.03	0.022
HUDSON BAYOU	1,595	12.07	1,140	0.71	0.26	6,190	3.88	1.42	550	0.34	0.126	360	0.23	0.082
SIESTA KEY	1,385	22.05	4,740	3.42	0.68	16,090	11.62	2.32	250	0.18	0.036	550	0.40	0.079
ANNA MARIA	919	10.35	640	0.70	0.30	3,210	3.49	1.49	170	0.18	0.079	130	0.14	0.060
PERICO	860	11.96	330	0.38	0.14	1,670	1.94	0.72	20	0.02	0.009	40	0.05	0.017
LONGBOAT KEY	1,697	8.45	970	0.57	0.30	4,760	2.80	1.46	160	0.09	0.049	160	0.09	0.049
OTHER ISLANDS	900	10.23	610	0.68	0.29	3,200	3.56	1.53	120	0.13	0.058	100	0.11	0.048
DIRECT TO BAY	4,241	12.25	3,330	0.79	0.28	20,610	4.86	1.75	880	0.21	0.075	700	0.17	0.059
BAY SURFACE	33,280	20.90	23,630	0.71	0.15	129,170	3.88	0.82	950	0.03	0.006	23,000	0.69	0.146
TOTAL	129,412	13.15	97,280	0.86	0.30	514,960	4.14	1.51	13,230	0.15	0.057	34,970	0.17	0.059

TABLE B-6

WET SEASON AND DRY SEASON LOADINGS BY SOURCE
FOR FIVE - YEAR FUTURE LAND USE CONDITIONS

SOURCE	RUNOFF (in)	% OF TOTAL	WET SEASON POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	9.14	43.2%	69,820	47.8%	371,050	48.9%	19,350	91.2%	14,860	26.2%
BASEFLOW	2.79	13.2%	24,550	16.8%	81,830	10.8%	200	0.9%	4,070	7.2%
SEPTIC	0.23	1.1%	4130	2.8%	61,900	8.2%	0	0.0%	0	0.0%
POINT SOURCE	0.34	1.6%	9,550	6.5%	35,000	4.6%	140	0.7%	720	1.3%
RAINFALL	8.67	40.9%	38,100	26.1%	208,290	27.5%	1,520	7.2%	37,090	65.4%
TOTAL	21.17		146,150		758,070		21,210		56,740	

SOURCE	RUNOFF (in)	% OF TOTAL	DRY SEASON POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	5.67	43.1%	43,280	44.5%	230,000	44.7%	11,980	90.6%	9,200	26.3%
BASEFLOW	1.02	7.7%	8,940	9.2%	29,810	5.8%	50	0.4%	1,510	4.3%
SEPTIC	0.47	3.6%	4,140	4.3%	61,980	12.0%	0	0.0%	0	0.0%
POINT SOURCE	0.62	4.7%	17,290	17.8%	64,000	12.4%	250	1.9%	1,260	3.6%
RAINFALL	5.37	40.9%	23,630	24.3%	129,170	25.1%	950	7.2%	23,000	65.8%
TOTAL	13.15		97,280		514,960		13,230		34,970	

TABLE B-7

WET SEASON AND DRY SEASON LOADINGS BY JURISDICTION
FOR FIVE - YEAR FUTURE LAND USE CONDITIONS

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	WET SEASON POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	7.50	35.4%	64,020	43.8%	337,210	44.5%	8,170	38.5%	10,280	18.1%
SARASOTA CITY	7,844	1.24	5.9%	11,320	7.7%	55,050	7.3%	3,610	17.0%	2,770	4.9%
MANATEE CO.	20,226	2.92	13.8%	24,470	16.7%	121,480	16.0%	6,820	32.2%	5,350	9.4%
ISLANDS	5,761	0.85	4.0%	8,240	5.6%	36,040	4.8%	1,090	5.1%	1,250	2.2%
BAY SURFACE	33,280	8.67	40.9%	38,100	26.1%	208,290	27.5%	1,520	7.2%	37,090	65.4%
TOTAL	129,412	21.17		146,150		758,070		21,210		56,740	

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	DRY SEASON POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	4.63	35.2%	41,550	42.7%	234,350	45.5%	5,080	38.4%	6,040	17.3%
SARASOTA CITY	7,844	0.77	5.8%	8,020	8.2%	37,340	7.3%	2,260	17.1%	1,790	5.1%
MANATEE CO.	20,226	1.80	13.7%	16,760	17.2%	85,170	16.5%	4,220	31.9%	3,160	9.0%
ISLANDS	5,761	0.57	4.3%	7,320	7.5%	28,930	5.6%	720	5.4%	980	2.8%
BAY SURFACE	33,280	5.37	40.9%	23,630	24.3%	129,170	25.1%	950	7.2%	23,000	65.8%
TOTAL	129,412	13.15		97,280		514,960		13,230		34,970	

TABLE B-8

WET YEAR LOADINGS BY WATERSHED
FOR FIVE - YEAR FUTURE LAND USE CONDITIONS

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	35.11	91,260	2.51	0.31	465,810	12.79	1.61	9,950	0.27	0.034	13,600	0.37	0.047
PALMA SOLA 2	1,120	34.98	2,310	2.06	0.26	11,380	10.16	1.28	460	0.41	0.052	440	0.39	0.050
BOWLEES CREEK	6,489	44.90	15,060	2.32	0.23	85,060	13.11	1.29	8,920	1.37	0.135	5,620	0.87	0.085
WEST BRADENTON	4,395	39.83	10,110	2.30	0.25	48,680	11.08	1.23	1,920	0.44	0.048	1,950	0.44	0.049
CEDAR HAMMOCK	1,930	43.45	5,500	2.85	0.29	27,550	14.27	1.45	1,640	0.85	0.086	1,290	0.67	0.068
WEST BOWLEES	1,559	38.24	4,090	2.62	0.30	19,830	12.72	1.47	910	0.58	0.067	810	0.52	0.060
PALMA SOLA	900	33.05	2,350	2.61	0.35	10,180	11.31	1.51	310	0.34	0.046	320	0.36	0.047
SOUTH BRADENTON	4,635	39.15	17,160	3.70	0.42	75,590	16.31	1.84	760	0.16	0.018	1,610	0.35	0.039
WHITAKER BAYOU	5,015	46.57	17,930	3.58	0.34	88,620	17.67	1.67	4,470	0.89	0.084	3,900	0.78	0.074
MATHENY CREEK	3,800	48.08	14,090	3.71	0.34	70,610	18.58	1.71	2,960	0.78	0.071	2,880	0.76	0.070
CATFISH CREEK	3,360	35.64	6,830	2.03	0.25	33,640	10.01	1.24	960	0.29	0.035	1,260	0.38	0.046
NORTH CREEK	1,920	29.87	3,210	1.67	0.25	15,450	8.05	1.19	290	0.15	0.022	530	0.28	0.041
SOUTH CREEK	12,995	27.85	17,510	1.35	0.21	79,060	6.08	0.96	360	0.03	0.004	2,360	0.18	0.029
HUDSON BAYOU	1,595	43.68	4,140	2.60	0.26	21,920	13.74	1.39	1,850	1.16	0.117	1,240	0.78	0.079
SIESTA KEY	1,385	56.49	9,460	6.83	0.53	34,830	25.15	1.96	720	0.52	0.041	1,200	0.87	0.068
ANNA MARIA	919	38.71	2,410	2.62	0.30	11,600	12.62	1.44	580	0.63	0.072	490	0.53	0.061
PERICO	860	46.02	1,570	1.83	0.18	6,800	7.91	0.76	80	0.09	0.009	160	0.19	0.018
LONGBOAT KEY	1,697	33.25	3,840	2.26	0.30	17,800	10.49	1.39	550	0.32	0.043	630	0.37	0.049
OTHER ISLANDS	900	38.53	2,260	2.51	0.29	11,090	12.32	1.41	400	0.44	0.051	400	0.44	0.051
DIRECT TO BAY	4,241	42.75	11,670	2.75	0.28	64,690	15.25	1.57	2,930	0.69	0.071	2,490	0.59	0.061
BAY SURFACE	33,280	69.70	78,800	2.37	0.15	430,790	12.94	0.82	3,150	0.09	0.006	76,700	2.30	0.146
TOTAL	129,412	45.66	321,560	2.72	0.29	1,630,980	12.98	1.39	44,170	0.50	0.053	119,880	0.59	0.059

TABLE B-9

DRY YEAR LOADINGS BY WATERSHED
FOR FIVE - YEAR FUTURE LAND USE CONDITIONS

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	20.73	59,410	1.63	0.35	346,630	9.52	2.03	9,980	0.27	0.058	9,590	0.26	0.056
PALMA SOLA 2	1,120	16.49	1,040	0.93	0.25	5,680	5.07	1.36	270	0.24	0.064	210	0.19	0.050
BOWLEES CREEK	6,489	23.83	7,680	1.18	0.22	46,480	7.16	1.33	5,320	0.82	0.152	3,140	0.48	0.090
WEST BRADENTON	4,395	19.43	4,710	1.07	0.24	24,740	5.63	1.28	1,130	0.26	0.058	950	0.22	0.049
CEDAR HAMMOCK	1,930	22.72	2,850	1.48	0.29	15,070	7.81	1.52	980	0.51	0.099	710	0.37	0.071
WEST BOWLEES	1,559	18.93	2,030	1.30	0.30	10,460	6.71	1.56	550	0.35	0.082	420	0.27	0.063
PALMA SOLA	900	15.06	1,100	1.22	0.36	5,140	5.71	1.67	180	0.20	0.059	140	0.16	0.046
SOUTH BRADENTON	4,635	21.11	10,990	2.37	0.50	51,570	11.13	2.33	450	0.10	0.020	740	0.16	0.033
WHITAKER BAYOU	5,015	27.47	12,290	2.45	0.39	62,020	12.37	1.99	2,890	0.58	0.093	2,430	0.48	0.078
MATHENY CREEK	3,800	34.47	13,400	3.53	0.45	63,960	16.83	2.15	2,540	0.67	0.086	2,380	0.63	0.080
CATFISH CREEK	3,360	20.58	4,550	1.35	0.29	24,520	7.30	1.56	950	0.28	0.061	890	0.26	0.057
NORTH CREEK	1,920	19.24	2,830	1.47	0.34	14,630	7.62	1.75	440	0.23	0.053	480	0.25	0.057
SOUTH CREEK	12,995	13.41	9,760	0.75	0.25	50,760	3.91	1.29	880	0.07	0.022	1,330	0.10	0.034
HUDSON BAYOU	1,595	22.95	2,140	1.34	0.26	11,950	7.49	1.44	1,100	0.69	0.133	680	0.43	0.082
SIESTA KEY	1,385	36.74	7,500	5.42	0.65	26,220	18.93	2.27	470	0.34	0.041	870	0.63	0.075
ANNA MARIA	919	19.27	1,180	1.28	0.29	6,130	6.67	1.53	350	0.38	0.087	250	0.27	0.062
PERICO	860	21.83	580	0.67	0.14	2,970	3.45	0.70	40	0.05	0.009	40	0.05	0.009
LONGBOAT KEY	1,697	15.18	1,750	1.03	0.30	8,850	5.22	1.52	320	0.19	0.055	280	0.16	0.048
OTHER ISLANDS	900	18.68	1,100	1.22	0.29	6,000	6.67	1.57	240	0.27	0.063	200	0.22	0.052
DIRECT TO BAY	4,241	23.23	6,530	1.54	0.29	41,050	9.68	1.84	1,900	0.45	0.085	1,390	0.33	0.062
BAY SURFACE	33,280	41.70	47,150	1.42	0.15	257,730	7.74	0.82	1,890	0.06	0.006	45,890	1.38	0.146
TOTAL	129,412	26.27	200,570	1.65	0.31	1,082,560	8.22	1.59	32,870	0.33	0.066	73,010	0.35	0.062

TABLE B-10

WET YEAR AND DRY YEAR LOADINGS BY SOURCE
FOR FIVE - YEAR FUTURE LAND USE CONDITIONS

SOURCE	RUNOFF (in)	% OF TOTAL	WET YEAR POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	18.91	41.4%	144,630	45.0%	767,170	47.0%	40,000	90.6%	30,690	25.6%
BASEFLOW	7.17	15.7%	63,050	19.6%	210,240	12.9%	630	1.4%	10,510	8.8%
SEPTIC	0.70	1.5%	8,260	2.6%	123,890	7.6%	0	0.0%	0	0.0%
POINT SOURCE	0.96	2.1%	26,820	8.3%	98,890	6.1%	390	0.9%	1,980	1.7%
RAINFALL	17.92	39.3%	78,800	24.5%	430,790	26.4%	3,150	7.1%	76,700	64.0%
TOTAL	45.66		321,560		1,630,980		44,170		119,880	

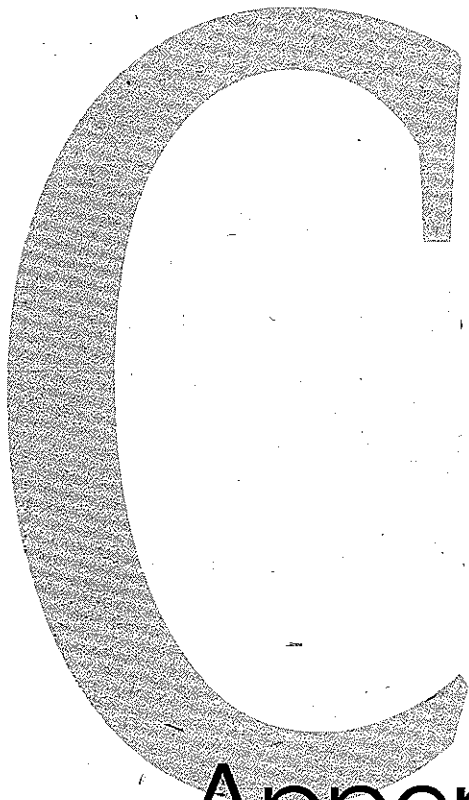
SOURCE	RUNOFF (in)	% OF TOTAL	DRY YEAR POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	12.98	49.4%	106,050	52.9%	560,060	51.7%	30,460	92.7%	23,610	32.3%
BASEFLOW	0.71	2.7%	6,190	3.1%	20,680	1.9%	30	0.1%	1,040	1.4%
SEPTIC	0.70	2.7%	8,270	4.1%	124,060	11.5%	0	0.0%	0	0.0%
POINT SOURCE	1.16	4.4%	32,910	16.4%	120,030	11.1%	490	1.5%	2,470	3.4%
RAINFALL	10.72	40.8%	47,150	23.5%	257,730	23.8%	1,890	5.7%	45,890	62.9%
TOTAL	26.27		200,570		1,082,560		32,870		73,010	

TABLE B-11

WET YEAR AND DRY YEAR LOADINGS BY JURISDICTION
FOR FIVE - YEAR FUTURE LAND USE CONDITIONS

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	WET YEAR POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	16.81	36.8%	143,950	44.8%	732,670	44.9%	17,010	38.5%	22,960	19.2%
SARASOTA CITY	7,844	2.66	5.8%	24,570	7.6%	117,490	7.2%	7,520	17.0%	5,890	4.9%
MANATEE CO.	20,226	6.37	14.0%	54,710	17.0%	267,910	16.4%	14,160	32.1%	11,450	9.6%
ISLANDS	5,761	1.89	4.1%	19,530	6.1%	82,120	5.0%	2,330	5.3%	2,880	2.4%
BAY SURFACE	33,280	17.92	39.3%	78,800	24.5%	430,790	26.4%	3,150	7.1%	76,700	64.0%
TOTAL	129,412	45.66		321,560		1,630,980		44,170		119,880	

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	DRY YEAR POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	9.82	37.4%	96,990	48.4%	550,570	50.9%	16,620	50.6%	16,130	22.1%
SARASOTA CITY	7,844	1.44	5.5%	14,870	7.4%	70,650	6.5%	4,520	13.8%	3,370	4.6%
MANATEE CO.	20,226	3.28	12.5%	29,440	14.7%	153,440	14.2%	8,420	25.6%	5,980	8.2%
ISLANDS	5,761	1.00	3.8%	12,120	6.0%	50,170	4.6%	1,420	4.3%	1,640	2.2%
BAY SURFACE	33,280	10.72	40.8%	47,150	23.5%	257,730	23.8%	1,890	5.7%	45,890	62.9%
TOTAL	129,412	26.27		200,570		1,082,560		32,870		73,010	



Appendix C

TABLE C-1

AVERAGE ANNUAL LOADINGS BY WATERSHED
FOR 20-YEAR FUTURE LAND USE CONDITIONS

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	27.10	73,030	2.01	0.33	396,950	10.90	1.77	9,850	0.27	0.044	11,270	0.31	0.050
PALMA SOLA 2	1,120	28.81	2,020	1.80	0.28	10,290	9.19	1.41	490	0.44	0.067	420	0.38	0.057
BOWLEES CREEK	6,489	35.10	11,590	1.79	0.22	67,850	10.46	1.31	7,580	1.17	0.147	4,600	0.71	0.089
WEST BRADENTON	4,395	30.07	7,670	1.75	0.26	38,270	8.71	1.28	1,660	0.38	0.055	1,540	0.35	0.051
CEDAR HAMMOCK	1,930	32.35	4,090	2.12	0.29	20,830	10.79	1.47	1,280	0.66	0.090	970	0.50	0.069
WEST BOWLEES	1,559	28.38	3,090	1.98	0.31	15,240	9.78	1.52	730	0.47	0.073	600	0.38	0.060
PALMA SOLA	900	27.46	1,800	2.00	0.32	8,480	9.42	1.51	340	0.38	0.061	290	0.32	0.052
SOUTH BRADENTON	4,635	39.53	18,590	4.01	0.45	89,480	19.31	2.15	1,360	0.29	0.033	1,800	0.39	0.043
WHITAKER BAYOU	5,015	37.59	16,160	3.22	0.38	76,600	15.28	1.79	3,650	0.73	0.085	3,290	0.66	0.077
MATHENY CREEK	3,800	39.41	13,110	3.45	0.39	64,440	16.96	1.90	2,540	0.67	0.075	2,470	0.65	0.073
CATFISH CREEK	3,360	25.16	4,840	1.44	0.25	24,860	7.40	1.30	660	0.20	0.034	860	0.26	0.045
NORTH CREEK	1,920	23.82	2,950	1.54	0.28	14,860	7.74	1.43	360	0.19	0.035	490	0.26	0.047
SOUTH CREEK	12,995	20.02	13,270	1.02	0.23	63,430	4.88	1.08	620	0.05	0.011	1,790	0.14	0.030
HUDSON BAYOU	1,595	32.58	3,070	1.92	0.26	16,570	10.39	1.41	1,440	0.90	0.122	930	0.58	0.079
SIESTA KEY	1,385	49.76	9,610	6.94	0.62	33,830	24.43	2.17	610	0.44	0.039	1,150	0.83	0.074
ANNA MARIA	919	29.95	1,890	2.06	0.30	9,400	10.23	1.51	500	0.54	0.080	390	0.42	0.063
PERICO	860	33.56	1,080	1.26	0.17	4,940	5.74	0.76	60	0.07	0.009	110	0.13	0.017
LONGBOAT KEY	1,697	25.86	3,230	1.90	0.32	15,300	9.02	1.54	530	0.31	0.053	530	0.31	0.053
OTHER ISLANDS	900	29.29	1,810	2.01	0.30	9,110	10.12	1.52	330	0.37	0.055	320	0.36	0.054
DIRECT TO BAY	4,241	32.28	8,930	2.11	0.29	52,070	12.28	1.68	2,380	0.56	0.077	1,890	0.45	0.061
BAY SURFACE	33,280	54.60	61,730	1.85	0.15	337,460	10.14	0.82	2,470	0.07	0.006	60,080	1.81	0.146
TOTAL	129,412	35.73	263,560	2.29	0.30	1,370,260	11.10	1.49	39,440	0.44	0.060	95,790	0.48	0.061

TABLE C-2

AVERAGE ANNUAL LOADINGS BY SOURCE
FOR 20-YEAR FUTURE LAND USE CONDITIONS

SOURCE	RUNOFF (in)	% OF TOTAL	AVERAGE YEAR POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	16.07	45.0%	126,340	47.9%	671,120	49.0%	36,190	91.8%	27,860	29.1%
BASEFLOW	3.61	10.1%	31,750	12.0%	105,890	7.7%	280	0.7%	5,310	5.5%
SEPTIC	0.70	2.0%	8,230	3.1%	123,520	9.0%	0	0.0%	0	0.0%
POINT SOURCE	1.31	3.7%	35,510	13.5%	132,270	9.7%	500	1.3%	2,540	2.7%
RAINFALL	14.04	39.3%	61,730	23.4%	337,460	24.6%	2,470	6.3%	60,080	62.7%
TOTAL	35.73		263,560		1,370,260		39,440		95,790	

TABLE C-3

AVERAGE ANNUAL LOADINGS BY JURISDICTION
FOR 20-YEAR FUTURE LAND USE CONDITIONS

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	AVERAGE YEAR POLLUTANT LOADING							
				Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	12.85	36.0%	116,080	44.0%	622,520	45.4%	16,040	40.7%	18,660	19.5%
SARASOTA CITY	7,844	2.06	5.8%	20,660	7.8%	94,700	6.9%	5,930	15.0%	4,700	4.9%
MANATEE CO.	20,226	5.27	14.7%	47,470	18.0%	243,000	17.7%	12,970	32.9%	9,850	10.3%
ISLANDS	5,761	1.51	4.2%	17,620	6.7%	72,580	5.3%	2,030	5.1%	2,500	2.6%
BAY SURFACE	33,280	14.04	39.3%	61,730	23.4%	337,460	24.6%	2,470	6.3%	60,080	62.7%
TOTAL	129,412	35.73		263,560		1,370,260		39,440		95,790	

TABLE C-4

WET SEASON LOADINGS BY WATERSHED
FOR 20-YEAR FUTURE LAND USE SCENARIO

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	16.61	44,060	1.21	0.32	232,990	6.40	1.70	6,070	0.17	0.044	7,090	0.19	0.052
PALMA SOLA 2	1,120	18.26	1,290	1.15	0.28	6,470	5.78	1.40	310	0.28	0.067	270	0.24	0.058
BOWLEES CREEK	6,489	22.01	7,300	1.12	0.23	42,420	6.54	1.31	4,680	0.72	0.145	2,870	0.44	0.089
WEST BRADENTON	4,395	19.09	4,910	1.12	0.26	24,160	5.50	1.27	1,020	0.23	0.054	990	0.23	0.052
CEDAR HAMMOCK	1,930	20.38	2,570	1.33	0.29	13,060	6.77	1.47	790	0.41	0.089	610	0.32	0.068
WEST BOWLEES	1,559	18.00	1,940	1.24	0.31	9,580	6.15	1.51	450	0.29	0.071	380	0.24	0.060
PALMA SOLA	900	17.45	1,120	1.24	0.31	5,340	5.93	1.50	200	0.22	0.056	190	0.21	0.053
SOUTH BRADENTON	4,635	21.40	8,900	1.92	0.40	41,990	9.06	1.87	830	0.18	0.037	1,070	0.23	0.048
WHITAKER BAYOU	5,015	22.43	9,060	1.81	0.36	43,800	8.73	1.72	2,230	0.44	0.087	1,960	0.39	0.077
MATHENY CREEK	3,800	22.32	6,390	1.68	0.33	33,310	8.77	1.73	1,550	0.41	0.081	1,390	0.37	0.072
CATFISH CREEK	3,360	16.03	3,120	0.93	0.26	15,570	4.63	1.28	400	0.12	0.033	550	0.16	0.045
NORTH CREEK	1,920	15.18	1,880	0.98	0.28	9,280	4.83	1.41	230	0.12	0.035	310	0.16	0.047
SOUTH CREEK	12,995	13.05	8,810	0.68	0.23	41,150	3.17	1.07	400	0.03	0.010	1,210	0.09	0.031
HUDSON BAYOU	1,595	20.51	1,930	1.21	0.26	10,370	6.50	1.40	890	0.56	0.120	590	0.37	0.080
SIESTA KEY	1,385	25.13	4,060	2.93	0.51	15,280	11.03	1.94	340	0.25	0.043	530	0.38	0.067
ANNA MARIA	919	18.94	1,210	1.32	0.31	5,890	6.41	1.49	310	0.34	0.079	250	0.27	0.063
PERICO	860	21.42	670	0.78	0.16	3,180	3.70	0.76	30	0.03	0.007	80	0.09	0.019
LONGBOAT KEY	1,697	16.50	2,050	1.21	0.32	9,670	5.70	1.52	320	0.19	0.050	340	0.20	0.054
OTHER ISLANDS	900	18.52	1,130	1.26	0.30	5,610	6.23	1.49	210	0.23	0.056	200	0.22	0.053
DIRECT TO BAY	4,241	19.86	5,500	1.30	0.29	31,100	7.33	1.63	1,460	0.34	0.076	1,200	0.28	0.063
BAY SURFACE	33,280	33.70	38,100	1.14	0.15	208,290	6.26	0.82	1,520	0.05	0.006	37,090	1.11	0.146
TOTAL	129,412	21.93	156,000	1.31	0.29	808,510	6.45	1.44	24,240	0.27	0.059	59,170	0.30	0.062

TABLE C-5

DRY SEASON LOADINGS BY WATERSHED
FOR 20-YEAR LAND USE CONDITIONS

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb) -	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	10.50	28,980	0.80	0.33	163,960	4.50	1.89	3,760	0.10	0.043	4,190	0.12	0.048
PALMA SOLA 2	1,120	10.55	720	0.64	0.27	3,810	3.40	1.42	180	0.16	0.067	150	0.13	0.056
BOWLEES CREEK	6,489	13.08	4,240	0.65	0.22	25,470	3.92	1.32	2,890	0.45	0.150	1,730	0.27	0.090
WEST BRADENTON	4,395	10.98	2,790	0.63	0.26	14,120	3.21	1.29	630	0.14	0.058	560	0.13	0.051
CEDAR HAMMOCK	1,930	11.97	1,500	0.78	0.29	7,790	4.04	1.49	490	0.25	0.094	360	0.19	0.069
WEST BOWLEES	1,559	10.38	1,140	0.73	0.31	5,660	3.63	1.54	280	0.18	0.076	230	0.15	0.063
PALMA SOLA	900	10.00	640	0.71	0.31	3,150	3.50	1.54	130	0.14	0.064	110	0.12	0.054
SOUTH BRADENTON	4,635	18.13	9,700	2.09	0.51	47,500	10.25	2.49	530	0.11	0.028	720	0.16	0.038
WHITAKER BAYOU	5,015	15.16	7,050	1.41	0.41	32,740	6.53	1.90	1,410	0.28	0.082	1,320	0.26	0.077
MATHENY CREEK	3,800	17.09	6,680	1.76	0.45	31,140	8.19	2.12	990	0.26	0.067	1,080	0.28	0.073
CATFISH CREEK	3,360	9.13	1,730	0.51	0.25	9,310	2.77	1.34	250	0.07	0.036	310	0.09	0.045
NORTH CREEK	1,920	8.64	1,040	0.54	0.28	5,600	2.92	1.49	140	0.07	0.037	170	0.09	0.045
SOUTH CREEK	12,995	6.96	4,440	0.34	0.22	22,300	1.72	1.09	230	0.02	0.011	580	0.04	0.028
HUDSON BAYOU	1,595	12.07	1,140	0.71	0.26	6,190	3.88	1.42	550	0.34	0.126	360	0.23	0.082
SIESTA KEY	1,385	24.62	5,540	4.00	0.72	18,500	13.36	2.39	270	0.19	0.035	630	0.45	0.082
ANNA MARIA	919	11.01	700	0.76	0.31	3,500	3.81	1.53	190	0.21	0.083	150	0.16	0.065
PERICO	860	12.14	350	0.41	0.15	1,750	2.03	0.74	20	0.02	0.008	50	0.06	0.021
LONGBOAT KEY	1,697	9.35	1,160	0.68	0.32	5,670	3.34	1.58	200	0.12	0.056	190	0.11	0.053
OTHER ISLANDS	900	10.77	690	0.77	0.31	3,500	3.89	1.59	130	0.14	0.059	110	0.12	0.050
DIRECT TO BAY	4,241	12.42	3,390	0.80	0.28	20,910	4.93	1.75	910	0.21	0.076	720	0.17	0.060
BAY SURFACE	33,280	20.90	23,630	0.71	0.15	129,170	3.88	0.82	950	0.03	0.006	23,000	0.69	0.146
TOTAL	129,412	13.80	107,250	0.97	0.31	561,740	4.65	1.56	15,130	0.17	0.060	36,720	0.19	0.062

TABLE C-6

WET SEASON AND DRY SEASON LOADINGS BY SOURCE
FOR 20-YEAR FUTURE LAND USE CONDITIONS

SOURCE	RUNOFF (in)	% OF TOTAL	WET SEASON POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	9.92	45.2%	77,810	49.9%	414,240	51.2%	22,330	92.1%	17,260	29.2%
BASEFLOW	2.65	12.1%	23,290	14.9%	77,620	9.6%	200	0.8%	3,890	6.6%
SEPTIC	0.23	1.1%	4,120	2.6%	61,740	7.6%	0	0.0%	0	0.0%
POINT SOURCE	0.47	2.1%	12,680	8.1%	46,620	5.8%	190	0.8%	930	1.6%
RAINFALL	8.67	39.5%	38,100	24.4%	208,290	25.8%	1,520	6.3%	37,090	62.7%
TOTAL	21.93		156,000		808,510		24,240		59,170	

SOURCE	RUNOFF (in)	% OF TOTAL	DRY SEASON POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	6.15	44.6%	48,210	45.0%	256,840	45.7%	13,820	91.3%	10,690	29.1%
BASEFLOW	0.96	7.0%	8,450	7.9%	28,270	5.0%	40	0.3%	1,420	3.9%
SEPTIC	0.47	3.4%	4,130	3.9%	61,820	11.0%	0	0.0%	0	0.0%
POINT SOURCE	0.84	6.1%	22,830	21.3%	85,640	15.2%	320	2.1%	1,610	4.4%
RAINFALL	5.37	38.9%	23,630	22.0%	129,170	23.0%	950	6.3%	23,000	62.6%
TOTAL	13.80		107,250		561,740		15,130		36,720	

TABLE C-7

WET SEASON AND DRY SEASON LOADINGS BY JURISDICTION
FOR 20-YEAR FUTURE LAND USE CONDITIONS

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	WET SEASON POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	7.91	36.1%	69,570	44.6%	365,880	45.3%	9,890	40.8%	11,670	19.7%
SARASOTA CITY	7,844	1.27	5.8%	11,980	7.7%	56,360	7.0%	3,630	15.0%	2,850	4.8%
MANATEE CO.	20,226	3.20	14.6%	27,210	17.4%	138,350	17.1%	7,990	33.0%	6,160	10.4%
ISLANDS	5,761	0.89	4.1%	9,140	5.9%	39,630	4.9%	1,210	5.0%	1,400	2.4%
BAY SURFACE	33,280	8.67	39.5%	38,100	24.4%	208,290	25.8%	1,520	6.3%	37,090	62.7%
TOTAL	129,412	21.93		156,000		808,510		24,240		59,170	

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	DRY SEASON POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	4.94	35.8%	46,300	43.2%	256,630	45.7%	6,150	40.6%	7,010	19.1%
SARASOTA CITY	7,844	0.79	5.8%	8,590	8.0%	38,280	6.8%	2,270	15.0%	1,870	5.1%
MANATEE CO.	20,226	2.07	15.0%	20,260	18.9%	104,740	18.6%	4,950	32.7%	3,710	10.1%
ISLANDS	5,761	0.62	4.5%	8,470	7.9%	32,920	5.9%	810	5.4%	1,130	3.1%
BAY SURFACE	33,280	5.37	38.9%	23,630	22.0%	129,170	23.0%	950	6.3%	23,000	62.6%
TOTAL	129,412	13.80		107,250		561,740		15,130		36,720	

TABLE C-8

WET YEAR LOADINGS BY WATERSHED
FOR 20-YEAR FUTURE LAND USE CONDITIONS

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	37.01	97,550	2.68	0.32	501,620	13.77	1.64	12,610	0.35	0.041	15,530	0.43	0.051
PALMA SOLA 2	1,120	39.28	2,750	2.46	0.28	13,770	12.29	1.38	640	0.57	0.064	560	0.50	0.056
BOWLEES CREEK	6,489	46.64	15,610	2.41	0.23	89,320	13.76	1.30	9,680	1.49	0.141	6,010	0.93	0.088
WEST BRADENTON	4,395	41.15	10,620	2.42	0.26	51,600	11.74	1.26	2,140	0.49	0.052	2,120	0.48	0.052
CEDAR HAMMOCK	1,930	43.45	5,500	2.85	0.29	27,550	14.27	1.45	1,640	0.85	0.086	1,290	0.67	0.068
WEST BOWLEES	1,559	38.77	4,190	2.69	0.31	20,360	13.06	1.49	930	0.60	0.068	830	0.53	0.061
PALMA SOLA	900	37.70	2,440	2.71	0.32	11,380	12.64	1.48	450	0.50	0.059	410	0.46	0.053
SOUTH BRADENTON	4,635	49.97	21,960	4.74	0.42	103,870	22.41	1.98	1,740	0.38	0.033	2,380	0.51	0.045
WHITAKER BAYOU	5,015	48.49	19,520	3.89	0.35	92,640	18.47	1.68	4,620	0.92	0.084	4,140	0.83	0.075
MATHENY CREEK	3,800	50.37	15,480	4.07	0.36	76,010	20.00	1.75	3,240	0.85	0.075	3,110	0.82	0.072
CATFISH CREEK	3,360	35.34	6,890	2.05	0.26	33,670	10.02	1.25	840	0.25	0.031	1,220	0.36	0.045
NORTH CREEK	1,920	33.61	4,180	2.18	0.29	20,020	10.43	1.37	470	0.24	0.032	710	0.37	0.049
SOUTH CREEK	12,995	29.28	20,230	1.56	0.23	91,740	7.06	1.06	850	0.07	0.010	2,830	0.22	0.033
HUDSON BAYOU	1,595	43.68	4,140	2.60	0.26	21,920	13.74	1.39	1,850	1.16	0.117	1,240	0.78	0.079
SIESTA KEY	1,385	60.32	10,650	7.69	0.56	38,460	27.77	2.03	750	0.54	0.040	1,330	0.96	0.070
ANNA MARIA	919	40.61	2,590	2.82	0.31	12,490	13.59	1.48	640	0.70	0.076	530	0.58	0.063
PERICO	860	46.54	1,610	1.87	0.18	7,020	8.16	0.77	90	0.10	0.010	170	0.20	0.019
LONGBOAT KEY	1,697	35.85	4,450	2.62	0.32	20,650	12.17	1.50	670	0.39	0.049	730	0.43	0.053
OTHER ISLANDS	900	40.10	2,460	2.73	0.30	12,000	13.33	1.47	440	0.49	0.054	440	0.49	0.054
DIRECT TO BAY	4,241	43.25	11,870	2.80	0.29	65,780	15.51	1.58	3,030	0.71	0.073	2,560	0.60	0.062
BAY SURFACE	33,280	69.70	78,800	2.37	0.15	430,790	12.94	0.82	3,150	0.09	0.006	76,700	2.30	0.146
TOTAL	129,412	47.24	343,490	2.96	0.30	1,742,660	14.15	1.43	50,470	0.56	0.057	124,840	0.64	0.061

TABLE C-9

DRY YEAR LOADINGS BY WATERSHED
FOR 20 YEAR FUTURE LAND USE CONDITIONS

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	18.43	51,560	1.42	0.34	305,710	8.39	2.01	7,470	0.21	0.049	7,540	0.21	0.050
PALMA SOLA 2	1,120	19.69	1,370	1.22	0.27	7,250	6.47	1.45	380	0.34	0.076	300	0.27	0.060
BOWLEES CREEK	6,489	25.10	8,090	1.25	0.22	49,330	7.60	1.34	5,780	0.89	0.157	3,380	0.52	0.092
WEST BRADENTON	4,395	20.41	5,080	1.16	0.25	26,680	6.07	1.31	1,260	0.29	0.062	1,060	0.24	0.052
CEDAR HAMMOCK	1,930	22.72	2,850	1.48	0.29	15,070	7.81	1.52	980	0.51	0.099	710	0.37	0.071
WEST BOWLEES	1,559	19.32	2,100	1.35	0.31	10,810	6.93	1.58	560	0.36	0.082	430	0.28	0.063
PALMA SOLA	900	18.52	1,200	1.33	0.32	5,970	6.63	1.58	260	0.29	0.069	210	0.23	0.056
SOUTH BRADENTON	4,635	30.41	15,660	3.38	0.49	77,000	16.61	2.41	1,040	0.22	0.033	1,280	0.28	0.040
WHITAKER BAYOU	5,015	28.11	13,210	2.63	0.41	62,680	12.50	1.96	2,810	0.56	0.088	2,510	0.50	0.079
MATHENY CREEK	3,800	29.87	10,990	2.89	0.43	54,390	14.31	2.11	1,960	0.52	0.076	1,920	0.51	0.075
CATFISH CREEK	3,360	16.23	3,040	0.90	0.25	17,150	5.10	1.39	480	0.14	0.039	530	0.16	0.043
NORTH CREEK	1,920	15.21	1,880	0.98	0.28	10,360	5.40	1.57	280	0.15	0.042	310	0.16	0.047
SOUTH CREEK	12,995	11.84	7,100	0.55	0.20	38,490	2.96	1.10	450	0.03	0.013	860	0.07	0.025
HUDSON BAYOU	1,595	22.95	2,140	1.34	0.26	11,950	7.49	1.44	1,100	0.69	0.133	680	0.43	0.082
SIESTA KEY	1,385	40.54	8,680	6.27	0.68	29,800	21.52	2.34	490	0.35	0.039	1,000	0.72	0.079
ANNA MARIA	919	20.68	1,310	1.43	0.30	6,720	7.31	1.56	380	0.41	0.088	280	0.30	0.065
PERICO	860	22.22	600	0.70	0.14	3,120	3.63	0.72	50	0.06	0.012	50	0.06	0.012
LONGBOAT KEY	1,697	17.12	2,150	1.27	0.33	10,710	6.31	1.63	390	0.23	0.059	360	0.21	0.055
OTHER ISLANDS	900	19.85	1,240	1.38	0.31	6,590	7.32	1.63	260	0.29	0.064	220	0.24	0.054
DIRECT TO BAY	4,241	22.72	6,350	1.50	0.29	40,190	9.48	1.84	1,800	0.42	0.082	1,320	0.31	0.060
BAY SURFACE	33,280	41.70	47,150	1.42	0.15	257,730	7.74	0.82	1,890	0.06	0.006	45,890	1.38	0.146
TOTAL	129,412	25.74	193,750	1.71	0.31	1,047,700	8.46	1.59	30,070	0.33	0.065	70,840	0.35	0.062

TABLE C-10

WET YEAR AND DRY YEAR LOADINGS BY SOURCE
FOR 20-YEAR FUTURE LAND USE CONDITIONS

SOURCE	RUNOFF (in)	% OF TOTAL	WET YEAR POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	20.51	43.4%	161,150	46.9%	856,690	49.2%	46,240	91.6%	35,640	28.5%
BASEFLOW	6.80	14.4%	59,800	17.4%	199,390	11.4%	580	1.1%	9,960	8.0%
SEPTIC	0.70	1.5%	8,230	2.4%	123,520	7.1%	0	0.0%	0	0.0%
POINT SOURCE					430,790	24.7%	3,150	6.2%	76,700	61.4%
TOTAL	47.24		343,490		1,742,660		50,470		124,840	

SOURCE	RUNOFF (in)	% OF TOTAL	DRY YEAR POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	12.27	47.7%	96,400	49.8%	512,630	48.9%	27,650	92.0%	21,320	30.1%
BASEFLOW	0.73	2.8%	6,460	3.3%	21,550	2.1%	30	0.1%	1,090	1.5%
SEPTIC	0.70	2.7%	8,230	4.2%	123,520	11.8%	0	0.0%	0	0.0%
POINT SOURCE	1.31	5.1%	35,510	18.3%	132,270	12.6%	500	1.7%	2,540	3.6%
RAINFALL	10.72	41.7%	47,150	24.3%	257,730	24.6%	1,890	6.3%	45,890	64.8%
TOTAL	25.74		193,750		1,047,700		30,070		70,840	

TABLE C-11

WET YEAR AND DRY YEAR LOADINGS BY JURISDICTION
FOR 20-YEAR FUTURE LAND USE CONDITIONS

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	WET YEAR POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	17.63	37.3%	155,890	45.4%	793,500	45.5%	20,580	40.8%	25,810	20.7%
SARASOTA CITY	7,844	2.72	5.7%	25,820	7.5%	119,810	6.9%	7,550	15.0%	6,050	4.8%
MANATEE CO.	20,226	6.98	14.8%	61,230	17.8%	307,940	17.7%	16,600	32.9%	13,080	10.5%
ISLANDS	5,761	1.99	4.2%	21,750	6.3%	90,620	5.2%	2,590	5.1%	3,200	2.6%
BAY SURFACE	33,280	17.92	37.9%	78,800	22.9%	430,790	24.7%	3,150	6.2%	76,700	61.4%
TOTAL	129,412	47.24		343,490		1,742,660		50,470		124,840	

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	DRY YEAR POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	8.66	33.6%	81,040	41.8%	473,240	45.2%	12,170	40.5%	12,410	17.5%
SARASOTA CITY	7,844	1.49	5.8%	16,120	8.3%	72,970	7.0%	4,550	15.1%	3,530	5.0%
MANATEE CO.	20,226	3.78	14.7%	35,450	18.3%	186,820	17.8%	9,890	32.9%	7,100	10.0%
ISLANDS	5,761	1.09	4.2%	13,990	7.2%	56,940	5.4%	1,570	5.2%	1,910	2.7%
BAY SURFACE	33,280	10.72	41.6%	47,150	24.3%	257,730	24.6%	1,890	6.3%	45,890	64.8%
TOTAL	129,412	25.74		193,750		1,047,700		30,070		70,840	

TABLE C-12

AVERAGE ANNUAL LOADINGS BY SOURCE AND SEGMENT
FOR 20-YEAR LAND USE

Constituent	Segment Number	Watershed(s)	Average Annual Loadings (lb/yr) Surface Runoff	Baseflow	Septic Tanks	Point Source	Rainfall	Total
Total P								
	1	Anna Maria Island	1,650	240	0	0	3,587	5,477
	2	Perico Island, West Bradenton	7,030	1,720	0	0	3,999	12,749
	3	Palma Sola 2	1,710	310	0	0	2,563	4,583
	5	Longboat Key (40%)	1,076	216	0	0	6,307	7,599
	6	Palma Sola Creek, South Bradenton	8,790	1,820	0	9,780	9,179	29,569
	7	Longboat Key (40%)	1,076	216	0	0	8,102	9,394
	8	Cedar Hammock, Bowlees Creek, West Bowlees	16,520	2,250	0	0	8,204	26,974
	10	Longboat Key (20%), Other Islands (50%)	1,278	248	25	0	7,382	8,933
	11	Hudson Bayou, Whitaker Bayou, Direct to Bay	12,430	2,030	620	6,400	4,255	25,735
	13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	57,970	14,490	6,930	19,150	2,667	101,207
	14	Catfish Creek, North Creek, Direct to Bay	7,210	2,370	500	180	3,487	13,747
	16	Other Islands (50%), South Creek, Direct to Bay	9,600	5,840	155	0	1,998	17,593
		Total	126,340	31,750	8,230	35,510	61,730	263,560
Total N								
	1	Anna Maria Island	8,580	820	0	0	19,611	29,011
	2	Perico Island, West Bradenton	37,480	5,730	0	0	21,862	65,072
	3	Palma Sola 2	9,240	1,050	0	0	14,014	24,304
	5	Longboat Key (40%)	5,396	724	0	0	34,476	40,596
	6	Palma Sola Creek, South Bradenton	43,120	6,060	0	48,780	50,173	148,133
	7	Longboat Key (40%)	5,396	724	0	0	44,292	50,412
	8	Cedar Hammock, Bowlees Creek, West Bowlees	96,430	7,490	0	0	44,849	148,769
	10	Longboat Key (20%), Other Islands (50%)	6,438	837	340	0	40,357	47,972
	11	Hudson Bayou, Whitaker Bayou, Direct to Bay	70,080	6,790	9,270	19,190	23,261	128,591
	13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	297,470	48,320	104,100	63,400	14,581	527,871
	14	Catfish Creek, North Creek, Direct to Bay	37,960	7,860	7,530	900	19,063	73,313
	16	Other Islands (50%), South Creek, Direct to Bay	53,530	19,485	2,280	0	10,921	86,216
		Total	671,120	105,890	123,520	132,270	337,460	1,370,260

TABLE C-12 (CONTINUED)

AVERAGE ANNUAL LOADINGS BY SOURCE AND SEGMENT
FOR 20-YEAR LAND USE

Constituent	Segment Number	Watershed(s)	Average Annual Loadings (lb/yr)					
			Surface Runoff	Baseflow	Septic Tanks	Point Source	Rainfall	Total
Lead								
	1	Anna Maria Island	500	0	0	0	144	644
	2	Perico Island, West Bradenton	1,710	10	0	0	160	1,880
	3	Palma Sola 2	490	0	0	0	103	593
	5	Longboat Key (40%)	208	4	0	0	252	464
	6	Palma Sola Creek, South Bradenton	1,630	20	0	50	367	2,067
	7	Longboat Key (40%)	208	4	0	0	324	536
	8	Cedar Hammock, Bowlees Creek, West Bowlees	9,580	10	0	0	328	9,918
	10	Longboat Key (20%), Other Islands (50%)	269	2	0	0	295	566
	11	Hudson Bayou, Whitaker Bayou, Direct to Bay	6,000	20	0	120	170	6,310
	13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	13,200	140	0	330	107	13,777
	14	Catfish Creek, North Creek, Direct to Bay	1,440	20	0	0	140	1,600
	16	Other Islands (50%), South Creek, Direct to Bay	955	50	0	0	80	1,085
		Total	36,190	280	0	500	2,470	39,440
Zinc								
	1	Anna Maria Island	350	40	0	0	3,491	3,881
	2	Perico Island, West Bradenton	1,360	290	0	0	3,892	5,542
	3	Palma Sola 2	370	50	0	0	2,495	2,915
	5	Longboat Key (40%)	176	36	0	0	6,138	6,350
	6	Palma Sola Creek, South Bradenton	1,550	300	0	240	8,933	11,023
	7	Longboat Key (40%)	176	36	0	0	7,886	8,098
	8	Cedar Hammock, Bowlees Creek, West Bowlees	5,790	380	0	0	7,985	14,155
	10	Longboat Key (20%), Other Islands (50%)	223	43	0	0	7,185	7,451
	11	Hudson Bayou, Whitaker Bayou, Direct to Bay	3,960	340	0	620	4,141	9,061
	13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	11,330	2,430	0	1,680	2,596	18,036
	14	Catfish Creek, North Creek, Direct to Bay	1,350	390	0	0	3,394	5,134
	16	Other Islands (50%), South Creek, Direct to Bay	1,225	975	0	0	1,944	4,144
		Total	27,860	5,310	0	2,540	60,080	95,790

TABLE C-13

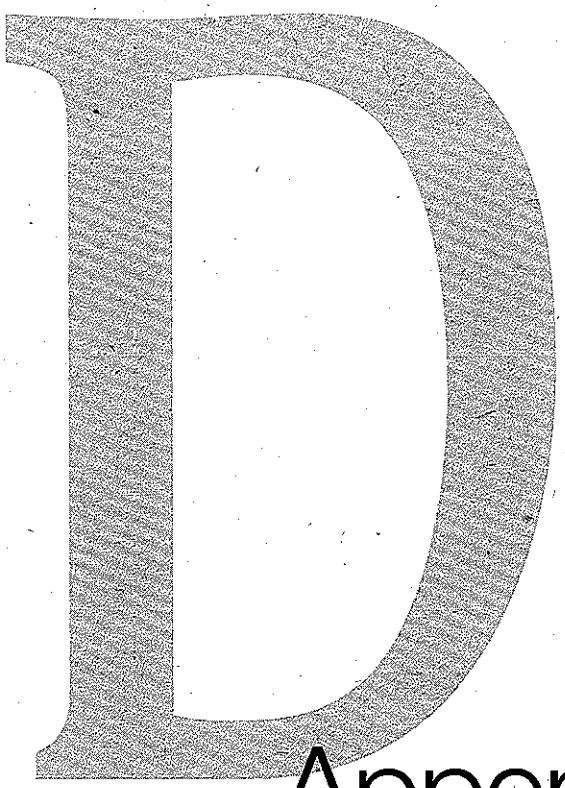
AVERAGE ANNUAL LOADINGS BY WATERSHED AND SOURCE
FOR 20 YEAR LAND USE

Constituent	Watershed	Average Annual Loadings (lb/yr) Surface Runoff	Baseflow	Septic Tanks	Point Source	Rainfall	Total
Total P							
	Philippi Creek	48,130	12,680	5,850	6,370	23,385	96,415
	Palma Sola 2	1,710	310	0	0	719	2,739
	Bowlees Creek	10,250	1,340	0	0	4,167	15,757
	West Bradenton	6,310	1,360	0	0	2,822	10,492
	Cedar Hammock	3,620	470	0	0	1,239	5,329
	West Bowlees	2,650	440	0	0	1,001	4,091
	Palma Sola Creek	1,530	270	0	0	578	2,378
	South Bradenton	7,260	1,550	0	9,780	2,976	21,566
	Whitaker Bayou	7,770	1,370	620	6,400	3,220	19,380
	Matheny Creek	5,280	1,060	690	6,080	2,440	15,550
	Catfish Creek	3,420	1,270	150	0	2,158	6,998
	North Creek	2,120	730	100	0	1,233	4,183
	South Creek	7,740	5,460	70	0	8,345	21,615
	Hudson Bayou	2,700	370	0	0	1,024	4,094
	Siesta Key	2,490	420	0	6,700	889	10,499
	Anna Maria Island	1,650	240	0	0	590	2,480
	Perico Island	720	360	0	0	552	1,632
	Longboat Key	2,690	540	0	0	1,090	4,320
	Other Islands	1,480	280	50	0	578	2,388
	Direct to Bay	6,820	1,230	700	180	2,723	11,653
	Total	126,340	31,750	8,230	35,510	61,730	263,560
Total N							
	Philippi Creek	243,540	42,280	87,750	23,380	127,838	524,788
	Palma Sola 2	9,240	1,050	0	0	3,932	14,222
	Bowlees Creek	63,390	4,460	0	0	22,779	90,629
	West Bradenton	33,730	4,540	0	0	15,428	53,698
	Cedar Hammock	19,280	1,550	0	0	6,775	27,605
	West Bowlees	13,760	1,480	0	0	5,473	20,713
	Palma Sola Creek	7,590	890	0	0	3,159	11,639
	South Bradenton	35,530	5,170	0	48,780	16,271	105,751
	Whitaker Bayou	43,570	4,570	9,270	19,190	17,605	94,205
	Matheny Creek	30,630	3,520	10,380	19,910	13,339	77,779
	Catfish Creek	18,320	4,230	2,310	0	11,795	36,655
	North Creek	10,900	2,420	1,540	0	6,740	21,600
	South Creek	44,190	18,210	1,030	0	45,617	109,047
	Hudson Bayou	15,330	1,240	0	0	5,599	22,169
	Siesta Key	12,320	1,400	0	20,110	4,862	38,692
	Anna Maria Island	8,580	820	0	0	3,226	12,626
	Perico Island	3,750	1,190	0	0	3,019	7,959
	Longboat Key	13,490	1,810	0	0	5,957	21,257
	Other Islands	7,480	950	680	0	3,159	12,269
	Direct to Bay	36,500	4,110	10,560	900	14,888	66,958
	Total	671,120	105,890	123,520	132,270	337,460	1,370,260

TABLE C-13 (CONTINUED)

AVERAGE ANNUAL LOADINGS BY WATERSHED AND SOURCE
FOR 20 YEAR LAND USE

Constituent	Watershed	Average Annual Loadings (lb/yr) Surface Runoff	Baseflow	Septic Tanks	Point Source	Rainfall	Total
Lead							
	Philippi Creek	9,630	130	0	90	936	10,786
	Palma Sola 2	490	0	0	0	29	519
	Bowlees Creek	7,570	10	0	0	167	7,747
	West Bradenton	1,650	10	0	0	113	1,773
	Cedar Hammock	1,280	0	0	0	50	1,330
	West Bowlees	730	0	0	0	40	770
	Palma Sola Creek	340	0	0	0	23	363
	South Bradenton	1,290	20	0	50	119	1,479
	Whitaker Bayou	3,510	20	0	120	129	3,779
	Matheny Creek	2,420	10	0	110	98	2,638
	Catfish Creek	650	10	0	0	86	746
	North Creek	350	10	0	0	49	409
	South Creek	570	50	0	0	334	954
	Hudson Bayou	1,440	0	0	0	41	1,481
	Siesta Key	480	0	0	130	36	646
	Anna Maria Island	500	0	0	0	24	524
	Perico Island	60	0	0	0	22	82
	Longboat Key	520	10	0	0	44	574
	Other Islands	330	0	0	0	23	353
	Direct to Bay	2,380	0	0	0	109	2,489
	Total	36,190	280	0	500	2,470	39,440
Zinc							
	Philippi Creek	8,680	2,120	0	470	22,760	34,030
	Palma Sola 2	370	50	0	0	700	1,120
	Bowlees Creek	4,370	230	0	0	4,055	8,655
	West Bradenton	1,310	230	0	0	2,747	4,287
	Cedar Hammock	890	80	0	0	1,206	2,176
	West Bowlees	530	70	0	0	974	1,574
	Palma Sola Creek	250	40	0	0	562	852
	South Bradenton	1,300	260	0	240	2,897	4,697
	Whitaker Bayou	2,440	230	0	620	3,134	6,424
	Matheny Creek	1,750	180	0	540	2,375	4,845
	Catfish Creek	650	210	0	0	2,100	2,960
	North Creek	370	120	0	0	1,200	1,690
	South Creek	880	910	0	0	8,122	9,912
	Hudson Bayou	870	60	0	0	997	1,927
	Siesta Key	410	70	0	670	866	2,016
	Anna Maria Island	350	40	0	0	574	964
	Perico Island	50	60	0	0	537	647
	Longboat Key	440	90	0	0	1,061	1,591
	Other Islands	270	50	0	0	562	882
	Direct to Bay	1,680	210	0	0	2,651	4,541
	Total	27,860	5,310	0	2,540	60,080	95,790



Appendix D

TABLE D-1

AVERAGE ANNUAL LOADINGS BY WATERSHED
FOR BUILDOUT FUTURE LAND USE CONDITIONS

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILIPPI CREEK	36,417	29.80	81,990	2.25	0.33	446,470	12.26	1.82	13,320	0.37	0.054	13,880	0.38	0.056
PALMA SOLA 2	1,120	31.79	2,340	2.09	0.29	11,880	10.61	1.47	610	0.54	0.076	510	0.46	0.063
BOWLEES CREEK	6,489	36.31	11,990	1.85	0.22	70,740	10.90	1.32	8,070	1.24	0.151	4,850	0.75	0.091
WEST BRADENTON	4,395	30.99	8,010	1.82	0.26	40,220	9.15	1.30	1,800	0.41	0.058	1,650	0.38	0.053
CEDAR HAMMOCK	1,930	32.35	4,090	2.12	0.29	20,830	10.79	1.47	1,280	0.66	0.090	970	0.50	0.069
WEST BOWLEES	1,559	28.74	3,170	2.03	0.31	15,580	10.00	1.53	740	0.47	0.073	620	0.40	0.061
PALMA SOLA	900	30.68	1,870	2.08	0.30	9,300	10.33	1.49	430	0.48	0.069	360	0.40	0.058
SOUTH BRADENTON	4,635	44.44	19,950	4.30	0.43	98,860	21.33	2.12	1,960	0.42	0.042	2,270	0.49	0.049
WHITAKER BAYOU	5,014	38.36	16,550	3.30	0.38	78,640	15.68	1.80	3,810	0.76	0.087	3,410	0.68	0.078
MATHENY CREEK	3,800	44.41	15,560	4.09	0.41	74,830	19.69	1.96	3,290	0.87	0.086	3,010	0.79	0.079
CATFISH CREEK	3,360	30.17	6,670	1.99	0.29	33,960	10.11	1.48	1,260	0.38	0.055	1,310	0.39	0.057
NORTH CREEK	1,920	28.47	4,110	2.14	0.33	20,220	10.53	1.63	580	0.30	0.047	700	0.36	0.057
SOUTH CREEK	12,995	21.83	16,520	1.27	0.26	78,680	6.05	1.22	1,190	0.09	0.019	2,360	0.18	0.037
HUDSON BAYOU	1,595	32.58	3,070	1.92	0.26	16,570	10.39	1.41	1,440	0.90	0.122	930	0.58	0.079
SIESTA KEY	1,385	49.76	9,610	6.94	0.62	33,830	24.43	2.17	610	0.44	0.039	1,150	0.83	0.074
ANNA MARIA	919	29.95	1,890	2.06	0.30	9,400	10.23	1.51	500	0.54	0.080	390	0.42	0.063
PERICO	860	38.83	1,460	1.70	0.19	7,090	8.24	0.94	160	0.19	0.021	210	0.24	0.028
LONGBOAT KEY	1,697	26.89	3,450	2.03	0.33	16,370	9.65	1.58	570	0.34	0.055	580	0.34	0.056
OTHER ISLANDS	900	29.29	1,810	2.01	0.30	9,110	10.12	1.52	330	0.37	0.055	320	0.36	0.054
DIRECT TO BAY	4,241	32.86	9,120	2.15	0.29	53,150	12.53	1.68	2,490	0.59	0.079	1,970	0.46	0.062
BAY SURFACE	33,280	54.60	61,730	1.85	0.15	337,460	10.14	0.82	2,470	0.07	0.006	60,080	1.81	0.146
TOTAL	129,412	37.43	284,960	2.48	0.31	1,483,190	12.06	1.54	46,910	0.50	0.065	101,530	0.53	0.065

TABLE D-2

AVERAGE ANNUAL LOADINGS BY SOURCE
FOR BUILDOUT FUTURE LAND USE CONDITIONS

SOURCE	RUNOFF (in)	% OF TOTAL	AVERAGE YEAR POLLUTANT LOADING							
			TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	17.91	47.8%	146,050	51.3%	776,460	52.4%	43,610	93.0%	33,680	33.2%
BASEFLOW	3.32	8.9%	29,200	10.2%	97,460	6.6%	260	0.6%	4,890	4.8%
SEPTIC	0.70	1.9%	8,270	2.9%	124,060	8.4%	0	0.0%	0	0.0%
POINT SOURCE	1.46	3.9%	39,710	13.9%	147,750	10.0%	570	1.2%	2,880	2.8%
RAINFALL	14.04	37.5%	61,730	21.7%	337,460	22.8%	2,470	5.3%	60,080	59.2%
TOTAL	37.43		284,960		1,483,190		46,910		101,530	

TABLE D-3

AVERAGE ANNUAL LOADINGS BY JURISDICTION
FOR BUILDOUT FUTURE LAND USE CONDITIONS

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	AVERAGE YEAR POLLUTANT LOADING							
				Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	14.17	37.9%	134,280	47.1%	714,970	48.2%	21,820	46.5%	23,180	22.8%
SARASOTA CITY	7,844	2.06	5.5%	20,660	7.3%	94,700	6.4%	5,940	12.7%	4,720	4.6%
MANATEE CO.	20,226	5.60	15.0%	50,070	17.6%	260,260	17.5%	14,510	30.9%	10,900	10.7%
ISLANDS	5,761	1.56	4.2%	18,220	6.4%	75,800	5.1%	2,170	4.6%	2,650	2.6%
BAY SURFACE	33,280	14.04	37.5%	61,730	21.7%	337,460	22.8%	2,470	5.3%	60,080	59.2%
TOTAL	129,412	37.43		284,960		1,483,190		46,910		101,530	

TABLE D-4

WET SEASON LOADINGS BY WATERSHED
FOR BUILDOUT FUTURE LAND USE CONDITIONS

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILIPPI CREEK	36,417	18.15	48,910	1.34	0.33	261,110	7.17	1.74	8,200	0.23	0.055	8,610	0.24	0.057
PALMA SOLA 2	1,120	20.04	1,480	1.32	0.29	7,430	6.63	1.46	380	0.34	0.075	310	0.28	0.061
BOWLEES CREEK	6,489	22.74	7,520	1.16	0.22	44,150	6.80	1.32	4,980	0.77	0.149	3,030	0.47	0.091
WEST BRADENTON	4,395	19.63	5,090	1.16	0.26	25,340	5.77	1.30	1,100	0.25	0.056	1,050	0.24	0.054
CEDAR HAMMOCK	1,930	20.38	2,570	1.33	0.29	13,060	6.77	1.47	790	0.41	0.089	610	0.32	0.068
WEST BOWLEES	1,559	18.22	1,980	1.27	0.31	9,790	6.28	1.52	460	0.30	0.071	390	0.25	0.061
PALMA SOLA	900	19.37	1,170	1.30	0.30	5,830	6.48	1.48	260	0.29	0.066	240	0.27	0.061
SOUTH BRADENTON	4,635	24.12	9,520	2.05	0.38	46,860	10.11	1.85	1,200	0.26	0.047	1,350	0.29	0.053
WHITAKER BAYOU	5,014	22.89	9,320	1.86	0.36	45,050	8.98	1.73	2,330	0.46	0.090	2,030	0.40	0.078
MATHENY CREEK	3,800	24.80	7,420	1.95	0.35	38,080	10.02	1.78	2,000	0.53	0.094	1,680	0.44	0.079
CATFISH CREEK	3,360	19.01	4,200	1.25	0.29	21,090	6.28	1.46	780	0.23	0.054	830	0.25	0.057
NORTH CREEK	1,920	17.96	2,590	1.35	0.33	12,550	6.54	1.61	350	0.18	0.045	430	0.22	0.055
SOUTH CREEK	12,995	14.13	10,800	0.83	0.26	50,410	3.88	1.21	750	0.06	0.018	1,550	0.12	0.037
HUDSON BAYOU	1,595	20.51	1,930	1.21	0.26	10,370	6.50	1.40	890	0.56	0.120	590	0.37	0.080
SIESTA KEY	1,385	25.06	4,040	2.92	0.51	15,210	10.98	1.93	330	0.24	0.042	520	0.38	0.066
ANNA MARIA	919	17.97	1,120	1.22	0.30	5,450	5.93	1.46	280	0.30	0.075	230	0.25	0.061
PERICO	860	24.56	900	1.05	0.19	4,490	5.22	0.94	100	0.12	0.021	150	0.17	0.031
LONGBOAT KEY	1,697	17.12	2,190	1.29	0.33	10,310	6.08	1.57	350	0.21	0.053	360	0.21	0.055
OTHER ISLANDS	900	17.71	1,030	1.14	0.29	5,150	5.72	1.43	190	0.21	0.053	190	0.21	0.053
DIRECT TO BAY	4,241	20.21	5,610	1.32	0.29	31,820	7.50	1.64	1,540	0.36	0.079	1,240	0.29	0.064
BAY SURFACE	33,280	33.70	38,100	1.14	0.15	208,290	6.26	0.82	1,520	0.05	0.006	37,090	1.11	0.146
TOTAL	129,412	22.89	167,490	1.40	0.30	871,840	6.95	1.48	28,780	0.30	0.065	62,480	0.32	0.065

TABLE D-5

DRY SEASON LOADINGS BY WATERSHED
FOR BUILDOUT FUTURE LAND USE CONDITIONS

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	11.65	33,080	0.91	0.34	185,330	5.09	1.93	5,110	0.14	0.053	5,260	0.14	0.055
PALMA SOLA 2	1,120	11.75	850	0.76	0.28	4,440	3.96	1.49	230	0.21	0.077	190	0.17	0.064
BOWLEES CREEK	6,489	13.57	4,410	0.68	0.22	26,620	4.10	1.33	3,080	0.47	0.154	1,830	0.28	0.092
WEST BRADENTON	4,395	11.35	2,930	0.67	0.26	14,880	3.39	1.32	690	0.16	0.061	610	0.14	0.054
CEDAR HAMMOCK	1,930	11.97	1,500	0.78	0.29	7,790	4.04	1.49	490	0.25	0.094	360	0.19	0.069
WEST BOWLEES	1,559	10.52	1,160	0.74	0.31	5,790	3.71	1.56	280	0.18	0.075	240	0.15	0.065
PALMA SOLA	900	11.31	680	0.76	0.29	3,480	3.87	1.51	160	0.18	0.069	140	0.16	0.061
SOUTH BRADENTON	4,635	20.31	10,450	2.25	0.49	52,020	11.22	2.44	750	0.16	0.035	900	0.19	0.042
WHITAKER BAYOU	5,014	15.47	7,210	1.44	0.41	33,540	6.69	1.91	1,480	0.30	0.084	1,370	0.27	0.078
MATHENY CREEK	3,800	19.61	8,140	2.14	0.48	36,780	9.68	2.18	1,290	0.34	0.076	1,340	0.35	0.079
CATFISH CREEK	3,360	11.16	2,440	0.73	0.29	12,880	3.83	1.52	490	0.15	0.058	480	0.14	0.056
NORTH CREEK	1,920	10.51	1,500	0.78	0.33	7,680	4.00	1.68	220	0.11	0.048	260	0.14	0.057
SOUTH CREEK	12,995	7.70	5,730	0.44	0.25	28,280	2.18	1.25	440	0.03	0.019	800	0.06	0.035
HUDSON BAYOU	1,595	12.07	1,140	0.71	0.26	6,190	3.88	1.42	550	0.34	0.126	360	0.23	0.082
SIESTA KEY	1,385	24.57	5,530	3.99	0.72	18,460	13.33	2.39	270	0.19	0.035	630	0.45	0.082
ANNA MARIA	919	10.35	640	0.70	0.30	3,210	3.49	1.49	170	0.18	0.079	130	0.14	0.060
PERICO	860	14.27	490	0.57	0.18	2,600	3.02	0.93	60	0.07	0.022	80	0.09	0.029
LONGBOAT KEY	1,697	9.77	1,250	0.74	0.33	6,070	3.58	1.62	220	0.13	0.059	210	0.12	0.056
OTHER ISLANDS	900	10.23	610	0.68	0.29	3,200	3.56	1.53	120	0.13	0.058	100	0.11	0.048
DIRECT TO BAY	4,241	12.65	3,440	0.81	0.28	21,320	5.03	1.75	950	0.22	0.078	740	0.17	0.061
BAY SURFACE	33,280	20.90	23,630	0.71	0.15	129,170	3.88	0.82	950	0.03	0.006	23,000	0.69	0.146
TOTAL	129,412	14.52	116,810	1.05	0.32	609,730	5.03	1.60	18,000	0.19	0.065	39,030	0.21	0.065

TABLE D-6

WET SEASON AND DRY SEASON LOADINGS BY SOURCE
FOR BUILDOUT FUTURE LAND USE CONDITIONS

SOURCE	RUNOFF (in)	% OF TOTAL	WET SEASON POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	11.04	48.2%	89,720	53.6%	478,210	54.9%	26,870	93.4%	20,780	33.3%
BASEFLOW	2.44	10.7%	21,460	12.8%	71,530	8.2%	180	0.6%	3,570	5.7%
SEPTIC	0.23	1.0%	4,130	2.5%	61,990	7.1%	0	0.0%	0	0.0%
POINT SOURCE	0.51	2.2%	14,080	8.4%	51,820	5.9%	210	0.7%	1,040	1.7%
RAINFALL	8.67	37.9%	38,100	22.7%	208,290	23.9%	1,520	5.3%	37,090	59.4%
TOTAL	22.89		167,490		871,840		28,780		62,480	

SOURCE	RUNOFF (in)	% OF TOTAL	DRY SEASON POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	6.85	47.2%	55,640	47.6%	296,500	48.6%	16,650	92.5%	12,880	33.0%
BASEFLOW	0.89	6.1%	7,790	6.7%	26,060	4.3%	40	0.2%	1,310	3.4%
SEPTIC	0.47	3.2%	4,140	3.5%	62,070	10.2%	0	0.0%	0	0.0%
POINT SOURCE	0.94	6.5%	25,610	21.9%	95,930	15.7%	360	2.0%	1,840	4.7%
RAINFALL	5.37	37.0%	23,630	20.2%	129,170	21.2%	950	5.3%	23,000	58.9%
TOTAL	14.52		116,810		609,730		18,000		39,030	

TABLE D-7

WET SEASON AND DRY SEASON LOADINGS BY JURISDICTION
FOR BUILDOUT FUTURE LAND USE CONDITIONS

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	WET SEASON POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	8.67	37.9%	79,600	47.5%	418,610	48.0%	13,440	46.7%	14,310	22.9%
SARASOTA CITY	7,844	1.27	5.5%	11,980	7.2%	56,360	6.5%	3,630	12.6%	2,860	4.6%
MANATEE CO.	20,226	3.39	14.8%	28,510	17.0%	147,970	17.0%	8,940	31.1%	6,770	10.8%
ISLANDS	5,761	0.91	4.0%	9,300	5.6%	40,610	4.7%	1,250	4.3%	1,450	2.3%
BAY SURFACE	33,280	8.67	37.9%	38,100	22.7%	208,290	23.9%	1,520	5.3%	37,090	59.4%
TOTAL	129,412	22.89		167,490		871,840		28,780		62,480	

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	DRY SEASON POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	5.51	37.9%	54,520	46.7%	296,370	48.6%	8,390	46.6%	8,860	22.7%
SARASOTA CITY	7,844	0.79	5.5%	8,590	7.4%	38,280	6.3%	2,280	12.7%	1,880	4.8%
MANATEE CO.	20,226	2.21	15.2%	21,520	18.4%	112,370	18.4%	5,540	30.8%	4,140	10.6%
ISLANDS	5,761	0.63	4.3%	8,550	7.3%	33,540	5.5%	840	4.7%	1,150	2.9%
BAY SURFACE	33,280	5.37	37.0%	23,630	20.2%	129,170	21.2%	950	5.3%	23,000	58.9%
TOTAL	129,412	14.52		116,810		609,730		18,000		39,030	

TABLE D-8

WET YEAR LOADINGS BY WATERSHED
FOR BUILDOUT FUTURE LAND USE CONDITIONS

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	40.11	107,810	2.96	0.33	560,620	15.39	1.69	17,030	0.47	0.051	18,710	0.51	0.057
PALMA SOLA 2	1,120	42.75	3,130	2.79	0.29	15,700	14.02	1.45	790	0.71	0.073	660	0.59	0.061
BOWLEES CREEK	6,489	48.06	16,070	2.48	0.23	92,790	14.30	1.31	10,300	1.59	0.146	6,330	0.98	0.090
WEST BRADENTON	4,395	42.22	11,050	2.51	0.26	53,960	12.28	1.28	2,300	0.52	0.055	2,240	0.51	0.053
CEDAR HAMMOCK	1,930	43.45	5,500	2.85	0.29	27,550	14.27	1.45	1,640	0.85	0.086	1,290	0.67	0.068
WEST BOWLEES	1,559	39.19	4,290	2.75	0.31	20,780	13.33	1.50	940	0.60	0.068	840	0.54	0.061
PALMA SOLA	900	41.46	2,520	2.80	0.30	12,340	13.71	1.46	550	0.61	0.065	490	0.54	0.058
SOUTH BRADENTON	4,635	55.55	23,390	5.05	0.40	114,510	24.71	1.96	2,500	0.54	0.043	2,940	0.63	0.050
WHITAKER BAYOU	5,014	49.38	19,990	3.99	0.36	95,150	18.98	1.70	4,810	0.96	0.086	4,290	0.86	0.076
MATHENY CREEK	3,800	55.88	18,050	4.75	0.38	87,390	23.00	1.82	4,170	1.10	0.087	3,760	0.99	0.078
CATFISH CREEK	3,360	41.18	9,100	2.71	0.29	44,840	13.35	1.43	1,610	0.48	0.051	1,760	0.52	0.056
NORTH CREEK	1,920	39.03	5,590	2.91	0.33	26,620	13.86	1.57	740	0.39	0.044	960	0.50	0.057
SOUTH CREEK	12,995	31.39	24,200	1.86	0.26	110,510	8.50	1.20	1,560	0.12	0.017	3,530	0.27	0.038
HUDSON BAYOU	1,595	43.68	4,140	2.60	0.26	21,920	13.74	1.39	1,850	1.16	0.117	1,240	0.78	0.079
SIESTA KEY	1,385	60.18	10,620	7.67	0.56	38,310	27.66	2.03	740	0.53	0.039	1,320	0.95	0.070
ANNA MARIA	919	38.71	2,410	2.62	0.30	11,600	12.62	1.44	580	0.63	0.072	490	0.53	0.061
PERICO	860	52.67	2,060	2.40	0.20	9,660	11.23	0.94	220	0.26	0.021	290	0.34	0.028
LONGBOAT KEY	1,697	37.06	4,730	2.79	0.33	21,960	12.94	1.54	720	0.42	0.051	780	0.46	0.055
OTHER ISLANDS	900	38.53	2,260	2.51	0.29	11,090	12.32	1.41	400	0.44	0.051	400	0.44	0.051
DIRECT TO BAY	4,241	43.93	12,100	2.85	0.29	67,130	15.83	1.59	3,190	0.75	0.076	2,650	0.62	0.063
BAY SURFACE	33,280	69.70	78,800	2.37	0.15	430,790	12.94	0.82	3,150	0.09	0.006	76,700	2.30	0.146
TOTAL	129,412	49.18	367,810	3.15	0.30	1,875,220	15.19	1.47	59,790	0.63	0.062	131,670	0.69	0.064

TABLE D-9

DRY YEAR LOADINGS BY WATERSHED
FOR BUILDOUT FUTURE LAND USE CONDITIONS

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	20.79	59,490	1.63	0.35	347,290	9.54	2.02	10,140	0.28	0.059	9,670	0.27	0.056
PALMA SOLA 2	1,120	22.27	1,640	1.46	0.29	8,560	7.64	1.51	470	0.42	0.083	360	0.32	0.064
BOWLEES CREEK	6,489	26.15	8,440	1.30	0.22	51,700	7.97	1.34	6,160	0.95	0.160	3,600	0.55	0.094
WEST BRADENTON	4,395	21.21	5,380	1.22	0.25	28,250	6.43	1.34	1,370	0.31	0.065	1,140	0.26	0.054
CEDAR HAMMOCK	1,930	22.72	2,850	1.48	0.29	15,070	7.81	1.52	980	0.51	0.099	710	0.37	0.071
WEST BOWLEES	1,559	19.64	2,170	1.39	0.31	11,080	7.11	1.60	570	0.37	0.082	440	0.28	0.063
PALMA SOLA	900	21.31	1,290	1.43	0.30	6,670	7.41	1.53	330	0.37	0.076	260	0.29	0.060
SOUTH BRADENTON	4,635	34.77	16,970	3.66	0.46	85,310	18.41	2.34	1,500	0.32	0.041	1,670	0.36	0.046
WHITAKER BAYOU	5,014	28.84	13,550	2.70	0.41	64,420	12.85	1.97	2,950	0.59	0.090	2,620	0.52	0.080
MATHENY CREEK	3,800	34.47	13,400	3.53	0.45	63,960	16.83	2.15	2,540	0.67	0.086	2,380	0.63	0.080
CATFISH CREEK	3,360	20.58	4,550	1.35	0.29	24,520	7.30	1.56	950	0.28	0.061	890	0.26	0.057
NORTH CREEK	1,920	19.24	2,830	1.47	0.34	14,630	7.62	1.75	440	0.23	0.053	480	0.25	0.057
SOUTH CREEK	12,995	13.41	9,760	0.75	0.25	50,760	3.91	1.28	880	0.07	0.022	1,330	0.10	0.034
HUDSON BAYOU	1,595	22.95	2,140	1.34	0.26	11,950	7.49	1.44	1,100	0.69	0.133	680	0.43	0.082
SIESTA KEY	1,385	40.43	8,660	6.25	0.68	29,700	21.44	2.34	490	0.35	0.039	990	0.71	0.078
ANNA MARIA	919	19.27	1,180	1.28	0.29	6,130	6.67	1.53	350	0.38	0.087	250	0.27	0.062
PERICO	860	26.79	930	1.08	0.18	4,870	5.66	0.93	120	0.14	0.023	130	0.15	0.025
LONGBOAT KEY	1,697	18.01	2,360	1.39	0.34	11,560	6.81	1.67	430	0.25	0.062	390	0.23	0.056
OTHER ISLANDS	900	18.68	1,100	1.22	0.29	6,000	6.67	1.57	240	0.27	0.063	200	0.22	0.052
DIRECT TO BAY	4,241	23.23	6,530	1.54	0.29	41,050	9.68	1.84	1,900	0.45	0.085	1,390	0.33	0.062
BAY SURFACE	33,280	41.70	47,150	1.42	0.15	257,730	7.74	0.82	1,890	0.06	0.006	45,890	1.38	0.146
TOTAL	129,412	27.22	212,370	1.85	0.32	1,141,210	9.19	1.62	35,800	0.38	0.070	75,470	0.39	0.066

TABLE D-10

WET YEAR AND DRY YEAR LOADINGS BY SOURCE
FOR BUILDOUT FUTURE LAND USE CONDITIONS

SOURCE	RUNOFF (in)	% OF TOTAL	WET YEAR POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	22.83	46.4%	185,910	50.5%	988,910	52.7%	55,540	92.9%	42,940	32.6%
BASEFLOW	6.26	12.7%	55,120	15.0%	183,710	9.8%	530	0.9%	9,150	6.9%
SEPTIC	0.70	1.4%	8,270	2.2%	124,060	6.6%	0	0.0%	0	0.0%
POINT SOURCE	1.46	3.0%	39,710	10.8%	147,750	7.9%	570	1.0%	2,880	2.2%
RAINFALL	17.92	36.4%	78,800	21.4%	430,790	23.0%	3,150	5.3%	76,700	58.3%
TOTAL	49.18		367,810		1,875,220		59,790		131,670	

SOURCE	RUNOFF (in)	% OF TOTAL	DRY YEAR POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	13.66	50.2%	111,270	52.4%	591,810	51.9%	33,310	93.0%	25,700	34.1%
BASEFLOW	0.68	2.5%	5,970	2.8%	19,860	1.7%	30	0.1%	1,000	1.3%
SEPTIC	0.70	2.6%	8,270	3.9%	124,060	10.9%	0	0.0%	0	0.0%
POINT SOURCE	1.46	5.4%	39,710	18.7%	147,750	12.9%	570	1.6%	2,880	3.8%
RAINFALL	10.72	39.4%	47,150	22.2%	257,730	22.6%	1,890	5.3%	45,890	60.8%
TOTAL	27.22		212,370		1,141,210		35,800		75,470	

TABLE D-11

WET YEAR AND DRY YEAR LOADINGS BY JURISDICTION
FOR BUILDOUT FUTURE LAND USE CONDITIONS

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	WET YEAR POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	19.15	38.9%	177,000	48.1%	903,920	48.2%	27,900	46.7%	31,290	23.8%
SARASOTA CITY	7,844	2.72	5.5%	25,820	7.0%	119,810	6.4%	7,560	12.6%	6,070	4.6%
MANATEE CO.	20,226	7.36	15.0%	64,120	17.4%	328,080	17.5%	18,520	31.0%	14,330	10.9%
ISLANDS	5,761	2.02	4.1%	22,070	6.0%	92,620	4.9%	2,660	4.4%	3,280	2.5%
BAY SURFACE	33,280	17.92	36.4%	78,800	21.4%	430,790	23.0%	3,150	5.3%	76,700	58.3%
TOTAL	129,412	49.18		367,810		1,875,220		59,790		131,670	

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	DRY YEAR POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	9.82	36.1%	96,990	45.7%	550,570	48.2%	16,620	46.4%	16,130	21.4%
SARASOTA CITY	7,844	1.50	5.5%	16,130	7.6%	73,050	6.4%	4,580	12.8%	3,560	4.7%
MANATEE CO.	20,226	4.07	15.0%	37,860	17.8%	201,600	17.7%	11,080	30.9%	7,930	10.5%
ISLANDS	5,761	1.11	4.1%	14,240	6.7%	58,260	5.1%	1,630	4.6%	1,960	2.6%
BAY SURFACE	33,280	10.72	39.4%	47,150	22.2%	257,730	22.6%	1,890	5.3%	45,890	60.8%
TOTAL	129,412	27.22		212,370		1,141,210		35,800		75,470	

TABLE D-12

AVERAGE ANNUAL LOADINGS BY SOURCE AND SEGMENT
FOR BUILDOUT LAND USE

Constituent	Segment Number	Watershed(s)	Average Annual Loadings (lb/yr) Surface Runoff	Baseflow	Septic Tanks	Point Source	Rainfall	Total
Total P								
	1	Anna Maria Island	1,650	240	0	0	3,587	5,477
	2	Perico Island, West Bradenton	7,860	1,610	0	0	3,999	13,469
	3	Palma Sola 2	2,070	270	0	0	2,563	4,903
	5	Longboat Key (40%)	1,172	208	0	0	6,307	7,687
	6	Palma Sola Creek, South Bradenton	9,890	1,540	0	10,390	9,179	30,999
	7	Longboat Key (40%)	1,172	208	0	0	8,102	9,482
	8	Cedar Hammock, Bowlees Creek, West Bowlees	17,110	2,140	0	0	8,204	27,454
	10	Longboat Key (20%), Other Islands (50%)	1,326	244	25	0	7,382	8,977
	11	Hudson Bayou, Whitaker Bayou, Direct to Bay	12,870	1,980	620	6,400	4,255	26,125
	13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	67,040	13,210	6,940	22,760	2,667	112,617
	14	Catfish Creek, North Creek, Direct to Bay	10,680	2,010	510	160	3,487	16,847
	16	Other Islands (50%), South Creek, Direct to Bay	13,210	5,540	175	0	1,998	20,923
		Total	146,050	29,200	8,270	39,710	61,730	284,960
Total N								
	1	Anna Maria Island	8,580	820	0	0	19,611	29,011
	2	Perico Island, West Bradenton	41,940	5,370	0	0	21,862	69,172
	3	Palma Sola 2	10,970	910	0	0	14,014	25,894
	5	Longboat Key (40%)	5,856	692	0	0	34,476	41,024
	6	Palma Sola Creek, South Bradenton	51,200	5,140	0	51,820	50,173	158,333
	7	Longboat Key (40%)	5,856	692	0	0	44,292	50,840
	8	Cedar Hammock, Bowlees Creek, West Bowlees	100,000	7,150	0	0	44,849	151,999
	10	Longboat Key (20%), Other Islands (50%)	6,668	821	340	0	40,357	48,186
	11	Hudson Bayou, Whitaker Bayou, Direct to Bay	72,220	6,630	9,330	19,190	23,261	130,631
	13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	348,890	44,080	104,280	75,950	14,581	587,781 0
	14	Catfish Creek, North Creek, Direct to Bay	54,350	6,700	7,500	790	19,063	88,403
	16	Other Islands (50%), South Creek, Direct to Bay	69,930	18,455	2,610	0	10,921	101,916
		Total	776,460	97,460	124,060	147,750	337,460	1,483,190

TABLE D-12 (CONTINUED)

AVERAGE ANNUAL LOADINGS BY SOURCE AND SEGMENT
FOR BUILDOUT LAND USE

Constituent	Segment Number	Watershed(s)	Average Annual Loadings (lb/yr)					
			Surface Runoff	Baseflow	Septic Tanks	Point Source	Rainfall	Total
Lead								
	1	Anna Maria Island	500	0	0	0	144	644
	2	Perico Island, West Bradenton	1,950	10	0	0	160	2,120
	3	Palma Sola 2	610	0	0	0	103	713
	5	Longboat Key (40%)	224	4	0	0	252	480
	6	Palma Sola Creek, South Bradenton	2,330	10	0	50	367	2,757
	7	Longboat Key (40%)	224	4	0	0	324	552
	8	Cedar Hammock, Bowlees Creek, West Bowlees	10,080	10	0	0	328	10,418
	10	Longboat Key (20%), Other Islands (50%)	277	2	0	0	295	574
	11	Hudson Bayou, Whitaker Bayou, Direct to Bay	6,150	20	0	130	170	6,470
	13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	17,370	130	0	390	107	17,997
	14	Catfish Creek, North Creek, Direct to Bay	2,340	20	0	0	140	2,500
	16	Other Islands (50%), South Creek, Direct to Bay	1,555	50	0	0	80	1,685
		Total	43,610	260	0	570	2,470	46,910
Zinc								
	1	Anna Maria Island	350	40	0	0	3,491	3,881
	2	Perico Island, West Bradenton	1,590	270	0	0	3,892	5,752
	3	Palma Sola 2	460	50	0	0	2,495	3,005
	5	Longboat Key (40%)	196	36	0	0	6,138	6,370
	6	Palma Sola Creek, South Bradenton	2,110	260	0	260	8,933	11,563
	7	Longboat Key (40%)	196	36	0	0	7,886	8,118
	8	Cedar Hammock, Bowlees Creek, West Bowlees	6,080	360	0	0	7,985	14,425
	10	Longboat Key (20%), Other Islands (50%)	233	43	0	0	7,185	7,461
	11	Hudson Bayou, Whitaker Bayou, Direct to Bay	4,070	330	0	640	4,141	9,181
	13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	14,410	2,200	0	1,980	2,596	21,186
	14	Catfish Creek, North Creek, Direct to Bay	2,110	340	0	0	3,394	5,844
	16	Other Islands (50%), South Creek, Direct to Bay	1,875	925	0	0	1,944	4,744
		Total	33,680	4,890	0	2,880	60,080	101,530

TABLE D-13

AVERAGE ANNUAL LOADINGS BY WATERSHED AND SOURCE
FOR BUILDOUT LAND USE

Constituent	Watershed	Average Annual Loadings (lb/yr) Surface Runoff	Baseflow	Septic Tanks	Point Source	Rainfall	Total
Total P							
	Philippi Creek	56,360	11,550	5,860	8,220	23,385	105,375
	Palma Sola 2	2,070	270	0	0	719	3,059
	Bowlees Creek	10,760	1,230	0	0	4,167	16,157
	West Bradenton	6,700	1,310	0	0	2,822	10,832
	Cedar Hammock	3,620	470	0	0	1,239	5,329
	West Bowlees	2,730	440	0	0	1,001	4,171
	Palma Sola Creek	1,640	230	0	0	578	2,448
	South Bradenton	8,250	1,310	0	10,390	2,976	22,926
	Whitaker Bayou	8,210	1,320	620	6,400	3,220	19,770
	Matheny Creek	6,120	910	690	7,840	2,440	18,000
	Catfish Creek	5,450	1,060	160	0	2,158	8,828
	North Creek	3,400	610	100	0	1,233	5,343
	South Creek	11,260	5,170	90	0	8,345	24,865
	Hudson Bayou	2,700	370	0	0	1,024	4,094
	Siesta Key	2,490	420	0	6,700	889	10,499
	Anna Maria Island	1,650	240	0	0	590	2,480
	Perico Island	1,160	300	0	0	552	2,012
	Longboat Key	2,930	520	0	0	1,090	4,540
	Other Islands	1,480	280	50	0	578	2,388
	Direct to Bay	7,070	1,190	700	160	2,723	11,843
	Total	146,050	29,200	8,270	39,710	61,730	284,960
Total N							
	Philippi Creek	289,860	38,520	87,920	30,170	127,838	574,308
	Palma Sola 2	10,970	910	0	0	3,932	15,812
	Bowlees Creek	66,600	4,140	0	0	22,779	93,519
	West Bradenton	35,850	4,370	0	0	15,428	55,648
	Cedar Hammock	19,280	1,550	0	0	6,775	27,605
	West Bowlees	14,120	1,460	0	0	5,473	21,053
	Palma Sola Creek	8,530	770	0	0	3,159	12,459
	South Bradenton	42,670	4,370	0	51,820	16,271	115,131
	Whitaker Bayou	45,710	4,410	9,330	19,190	17,605	96,245
	Matheny Creek	35,740	3,040	10,380	25,670	13,339	88,169
	Catfish Creek	28,080	3,520	2,360	0	11,795	45,755
	North Creek	16,720	2,040	1,460	0	6,740	26,960
	South Creek	60,110	17,220	1,350	0	45,617	124,297
	Hudson Bayou	15,330	1,240	0	0	5,599	22,169
	Siesta Key	12,320	1,400	0	20,110	4,862	38,692
	Anna Maria Island	8,580	820	0	0	3,226	12,626
	Perico Island	6,090	1,000	0	0	3,019	10,109
	Longboat Key	14,640	1,730	0	0	5,957	22,327
	Other Islands	7,480	950	680	0	3,159	12,269
	Direct to Bay	37,780	4,000	10,580	790	14,888	68,038
	Total	776,460	97,460	124,060	147,750	337,460	1,483,190

TABLE D-13 (CONTINUED)

AVERAGE ANNUAL LOADINGS BY WATERSHED AND SOURCE
FOR BUILDOUT LAND USE

Constituent	Watershed	Average Annual Loadings (lb/yr) Surface Runoff	Baseflow	Septic Tanks	Point Source	Rainfall	Total
Lead							
	Philippi Creek	13,080	120	0	120	936	14,256
	Palma Sola 2	610	0	0	0	29	639
	Bowlees Creek	8,060	10	0	0	167	8,237
	West Bradenton	1,790	10	0	0	113	1,913
	Cedar Hammock	1,280	0	0	0	50	1,330
	West Bowlees	740	0	0	0	40	780
	Palma Sola Creek	430	0	0	0	23	453
	South Bradenton	1,900	10	0	50	119	2,079
	Whitaker Bayou	3,660	20	0	130	129	3,939
	Matheny Creek	3,140	10	0	140	98	3,388
	Catfish Creek	1,250	10	0	0	86	1,346
	North Creek	570	10	0	0	49	629
	South Creek	1,140	50	0	0	334	1,524
	Hudson Bayou	1,440	0	0	0	41	1,481
	Siesta Key	480	0	0	130	36	646
	Anna Maria Island	500	0	0	0	24	524
	Perico Island	160	0	0	0	22	182
	Longboat Key	560	10	0	0	44	614
	Other Islands	330	0	0	0	23	353
	Direct to Bay	2,490	0	0	0	109	2,599
	Total	43,610	260	0	570	2,470	46,910
Zinc							
	Philippi Creek	11,350	1,920	0	610	22,760	36,640
	Palma Sola 2	460	50	0	0	700	1,210
	Bowlees Creek	4,640	210	0	0	4,055	8,905
	West Bradenton	1,430	220	0	0	2,747	4,397
	Cedar Hammock	890	80	0	0	1,206	2,176
	West Bowlees	550	70	0	0	974	1,594
	Palma Sola Creek	320	40	0	0	562	922
	South Bradenton	1,790	220	0	260	2,897	5,167
	Whitaker Bayou	2,550	220	0	640	3,134	6,544
	Matheny Creek	2,160	150	0	700	2,375	5,385
	Catfish Creek	1,130	180	0	0	2,100	3,410
	North Creek	600	100	0	0	1,200	1,900
	South Creek	1,500	860	0	0	8,122	10,482
	Hudson Bayou	870	60	0	0	997	1,927
	Siesta Key	410	70	0	670	866	2,016
	Anna Maria Island	350	40	0	0	574	964
	Perico Island	160	50	0	0	537	747
	Longboat Key	490	90	0	0	1,061	1,641
	Other Islands	270	50	0	0	562	882
	Direct to Bay	1,760	210	0	0	2,651	4,621
	Total	33,680	4,890	0	2,880	60,080	101,530

Appendix E

TABLE E-1

AVERAGE ANNUAL LOADINGS BY WATERSHED
FOR 20-YEAR FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	24.66	56,830	1.56	0.28	280,250	7.70	1.38	7,620	0.21	0.037	9,580	0.26	0.047
PALMA SOLA 2	1,120	26.17	1,680	1.50	0.25	8,700	7.77	1.31	360	0.32	0.054	340	0.30	0.051
BOWLEES CREEK	6,489	34.56	11,060	1.70	0.22	65,390	10.08	1.29	7,040	1.08	0.139	4,370	0.67	0.086
WEST BRADENTON	4,395	29.40	7,140	1.62	0.24	36,050	8.20	1.23	1,510	0.34	0.052	1,430	0.33	0.049
CEDAR HAMMOCK	1,930	32.35	4,090	2.12	0.29	20,830	10.79	1.47	1,280	0.66	0.090	970	0.50	0.069
WEST BOWLEES	1,559	28.06	2,960	1.90	0.30	14,710	9.44	1.48	680	0.44	0.069	570	0.37	0.057
PALMA SOLA	900	24.32	1,480	1.64	0.30	7,030	7.81	1.42	240	0.27	0.048	230	0.26	0.046
SOUTH BRADENTON	4,635	35.91	16,330	3.52	0.43	79,480	17.15	2.11	670	0.14	0.018	1,320	0.28	0.035
WHITAKER BAYOU	5,015	36.40	15,420	3.07	0.37	68,090	13.58	1.65	3,530	0.70	0.085	3,220	0.64	0.078
MATHENY CREEK	3,800	30.69	6,060	1.59	0.23	34,220	9.01	1.29	2,020	0.53	0.076	1,750	0.46	0.066
CATFISH CREEK	3,360	24.04	3,750	1.12	0.20	18,650	5.55	1.02	290	0.09	0.016	650	0.19	0.036
NORTH CREEK	1,920	22.69	2,250	1.17	0.23	10,910	5.68	1.10	230	0.12	0.023	380	0.20	0.038
SOUTH CREEK	12,995	19.89	11,560	0.89	0.20	55,470	4.27	0.95	290	0.02	0.005	1,500	0.12	0.026
HUDSON BAYOU	1,595	32.58	3,050	1.91	0.26	16,490	10.34	1.40	1,420	0.89	0.121	920	0.58	0.078
SIESTA KEY	1,385	49.68	9,580	6.92	0.61	33,730	24.35	2.16	600	0.43	0.038	1,150	0.83	0.074
ANNA MARIA	919	28.68	1,760	1.92	0.29	8,780	9.55	1.47	450	0.49	0.075	360	0.39	0.060
PERICO	860	33.26	1,020	1.19	0.16	4,750	5.52	0.73	50	0.06	0.008	110	0.13	0.017
LONGBOAT KEY	1697	24.34	2,780	1.64	0.30	13,410	7.90	1.43	440	0.26	0.047	460	0.27	0.049
OTHER ISLANDS	900	28.34	1,660	1.84	0.29	8,490	9.43	1.47	310	0.34	0.054	300	0.33	0.052
DIRECT TO BAY	4,241	30.59	8,050	1.90	0.27	42,130	9.93	1.43	2,300	0.54	0.078	1,850	0.44	0.063
BAY SURFACE	33,280	54.60	61,730	1.85	0.15	337,460	10.14	0.82	2,470	0.07	0.006	60,080	1.81	0.146
TOTAL	129,412	34.36	230,240	2.03	0.28	1,165,020	9.72	1.36	33,800	0.38	0.054	91,540	0.45	0.058

TABLE E-2

AVERAGE ANNUAL LOADINGS BY SOURCE
FOR 20-YEAR FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

SOURCE	RUNOFF (in)	% OF TOTAL	AVERAGE YEAR POLLUTANT LOADING							
			TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	15.21	44.3%	109,300	47.5%	599,150	51.4%	30,710	90.9%	24,280	26.5%
BASEFLOW	3.74	10.9%	32,920	14.3%	109,800	9.4%	290	0.9%	5,480	6.0%
SEPTIC	0.14	0.4%	1,680	0.7%	25,240	2.2%	0	0.0%	0	0.0%
POINT SOURCE	1.23	3.6%	24,610	10.7%	93,370	8.0%	330	1.0%	1,700	1.9%
RAINFALL	14.04	40.9%	61,730	26.8%	337,460	29.0%	2,470	7.3%	60,080	65.6%
TOTAL	34.36		230,240		1,165,020		33,800		91,540	

TABLE E-3

AVERAGE ANNUAL LOADINGS BY JURISDICTION
FOR 20-YEAR FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	AVERAGE YEAR POLLUTANT LOADING							
				Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	11.75	34.2%	87,850	38.2%	439,650	37.7%	12,440	36.8%	15,590	17.0%
SARASOTA CITY	7,844	2.06	6.0%	20,440	8.9%	93,970	8.1%	5,770	17.1%	4,630	5.1%
MANATEE CO.	20,226	5.04	14.7%	43,420	18.9%	224,780	19.3%	11,270	33.3%	8,860	9.7%
ISLANDS	5,761	1.47	4.3%	16,800	7.3%	69,160	5.9%	1,850	5.5%	2,380	2.6%
BAY SURFACE	33,280	14.04	40.9%	61,730	26.8%	337,460	29.0%	2,470	7.3%	60,080	65.6%
TOTAL	129,412	34.36		230,240		1,165,020		33,800		91,540	

TABLE E-4

WET SEASON LOADINGS BY WATERSHED
FOR 20-YEAR FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	15.55	36,220	0.99	0.28	175,320	4.81	1.37	4,740	0.13	0.037	6,150	0.17	0.048
PALMA SOLA 2	1,120	16.68	1,090	0.97	0.26	5,510	4.92	1.30	220	0.20	0.052	210	0.19	0.050
BOWLEES CREEK	6,489	21.70	6,980	1.08	0.22	40,970	6.31	1.28	4,370	0.67	0.137	2,740	0.42	0.086
WEST BRADENTON	4,395	18.69	4,580	1.04	0.25	22,780	5.18	1.22	930	0.21	0.050	920	0.21	0.049
CEDAR HAMMOCK	1,930	20.38	2,570	1.33	0.29	13,060	6.77	1.47	790	0.41	0.089	610	0.32	0.068
WEST BOWLEES	1,559	17.81	1,880	1.21	0.30	9,370	6.01	1.49	440	0.28	0.070	370	0.24	0.059
PALMA SOLA	900	15.59	940	1.04	0.30	4,460	4.96	1.40	140	0.16	0.044	160	0.18	0.050
SOUTH BRADENTON	4,635	19.24	7,520	1.62	0.37	35,880	7.74	1.78	400	0.09	0.020	790	0.17	0.039
WHITAKER BAYOU	5,015	21.96	8,680	1.73	0.35	39,490	7.87	1.58	2,180	0.43	0.087	1,920	0.38	0.077
MATHENY CREEK	3,800	19.23	3,830	1.01	0.23	21,250	5.59	1.28	1,260	0.33	0.076	1,100	0.29	0.066
CATFISH CREEK	3,360	15.14	2,440	0.73	0.21	11,820	3.52	1.03	180	0.05	0.016	430	0.13	0.037
NORTH CREEK	1,920	14.23	1,440	0.75	0.23	6,880	3.58	1.11	150	0.08	0.024	240	0.13	0.039
SOUTH CREEK	12,995	12.81	7,680	0.59	0.20	36,050	2.77	0.96	180	0.01	0.005	1,010	0.08	0.027
HUDSON BAYOU	1,595	20.51	1,930	1.21	0.26	10,370	6.50	1.40	890	0.56	0.120	590	0.37	0.080
SIESTA KEY	1,385	25.09	4,030	2.91	0.51	15,220	10.99	1.93	330	0.24	0.042	520	0.38	0.066
ANNA MARIA	919	18.18	1,140	1.24	0.30	5,520	6.01	1.46	280	0.30	0.074	230	0.25	0.061
PERICO	860	21.24	630	0.73	0.15	3,060	3.56	0.74	30	0.03	0.007	70	0.08	0.017
LONGBOAT KEY	1697	15.60	1,790	1.05	0.30	8,520	5.02	1.42	270	0.16	0.045	290	0.17	0.048
OTHER ISLANDS	900	17.95	1,040	1.16	0.28	5,230	5.81	1.43	190	0.21	0.052	190	0.21	0.052
DIRECT TO BAY	4,241	19.24	5,080	1.20	0.27	26,240	6.19	1.42	1,420	0.33	0.077	1,170	0.28	0.063
BAY SURFACE	33,280	33.70	38,100	1.14	0.15	208,290	6.26	0.82	1,520	0.05	0.006	37,090	1.11	0.146
TOTAL	129,412	21.28	139,590	1.18	0.27	705,290	5.73	1.33	20,910	0.24	0.054	56,800	0.27	0.058

TABLE E-5

DRY SEASON LOADINGS BY WATERSHED
FOR 20-YEAR FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	9.11	20,660	0.57	0.27	105,190	2.89	1.40	2,890	0.08	0.038	3,420	0.09	0.045
PALMA SOLA 2	1,120	9.48	580	0.52	0.24	3,170	2.83	1.32	130	0.12	0.054	130	0.12	0.054
BOWLEES CREEK	6,489	12.87	4,050	0.62	0.21	24,550	3.78	1.30	2,700	0.42	0.143	1,650	0.25	0.087
WEST BRADENTON	4,395	10.71	2,580	0.59	0.24	13,240	3.01	1.24	580	0.13	0.054	520	0.12	0.049
CEDAR HAMMOCK	1,930	11.97	1,500	0.78	0.29	7,790	4.04	1.49	490	0.25	0.094	360	0.19	0.069
WEST BOWLEES	1,559	10.25	1,100	0.71	0.30	5,510	3.53	1.52	270	0.17	0.075	220	0.14	0.061
PALMA SOLA	900	8.74	530	0.59	0.30	2,580	2.87	1.45	90	0.10	0.050	80	0.09	0.045
SOUTH BRADENTON	4,635	16.67	8,810	1.90	0.50	43,600	9.41	2.49	260	0.06	0.015	530	0.11	0.030
WHITAKER BAYOU	5,015	14.44	6,730	1.34	0.41	28,690	5.72	1.75	1,380	0.28	0.084	1,310	0.26	0.080
MATHENY CREEK	3,800	11.46	2,210	0.58	0.22	12,980	3.42	1.31	770	0.20	0.078	650	0.17	0.066
CATFISH CREEK	3,360	8.90	1,330	0.40	0.20	6,830	2.03	1.01	110	0.03	0.016	220	0.07	0.032
NORTH CREEK	1,920	8.47	810	0.42	0.22	4,000	2.08	1.09	90	0.05	0.024	130	0.07	0.035
SOUTH CREEK	12,995	7.08	3,870	0.30	0.19	19,440	1.50	0.93	100	0.01	0.005	470	0.04	0.023
HUDSON BAYOU	1,595	12.07	1,140	0.71	0.26	6,190	3.88	1.42	550	0.34	0.126	360	0.23	0.082
SIESTA KEY	1,385	24.59	5,520	3.99	0.72	18,480	13.34	2.39	270	0.19	0.035	630	0.45	0.082
ANNA MARIA	919	10.50	650	0.71	0.30	3,270	3.56	1.50	170	0.18	0.078	130	0.14	0.059
PERICO	860	12.02	320	0.37	0.14	1,680	1.95	0.72	20	0.02	0.009	40	0.05	0.017
LONGBOAT KEY	1697	8.74	990	0.58	0.29	4,930	2.91	1.47	170	0.10	0.051	170	0.10	0.051
OTHER ISLANDS	900	10.39	630	0.70	0.30	3,260	3.62	1.54	120	0.13	0.057	100	0.11	0.047
DIRECT TO BAY	4,241	11.35	2,930	0.69	0.27	15,890	3.75	1.46	880	0.21	0.081	700	0.17	0.064
BAY SURFACE	33,280	20.90	23,630	0.71	0.15	129,170	3.88	0.82	950	0.03	0.006	23,000	0.69	0.146
TOTAL	129,412	13.08	90,570	0.85	0.29	460,440	4.00	1.41	12,990	0.15	0.056	34,820	0.17	0.058

TABLE E-6

WET SEASON AND DRY SEASON LOADINGS BY SOURCE
FOR 20-YEAR FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

SOURCE	RUNOFF (in)	% OF TOTAL	WET SEASON POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	9.39	44.1%	67,440	48.3%	370,260	52.5%	19,060	91.2%	15,040	26.5%
BASEFLOW	2.74	12.9%	24,160	17.3%	80,500	11.4%	200	1.0%	4,030	7.1%
SEPTIC	0.05	0.2%	850	0.6%	12,590	1.8%	0	0.0%	0	0.0%
POINT SOURCE	0.44	2.1%	9,040	6.5%	33,650	4.8%	130	0.6%	640	1.1%
RAINFALL	8.67	40.7%	38,100	27.3%	208,290	29.5%	1,520	7.3%	37,090	65.3%
TOTAL	21.28		139,590		705,290		20,910		56,800	

SOURCE	RUNOFF (in)	% OF TOTAL	DRY SEASON POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	5.82	44.5%	41,740	46.1%	229,560	49.9%	11,790	90.8%	9,300	26.7%
BASEFLOW	1.00	7.6%	8,770	9.7%	29,320	6.4%	40	0.3%	1,480	4.3%
SEPTIC	0.09	0.7%	860	0.9%	12,670	2.8%	0	0.0%	0	0.0%
POINT SOURCE	0.79	6.0%	15,570	17.2%	59,720	13.0%	210	1.6%	1,040	3.0%
RAINFALL	5.37	41.1%	23,630	26.1%	129,170	28.1%	950	7.3%	23,000	66.1%
TOTAL	13.08		90,570		460,440		12,990		34,820	

TABLE E-7

WET SEASON AND DRY SEASON LOADINGS BY JURISDICTION
FOR 20-YEAR FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	WET SEASON POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	7.42	34.9%	56,140	40.2%	275,870	39.1%	7,720	36.9%	10,010	17.6%
SARASOTA CITY	7,844	1.27	6.0%	11,980	8.6%	56,360	8.0%	3,630	17.4%	2,850	5.0%
MANATEE CO.	20,226	3.06	14.4%	24,720	17.7%	127,220	18.0%	6,940	33.2%	5,550	9.8%
ISLANDS	5,761	0.87	4.1%	8,650	6.2%	37,550	5.3%	1,100	5.3%	1,300	2.3%
BAY SURFACE	33,280	8.67	40.7%	38,100	27.3%	208,290	29.5%	1,520	7.3%	37,090	65.3%
TOTAL	129,412	21.28		139,590		705,290		20,910		56,800	

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	DRY SEASON POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	4.33	33.1%	31,550	34.8%	163,790	35.6%	4,720	36.3%	5,560	16.0%
SARASOTA CITY	7,844	0.79	6.1%	8,590	9.5%	38,280	8.3%	2,270	17.5%	1,870	5.4%
MANATEE CO.	20,226	1.98	15.1%	18,660	20.6%	97,580	21.2%	4,300	33.1%	3,320	9.5%
ISLANDS	5,761	0.60	4.6%	8,140	9.0%	31,620	6.9%	750	5.8%	1,070	3.1%
BAY SURFACE	33,280	5.37	41.1%	23,630	26.1%	129,170	28.1%	950	7.3%	23,000	66.1%
TOTAL	129,412	13.08		90,570		460,440		12,990		34,820	

TABLE E-8

WET YEAR LOADINGS BY WATERSHED
FOR 20-YEAR FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	34.42	80,000	2.20	0.28	378,890	10.40	1.33	9,840	0.27	0.035	13,570	0.37	0.048
PALMA SOLA 2	1,120	36.20	2,350	2.10	0.26	11,800	10.54	1.28	470	0.42	0.051	460	0.41	0.050
BOWLEES CREEK	6,489	46.02	14,990	2.31	0.22	86,350	13.31	1.28	9,040	1.39	0.134	5,750	0.89	0.085
WEST BRADENTON	4,395	40.37	9,980	2.27	0.25	48,820	11.11	1.21	1,940	0.44	0.048	1,980	0.45	0.049
CEDAR HAMMOCK	1,930	43.45	5,500	2.85	0.29	27,550	14.27	1.45	1,640	0.85	0.086	1,290	0.67	0.068
WEST BOWLEES	1,559	38.40	4,090	2.62	0.30	19,910	12.77	1.47	910	0.58	0.067	810	0.52	0.060
PALMA SOLA	900	34.05	2,060	2.29	0.30	9,580	10.64	1.38	320	0.36	0.046	320	0.36	0.046
SOUTH BRADENTON	4,635	45.75	19,210	4.14	0.40	91,520	19.75	1.90	850	0.18	0.018	1,800	0.39	0.037
WHITAKER BAYOU	5,015	47.25	18,770	3.74	0.35	84,030	16.76	1.56	4,510	0.90	0.084	4,070	0.81	0.076
MATHENY CREEK	3,800	41.53	8,320	2.19	0.23	45,270	11.91	1.27	2,600	0.68	0.073	2,350	0.62	0.066
CATFISH CREEK	3,360	33.90	5,530	1.65	0.21	26,280	7.82	1.02	380	0.11	0.015	950	0.28	0.037
NORTH CREEK	1,920	32.13	3,300	1.72	0.24	15,310	7.97	1.09	300	0.16	0.021	560	0.29	0.040
SOUTH CREEK	12,995	29.03	18,030	1.39	0.21	81,740	6.29	0.96	410	0.03	0.005	2,470	0.19	0.029
HUDSON BAYOU	1,595	43.68	4,140	2.60	0.26	21,920	13.74	1.39	1,850	1.16	0.117	1,240	0.78	0.079
SIESTA KEY	1,385	60.24	10,630	7.68	0.56	38,330	27.68	2.03	740	0.53	0.039	1,320	0.95	0.070
ANNA MARIA	919	39.13	2,430	2.64	0.30	11,750	12.79	1.44	580	0.63	0.071	490	0.53	0.060
PERICO	860	46.18	1,550	1.80	0.17	6,790	7.90	0.75	80	0.09	0.009	160	0.19	0.018
LONGBOAT KEY	1697	34.09	3,880	2.29	0.30	18,310	10.79	1.40	560	0.33	0.043	640	0.38	0.049
OTHER ISLANDS	900	39.00	2,280	2.53	0.29	11,240	12.49	1.41	400	0.44	0.050	410	0.46	0.052
DIRECT TO BAY	4,241	41.53	10,970	2.59	0.27	55,670	13.13	1.39	2,940	0.69	0.074	2,500	0.59	0.063
BAY SURFACE	33,280	69.70	78,800	2.37	0.15	430,790	12.94	0.82	3,150	0.09	0.006	76,700	2.30	0.146
TOTAL	129,412	45.76	306,810	2.66	0.28	1,521,850	12.62	1.33	43,510	0.49	0.052	119,840	0.59	0.058

Note: Loading totals do not include pollutant settling in tidal tributaries. See text for discussion of settling in tributaries.

TABLE E-9

DRY YEAR LOADINGS BY WATERSHED
FOR 20-YEAR FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	16.11	36,610	1.01	0.28	194,560	5.34	1.46	5,790	0.16	0.044	6,140	0.17	0.046
PALMA SOLA 2	1,120	17.40	1,090	0.97	0.25	5,970	5.33	1.35	280	0.25	0.063	230	0.21	0.052
BOWLEES CREEK	6,489	24.64	7,680	1.18	0.21	47,410	7.31	1.31	5,390	0.83	0.149	3,230	0.50	0.089
WEST BRADENTON	4,395	19.83	4,650	1.06	0.24	24,910	5.67	1.26	1,150	0.26	0.058	970	0.22	0.049
CEDAR HAMMOCK	1,930	22.72	2,850	1.48	0.29	15,070	7.81	1.52	980	0.51	0.099	710	0.37	0.071
WEST BOWLEES	1,559	19.05	2,040	1.31	0.30	10,530	6.75	1.56	550	0.35	0.082	420	0.27	0.062
PALMA SOLA	900	15.81	940	1.04	0.29	4,800	5.33	1.49	180	0.20	0.056	150	0.17	0.047
SOUTH BRADENTON	4,635	27.27	13,820	2.98	0.48	68,960	14.88	2.41	510	0.11	0.018	910	0.20	0.032
WHITAKER BAYOU	5,015	26.96	12,550	2.50	0.41	54,530	10.87	1.78	2,740	0.55	0.089	2,470	0.49	0.081
MATHENY CREEK	3,800	21.25	4,050	1.07	0.22	24,630	6.48	1.35	1,540	0.41	0.084	1,240	0.33	0.068
CATFISH CREEK	3,360	15.36	2,170	0.65	0.19	11,950	3.56	1.02	210	0.06	0.018	370	0.11	0.032
NORTH CREEK	1,920	14.38	1,310	0.68	0.21	7,050	3.67	1.13	170	0.09	0.027	230	0.12	0.037
SOUTH CREEK	12,995	11.81	5,810	0.45	0.17	32,230	2.48	0.93	190	0.01	0.005	630	0.05	0.018
HUDSON BAYOU	1,595	22.95	2,140	1.34	0.26	11,950	7.49	1.44	1,100	0.69	0.133	680	0.43	0.082
SIESTA KEY	1,385	40.48	8,660	6.25	0.68	29,710	21.45	2.34	490	0.35	0.039	990	0.71	0.078
ANNA MARIA	919	19.58	1,190	1.29	0.29	6,230	6.78	1.53	350	0.38	0.086	260	0.28	0.064
PERICO	860	21.95	570	0.66	0.13	2,970	3.45	0.69	40	0.05	0.009	40	0.05	0.009
LONGBOAT KEY	1697	15.80	1,790	1.05	0.29	9,200	5.42	1.51	330	0.19	0.054	300	0.18	0.049
OTHER ISLANDS	900	19.03	1,130	1.26	0.29	6,100	6.78	1.57	240	0.27	0.062	200	0.22	0.052
DIRECT TO BAY	4,241	21.07	5,530	1.30	0.27	30,370	7.16	1.50	1,740	0.41	0.086	1,290	0.30	0.064
BAY SURFACE	33,280	41.70	47,150	1.42	0.15	257,730	7.74	0.82	1,890	0.06	0.006	45,890	1.38	0.146
TOTAL	129,412	24.47	163,730	1.47	0.28	856,860	7.23	1.43	25,860	0.29	0.060	67,350	0.32	0.058

TABLE E-10

WET YEAR AND DRY YEAR LOADINGS BY SOURCE
FOR 20-YEAR FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

SOURCE	RUNOFF (in)	% OF TOTAL	WET YEAR POLLUTANT LOADING							
			TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	19.42	42.4%	139,690	45.5%	765,660	50.3%	39,410	90.6%	31,120	26.0%
BASEFLOW	7.05	15.4%	62,030	20.2%	206,790	13.6%	620	1.4%	10,320	8.6%
SEPTIC	0.14	0.3%	1,680	0.5%	25,240	1.7%	0	0.0%	0	0.0%
POINT SOURCE	1.23	2.7%	24,610	8.0%	93,370	6.1%	330	0.8%	1,700	1.4%
RAINFALL	17.92	39.2%	78,800	25.7%	430,790	28.3%	3,150	7.2%	76,700	64.0%
TOTAL	45.76		306,810		1,521,850		43,510		119,840	

SOURCE	RUNOFF (in)	% OF TOTAL	DRY YEAR POLLUTANT LOADING							
			TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	11.62	47.5%	83,600	51.1%	458,180	53.5%	23,600	91.3%	18,620	27.6%
BASEFLOW	0.76	3.1%	6,690	4.1%	22,340	2.6%	40	0.2%	1,140	1.7%
SEPTIC	0.14	0.6%	1,680	1.0%	25,240	2.9%	0	0.0%	0	0.0%
POINT SOURCE	1.23	5.0%	24,610	15.0%	93,370	10.9%	330	1.3%	1,700	2.5%
RAINFALL	10.72	43.8%	47,150	28.8%	257,730	30.1%	1,890	7.3%	45,890	68.1%
TOTAL	24.47		163,730		856,860		25,860		67,350	

TABLE E-11

WET YEAR AND DRY YEAR LOADINGS BY JURISDICTION
FOR 20-YEAR FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	WET YEAR POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	16.45	36.0%	125,130	40.8%	599,470	39.4%	16,020	36.8%	22,210	18.5%
SARASOTA CITY	7,844	2.72	5.9%	25,820	8.4%	119,810	7.9%	7,550	17.4%	6,050	5.0%
MANATEE CO.	20,226	6.71	14.7%	56,300	18.4%	285,360	18.8%	14,430	33.2%	11,860	9.9%
ISLANDS	5,761	1.95	4.3%	20,760	6.8%	86,420	5.7%	2,360	5.4%	3,020	2.5%
BAY SURFACE	33,280	17.92	39.2%	78,800	25.7%	430,790	28.3%	3,150	7.2%	76,700	64.0%
TOTAL	129,412	45.76		306,810		1,521,850		43,510		119,840	

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	DRY YEAR POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	7.62	31.1%	54,970	33.6%	299,770	35.0%	9,380	36.3%	9,820	14.6%
SARASOTA CITY	7,844	1.49	6.1%	16,120	9.8%	72,970	8.5%	4,550	17.6%	3,530	5.2%
MANATEE CO.	20,226	3.58	14.6%	32,140	19.6%	172,180	20.1%	8,590	33.2%	6,320	9.4%
ISLANDS	5,761	1.06	4.3%	13,350	8.2%	54,210	6.3%	1,450	5.6%	1,790	2.7%
BAY SURFACE	33,280	10.72	43.8%	47,150	28.8%	257,730	30.1%	1,890	7.3%	45,890	68.1%
TOTAL	129,412	24.47		163,730		856,860		25,860		67,350	

TABLE E-12

AVERAGE ANNUAL LOADINGS BY SOURCE AND SEGMENT
FOR 20-YEAR FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

Constituent	Segment Number	Watershed(s)	Average Annual Loadings (lb/yr)					
			Surface Runoff	Baseflow	Septic Tanks	Point Source	Rainfall	Total
Total P								
	1	Anna Maria Island	1,500	260	0	0	3,587	5,347
	2	Perico Island, West Bradenton	6,400	1,760	0	0	3,999	12,159
	3	Palma Sola 2	1,330	350	0	0	2,563	4,243
	5	Longboat Key (40%)	884	228	0	0	6,307	7,419
	6	Palma Sola Creek, South Bradenton	5,970	2,060	0	9,780	9,178	26,988
	7	Longboat Key (40%)	884	228	0	0	8,102	9,214
	8	Cedar Hammock, Bowlees Creek, West Bowlees	15,810	2,300	0	0	8,204	26,314
	10	Longboat Key (20%), Other Islands (50%)	1,102	259	25	0	7,382	8,768
	11	Hudson Bayou, Whitaker Bayou, Direct to Bay	12,110	2,050	120	6,440	4,255	24,975
	13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	50,900	14,950	1,390	7,710	2,667	77,617
	14	Catfish Creek, North Creek, Direct to Bay	5,110	2,500	100	300	3,487	11,497
	16	Other Islands (50%), South Creek, Direct to Bay	7,300	5,975	45	380	1,998	15,698
		Total	109,300	32,920	1,680	24,610	61,730	230,240
Total N								
	1	Anna Maria Island	7,920	860	0	0	19,611	28,391
	2	Perico Island, West Bradenton	34,930	5,870	0	0	21,862	62,662
	3	Palma Sola 2	7,530	1,170	0	0	14,014	22,714
	5	Longboat Key (40%)	4,600	764	0	0	34,476	39,840
	6	Palma Sola Creek, South Bradenton	30,850	6,880	0	48,780	50,173	136,683
	7	Longboat Key (40%)	4,600	764	0	0	44,292	49,656
	8	Cedar Hammock, Bowlees Creek, West Bowlees	93,280	7,650	0	0	44,849	145,779
	10	Longboat Key (20%), Other Islands (50%)	5,715	872	340	0	40,357	47,284
	11	Hudson Bayou, Whitaker Bayou, Direct to Bay	68,730	6,850	1,850	19,310	23,261	120,001
	13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	267,630	49,850	20,820	23,190	14,581	376,071
	14	Catfish Creek, North Creek, Direct to Bay	29,120	8,330	1,500	920	19,063	58,933
	16	Other Islands (50%), South Creek, Direct to Bay	44,245	19,940	730	1,170	10,921	77,006
		Total	599,150	109,800	25,240	93,370	337,460	1,165,020

TABLE E-12 (CONTINUED)

AVERAGE ANNUAL LOADINGS BY SOURCE AND SEGMENT
FOR 20-YEAR FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

Constituent	Segment Number	Watershed(s)	Average Annual Loadings (lb/yr)					
			Surface Runoff	Baseflow	Septic Tanks	Point Source	Rainfall	Total
Lead								
	1	Anna Maria Island	450	0	0	0	144	594
	2	Perico Island, West Bradenton	1,550	10	0	0	160	1,720
	3	Palma Sola 2	360	0	0	0	103	463
	5	Longboat Key (40%)	172	4	0	0	252	428
	6	Palma Sola Creek, South Bradenton	840	20	0	50	367	1,277
	7	Longboat Key (40%)	172	4	0	0	324	500
	8	Cedar Hammock, Bowlees Creek, West Bowlees	8,990	10	0	0	328	9,328
	10	Longboat Key (20%), Other Islands (50%)	241	2	0	0	295	538
	11	Hudson Bayou, Whitaker Bayou, Direct to Bay	5,860	20	0	120	170	6,170
	13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	10,620	140	0	150	107	11,017
	14	Catfish Creek, North Creek, Direct to Bay	880	20	0	0	140	1,040
	16	Other Islands (50%), South Creek, Direct to Bay	575	60	0	10	80	725
		Total	30,710	290	0	330	2,470	33,800
Zinc								
	1	Anna Maria Island	320	40	0	0	3,491	3,851
	2	Perico Island, West Bradenton	1,250	290	0	0	3,892	5,432
	3	Palma Sola 2	280	60	0	0	2,495	2,835
	5	Longboat Key (40%)	144	40	0	0	6,138	6,322
	6	Palma Sola Creek, South Bradenton	970	340	0	240	8,933	10,483
	7	Longboat Key (40%)	144	40	0	0	7,886	8,070
	8	Cedar Hammock, Bowlees Creek, West Bowlees	5,530	380	0	0	7,985	13,895
	10	Longboat Key (20%), Other Islands (50%)	197	45	0	0	7,185	7,427
	11	Hudson Bayou, Whitaker Bayou, Direct to Bay	3,880	340	0	620	4,141	8,981
	13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	9,770	2,490	0	770	2,596	15,626
	14	Catfish Creek, North Creek, Direct to Bay	940	420	0	30	3,394	4,784
	16	Other Islands (50%), South Creek, Direct to Bay	855	995	0	40	1,944	3,834
		Total	24,280	5,480	0	1,700	60,080	91,540

TABLE E-13

AVERAGE ANNUAL LOADINGS BY WATERSHED AND SOURCE
FOR 20-YEAR FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

Constituent	Watershed	Average Annual Loadings (lb/yr) Surface Runoff	Baseflow	Septic Tanks	Point Source	Rainfall	Total
Total P							
	Phillippi Creek	41,590	13,110	1,170	960	0	56,830
	Palma Sola 2	1,330	350	0	0	0	1,680
	Bowlees Creek	9,680	1,380	0	0	0	11,060
	West Bradenton	5,740	1,400	0	0	0	7,140
	Cedar Hammock	3,620	470	0	0	0	4,090
	West Bowlees	2,510	450	0	0	0	2,960
	Palma Sola Creek	1,180	300	0	0	0	1,480
	South Bradenton	4,790	1,760	0	9,780	0	16,330
	Whitaker Bayou	7,470	1,390	120	6,440	0	15,420
	Matheny Creek	4,780	1,090	140	50	0	6,060
	Catfish Creek	2,200	1,350	30	170	0	3,750
	North Creek	1,330	780	20	120	0	2,250
	South Creek	5,590	5,590	10	370	0	11,560
	Hudson Bayou	2,680	370	0	0	0	3,050
	Siesta Key	2,460	420	0	6,700	0	9,580
	Anna Maria Island	1,500	260	0	0	0	1,760
	Perico Island	660	360	0	0	0	1,020
	Longboat Key	2,210	570	0	0	0	2,780
	Other Islands	1,320	290	50	0	0	1,660
	Direct to Bay	6,660	1,230	140	20	0	8,050
	Bay Surface	0	0	0	0	61,730	61,730
	Total	109,300	32,920	1,680	24,610	61,730	230,240
Total N							
	Phillippi Creek	216,080	43,690	17,550	2,930	0	280,250
	Palma Sola 2	7,530	1,170	0	0	0	8,700
	Bowlees Creek	60,790	4,600	0	0	0	65,390
	West Bradenton	31,380	4,670	0	0	0	36,050
	Cedar Hammock	19,280	1,550	0	0	0	20,830
	West Bowlees	13,210	1,500	0	0	0	14,710
	Palma Sola Creek	6,020	1,010	0	0	0	7,030
	South Bradenton	24,830	5,870	0	48,780	0	79,480
	Whitaker Bayou	42,300	4,630	1,850	19,310	0	68,090
	Matheny Creek	28,360	3,630	2,080	150	0	34,220
	Catfish Creek	13,170	4,500	460	520	0	18,650
	North Creek	7,630	2,600	310	370	0	10,910
	South Creek	35,480	18,640	210	1,140	0	55,470
	Hudson Bayou	15,250	1,240	0	0	0	16,490
	Siesta Key	12,210	1,410	0	20,110	0	33,730
	Anna Maria Island	7,920	860	0	0	0	8,780
	Perico Island	3,550	1,200	0	0	0	4,750
	Longboat Key	11,500	1,910	0	0	0	13,410
	Other Islands	6,830	980	680	0	0	8,490
	Direct to Bay	35,830	4,140	2,100	60	0	42,130
	Bay Surface	0	0	0	0	337,460	337,460
	Total	599,150	109,800	25,240	93,370	337,460	1,165,020

TABLE E-13 (CONTINUED)

AVERAGE ANNUAL LOADINGS BY WATERSHED AND SOURCE
FOR 20-YEAR FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

Constituent	Watershed	Average Annual Loadings (lb/yr) Surface Runoff	Baseflow	Septic Tanks	Point Source	Rainfall	Total
Lead							
	Phillippi Creek	7,470	130	0	20	0	7,620
	Palma Sola 2	360	0	0	0	0	360
	Bowlees Creek	7,030	10	0	0	0	7,040
	West Bradenton	1,500	10	0	0	0	1,510
	Cedar Hammock	1,280	0	0	0	0	1,280
	West Bowlees	680	0	0	0	0	680
	Palma Sola Creek	240	0	0	0	0	240
	South Bradenton	600	20	0	50	0	670
	Whitaker Bayou	3,390	20	0	120	0	3,530
	Matheny Creek	2,010	10	0	0	0	2,020
	Catfish Creek	280	10	0	0	0	290
	North Creek	220	10	0	0	0	230
	South Creek	220	60	0	10	0	290
	Hudson Bayou	1,420	0	0	0	0	1,420
	Siesta Key	470	0	0	130	0	600
	Anna Maria Island	450	0	0	0	0	450
	Perico Island	50	0	0	0	0	50
	Longboat Key	430	10	0	0	0	440
	Other Islands	310	0	0	0	0	310
	Direct to Bay	2,300	0	0	0	0	2,300
	Bay Surface	0	0	0	0	2,470	2,470
	Total	30,710	290	0	330	2,470	33,800
Zinc							
	Phillippi Creek	7,300	2,180	0	100	0	9,580
	Palma Sola 2	280	60	0	0	0	340
	Bowlees Creek	4,140	230	0	0	0	4,370
	West Bradenton	1,200	230	0	0	0	1,430
	Cedar Hammock	890	80	0	0	0	970
	West Bowlees	500	70	0	0	0	570
	Palma Sola Creek	180	50	0	0	0	230
	South Bradenton	790	290	0	240	0	1,320
	Whitaker Bayou	2,370	230	0	620	0	3,220
	Matheny Creek	1,570	180	0	0	0	1,750
	Catfish Creek	400	230	0	20	0	650
	North Creek	240	130	0	10	0	380
	South Creek	530	930	0	40	0	1,500
	Hudson Bayou	860	60	0	0	0	920
	Siesta Key	410	70	0	670	0	1,150
	Anna Maria Island	320	40	0	0	0	360
	Perico Island	50	60	0	0	0	110
	Longboat Key	360	100	0	0	0	460
	Other Islands	250	50	0	0	0	300
	Direct to Bay	1,640	210	0	0	0	1,850
	Bay Surface	0	0	0	0	60,080	60,080
	Total	24,280	5,480	0	1,700	60,080	91,540

Appendix F

TABLE F-1

AVERAGE ANNUAL LOADINGS BY WATERSHED
FOR BUILDOUT FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	25.91	55,310	1.52	0.26	285,840	7.85	1.34	8,040	0.22	0.038	10,190	0.28	0.048
PALMA SOLA 2	1,120	27.01	1,720	1.54	0.25	8,960	8.00	1.31	370	0.33	0.054	360	0.32	0.053
BOWLEES CREEK	6,489	35.27	11,030	1.70	0.21	66,140	10.19	1.28	7,110	1.10	0.137	4,460	0.69	0.086
WEST BRADENTON	4,395	30.12	7,140	1.62	0.24	36,800	8.37	1.23	1,530	0.35	0.051	1,480	0.34	0.049
CEDAR HAMMOCK	1,930	32.35	4,090	2.12	0.29	20,830	10.79	1.47	1,280	0.66	0.090	970	0.50	0.069
WEST BOWLEES	1,559	28.17	2,970	1.91	0.30	14,760	9.47	1.48	680	0.44	0.068	570	0.37	0.057
PALMA SOLA	900	25.02	1,300	1.44	0.25	6,670	7.41	1.31	240	0.27	0.047	230	0.26	0.045
SOUTH BRADENTON	4,635	37.89	15,870	3.42	0.40	80,760	17.42	2.03	710	0.15	0.018	1,410	0.30	0.035
WHITAKER BAYOU	5,015	36.75	15,450	3.08	0.37	68,500	13.66	1.64	3,540	0.71	0.085	3,250	0.65	0.078
MATHENY CREEK	3,800	32.79	6,080	1.60	0.22	35,760	9.41	1.27	2,140	0.56	0.076	1,910	0.50	0.068
CATFISH CREEK	3,360	26.38	3,940	1.17	0.20	20,660	6.15	1.03	370	0.11	0.018	750	0.22	0.037
NORTH CREEK	1,920	24.47	2,360	1.23	0.22	11,890	6.19	1.12	240	0.13	0.023	410	0.21	0.039
SOUTH CREEK	12,995	20.65	11,910	0.92	0.20	58,520	4.50	0.96	310	0.02	0.005	1,580	0.12	0.026
HUDSON BAYOU	1,595	32.58	3,050	1.91	0.26	16,490	10.34	1.40	1,420	0.89	0.121	920	0.58	0.078
SIESTA KEY	1,385	49.74	9,590	6.92	0.61	33,770	24.38	2.16	600	0.43	0.038	1,150	0.83	0.074
ANNA MARIA	919	28.68	1,760	1.92	0.29	8,780	9.55	1.47	450	0.49	0.075	360	0.39	0.060
PERICO	860	34.83	860	1.00	0.13	4,600	5.35	0.68	60	0.07	0.009	120	0.14	0.018
LONGBOAT KEY	1697	24.67	2,810	1.66	0.30	13,620	8.03	1.44	440	0.26	0.046	460	0.27	0.048
OTHER ISLANDS	900	28.34	1,660	1.84	0.29	8,490	9.43	1.47	310	0.34	0.054	300	0.33	0.052
DIRECT TO BAY	4,241	30.89	8,070	1.90	0.27	42,420	10.00	1.43	2,310	0.54	0.078	1,880	0.44	0.063
BAY SURFACE	33,280	54.60	61,730	1.85	0.15	337,460	10.14	0.82	2,470	0.07	0.006	60,080	1.81	0.146
TOTAL	129,412	35.12	228,700	2.01	0.27	1,181,720	9.84	1.35	34,620	0.39	0.054	92,840	0.45	0.058

TABLE F-2

AVERAGE ANNUAL LOADINGS BY SOURCE
FOR BUILDOUT FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

SOURCE	RUNOFF (in)	% OF TOTAL	AVERAGE YEAR POLLUTANT LOADING							
			TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	16.01	45.6%	107,960	47.2%	615,660	52.1%	31,540	91.1%	25,710	27.7%
BASEFLOW	3.62	10.3%	31,840	13.9%	106,140	9.0%	280	0.8%	5,310	5.7%
SEPTIC	0.14	0.4%	1,680	0.7%	25,240	2.1%	0	0.0%	0	0.0%
POINT SOURCE	1.30	3.7%	25,490	11.1%	97,220	8.2%	330	1.0%	1,740	1.9%
RAINFALL	14.04	40.0%	61,730	27.0%	337,460	28.6%	2,470	7.1%	60,080	64.7%
TOTAL	35.12		228,700		1,181,720		34,620		92,840	

TABLE F-3

AVERAGE ANNUAL LOADINGS BY JURISDICTION
FOR BUILDOUT FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	AVERAGE YEAR POLLUTANT LOADING							
				Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	12.34	35.1%	87,050	38.1%	453,370	38.4%	13,100	37.8%	16,620	17.9%
SARASOTA CITY	7,844	2.06	5.9%	20,440	8.9%	93,970	8.0%	5,770	16.7%	4,630	5.0%
MANATEE CO.	20,226	5.19	14.8%	42,800	18.7%	227,660	19.3%	11,420	33.0%	9,120	9.8%
ISLANDS	5,761	1.49	4.2%	16,680	7.3%	69,260	5.9%	1,860	5.4%	2,390	2.6%
BAY SURFACE	33,280	14.04	40.0%	61,730	27.0%	337,460	28.6%	2,470	7.1%	60,080	64.7%
TOTAL	129,412	35.12		228,700		1,181,720		34,620		92,840	

TABLE F-4

WET SEASON LOADINGS BY WATERSHED
FOR BUILDOUT FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	16.52	35,550	0.98	0.26	179,540	4.93	1.32	5,020	0.14	0.037	6,550	0.18	0.048
PALMA SOLA 2	1,120	17.19	1,090	0.97	0.25	5,660	5.05	1.30	230	0.21	0.053	220	0.20	0.050
BOWLEES CREEK	6,489	22.12	6,970	1.07	0.21	41,390	6.38	1.27	4,410	0.68	0.136	2,800	0.43	0.086
WEST BRADENTON	4,395	19.12	4,550	1.04	0.24	23,230	5.29	1.22	940	0.21	0.049	950	0.22	0.050
CEDAR HAMMOCK	1,930	20.38	2,570	1.33	0.29	13,060	6.77	1.47	790	0.41	0.089	610	0.32	0.068
WEST BOWLEES	1,559	17.88	1,890	1.21	0.30	9,400	6.03	1.49	440	0.28	0.070	380	0.24	0.060
PALMA SOLA	900	16.00	830	0.92	0.25	4,230	4.70	1.30	140	0.16	0.043	160	0.18	0.049
SOUTH BRADENTON	4,635	20.22	7,070	1.53	0.33	35,830	7.73	1.69	430	0.09	0.020	840	0.18	0.040
WHITAKER BAYOU	5,015	22.23	8,730	1.74	0.35	39,780	7.93	1.57	2,190	0.44	0.087	1,940	0.39	0.077
MATHENY CREEK	3,800	20.59	3,870	1.02	0.22	22,240	5.85	1.25	1,330	0.35	0.075	1,190	0.31	0.067
CATFISH CREEK	3,360	16.96	2,590	0.77	0.20	13,220	3.93	1.02	220	0.07	0.017	480	0.14	0.037
NORTH CREEK	1,920	15.82	1,560	0.81	0.23	7,610	3.96	1.11	160	0.08	0.023	260	0.14	0.038
SOUTH CREEK	12,995	13.50	8,020	0.62	0.20	38,310	2.95	0.96	210	0.02	0.005	1,090	0.08	0.027
HUDSON BAYOU	1,595	20.51	1,930	1.21	0.26	10,370	6.50	1.40	890	0.56	0.120	590	0.37	0.080
SIESTA KEY	1,385	25.13	4,040	2.92	0.51	15,250	11.01	1.93	330	0.24	0.042	520	0.38	0.066
ANNA MARIA	919	18.18	1,140	1.24	0.30	5,520	6.01	1.46	280	0.30	0.074	230	0.25	0.061
PERICO	860	22.18	540	0.63	0.12	2,980	3.47	0.69	30	0.03	0.007	80	0.09	0.019
LONGBOAT KEY	1697	15.80	1,780	1.05	0.29	8,630	5.09	1.42	270	0.16	0.044	300	0.18	0.049
OTHER ISLANDS	900	17.95	1,040	1.16	0.28	5,230	5.81	1.43	190	0.21	0.052	190	0.21	0.052
DIRECT TO BAY	4,241	19.46	5,110	1.20	0.27	26,430	6.23	1.41	1,420	0.33	0.076	1,180	0.28	0.063
BAY SURFACE	33,280	33.70	38,100	1.14	0.15	208,290	6.26	0.82	1,520	0.05	0.006	37,090	1.11	0.146
TOTAL	129,412	21.84	138,970	1.17	0.26	716,200	5.80	1.31	21,440	0.24	0.054	57,650	0.28	0.059

TABLE F-5

DRY SEASON LOADINGS BY WATERSHED
FOR BUILDOUT FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	9.39	19,830	0.54	0.26	106,530	2.93	1.37	3,060	0.08	0.039	3,650	0.10	0.047
PALMA SOLA 2	1,120	9.82	610	0.54	0.24	3,300	2.95	1.32	130	0.12	0.052	130	0.12	0.052
BOWLEES CREEK	6,489	13.15	4,050	0.62	0.21	24,850	3.83	1.28	2,730	0.42	0.141	1,690	0.26	0.087
WEST BRADENTON	4,395	11.00	2,570	0.58	0.23	13,550	3.08	1.24	580	0.13	0.053	540	0.12	0.049
CEDAR HAMMOCK	1,930	11.97	1,500	0.78	0.29	7,790	4.04	1.49	490	0.25	0.094	360	0.19	0.069
WEST BOWLEES	1,559	10.29	1,120	0.72	0.31	5,530	3.55	1.52	270	0.17	0.074	220	0.14	0.060
PALMA SOLA	900	9.02	470	0.52	0.26	2,430	2.70	1.32	90	0.10	0.049	80	0.09	0.043
SOUTH BRADENTON	4,635	17.67	8,830	1.91	0.48	44,940	9.70	2.42	270	0.06	0.015	580	0.13	0.031
WHITAKER BAYOU	5,015	14.52	6,730	1.34	0.41	28,820	5.75	1.75	1,380	0.28	0.084	1,310	0.26	0.079
MATHENY CREEK	3,800	12.20	2,230	0.59	0.21	13,550	3.57	1.29	810	0.21	0.077	700	0.18	0.067
CATFISH CREEK	3,360	9.42	1,360	0.40	0.19	7,460	2.22	1.04	140	0.04	0.020	270	0.08	0.038
NORTH CREEK	1,920	8.65	810	0.42	0.22	4,280	2.23	1.14	90	0.05	0.024	140	0.07	0.037
SOUTH CREEK	12,995	7.15	3,910	0.30	0.19	20,250	1.56	0.96	100	0.01	0.005	490	0.04	0.023
HUDSON BAYOU	1,595	12.07	1,140	0.71	0.26	6,190	3.88	1.42	550	0.34	0.126	360	0.23	0.082
SIESTA KEY	1,385	24.61	5,530	3.99	0.72	18,480	13.34	2.39	270	0.19	0.035	630	0.45	0.082
ANNA MARIA	919	10.50	650	0.71	0.30	3,270	3.56	1.50	170	0.18	0.078	130	0.14	0.059
PERICO	860	12.66	260	0.30	0.11	1,630	1.90	0.66	20	0.02	0.008	50	0.06	0.020
LONGBOAT KEY	1697	8.88	1,000	0.59	0.29	5,000	2.95	1.46	170	0.10	0.050	170	0.10	0.050
OTHER ISLANDS	900	10.39	630	0.70	0.30	3,260	3.62	1.54	120	0.13	0.057	100	0.11	0.047
DIRECT TO BAY	4,241	11.43	2,930	0.69	0.27	16,010	3.78	1.46	880	0.21	0.080	700	0.17	0.064
BAY SURFACE	33,280	20.90	23,630	0.71	0.15	129,170	3.88	0.82	950	0.03	0.006	23,000	0.69	0.146
TOTAL	129,412	13.28	89,790	0.84	0.28	466,290	4.05	1.40	13,270	0.15	0.055	35,300	0.18	0.059

TABLE F-6

WET SEASON AND DRY SEASON LOADINGS BY SOURCE
FOR BUILDOUT FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

SOURCE	RUNOFF (in)	% OF TOTAL	WET SEASON POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	9.88	45.3%	66,630	47.9%	380,500	53.1%	19,570	91.3%	15,940	27.6%
BASEFLOW	2.65	12.1%	23,360	16.8%	77,810	10.9%	200	0.9%	3,900	6.8%
SEPTIC	0.05	0.2%	850	0.6%	12,590	1.8%	0	0.0%	0	0.0%
POINT SOURCE	0.59	2.7%	10,030	7.2%	37,010	5.2%	150	0.7%	720	1.2%
RAINFALL	8.67	39.7%	38,100	27.4%	208,290	29.1%	1,520	7.1%	37,090	64.3%
TOTAL	21.84		138,970		716,200		21,440		57,650	

SOURCE	RUNOFF (in)	% OF TOTAL	DRY SEASON POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	6.13	46.2%	41,330	46.0%	235,920	50.6%	12,090	91.1%	9,860	27.9%
BASEFLOW	0.97	7.3%	8,500	9.5%	28,310	6.1%	40	0.3%	1,430	4.1%
SEPTIC	0.09	0.7%	860	1.0%	12,670	2.7%	0	0.0%	0	0.0%
POINT SOURCE	0.71	5.4%	15,470	17.2%	60,220	12.9%	190	1.4%	1,010	2.9%
RAINFALL	5.37	40.5%	23,630	26.3%	129,170	27.7%	950	7.2%	23,000	65.2%
TOTAL	13.28		89,790		466,290		13,270		35,300	

TABLE F-7

WET SEASON AND DRY SEASON LOADINGS BY JURISDICTION
FOR BUILDOUT FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	WET SEASON POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	7.89	36.1%	56,200	40.4%	285,870	39.9%	8,150	38.0%	10,680	18.5%
SARASOTA CITY	7,844	1.27	5.8%	11,980	8.6%	56,360	7.9%	3,630	16.9%	2,850	4.9%
MANATEE CO.	20,226	3.14	14.4%	24,130	17.4%	128,070	17.9%	7,040	32.8%	5,710	9.9%
ISLANDS	5,761	0.88	4.0%	8,560	6.2%	37,610	5.3%	1,100	5.1%	1,320	2.3%
BAY SURFACE	33,280	8.67	39.7%	38,100	27.4%	208,290	29.1%	1,520	7.1%	37,090	64.3%
TOTAL	129,412	21.84		138,970		716,200		21,440		57,650	

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	DRY SEASON POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	4.45	33.5%	30,800	34.3%	167,610	35.9%	4,950	37.3%	5,910	16.7%
SARASOTA CITY	7,844	0.79	6.0%	8,590	9.6%	38,280	8.2%	2,270	17.1%	1,870	5.3%
MANATEE CO.	20,226	2.05	15.4%	18,670	20.8%	99,590	21.4%	4,350	32.8%	3,440	9.7%
ISLANDS	5,761	0.61	4.6%	8,100	9.0%	31,640	6.8%	750	5.7%	1,080	3.1%
BAY SURFACE	33,280	5.37	40.5%	23,630	26.3%	129,170	27.7%	950	7.2%	23,000	65.2%
TOTAL	129,412	13.28		89,790		466,290		13,270		35,300	

TABLE F-8

WET YEAR LOADINGS BY WATERSHED
FOR BUILDOUT FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	35.85	77,730	2.13	0.26	384,830	10.57	1.30	10,380	0.29	0.035	14,290	0.39	0.048
PALMA SOLA 2	1,120	37.18	2,380	2.13	0.25	12,130	10.83	1.29	480	0.43	0.051	480	0.43	0.051
BOWLEES CREEK	6,489	46.84	14,920	2.30	0.22	87,200	13.44	1.27	9,130	1.41	0.133	5,860	0.90	0.085
WEST BRADENTON	4,395	41.21	9,950	2.26	0.24	49,680	11.30	1.21	1,970	0.45	0.048	2,040	0.46	0.050
CEDAR HAMMOCK	1,930	43.45	5,500	2.85	0.29	27,550	14.27	1.45	1,640	0.85	0.086	1,290	0.67	0.068
WEST BOWLEES	1,559	38.53	4,100	2.63	0.30	19,990	12.82	1.47	910	0.58	0.067	810	0.52	0.060
PALMA SOLA	900	34.86	1,810	2.01	0.25	9,110	10.12	1.28	320	0.36	0.045	330	0.37	0.046
SOUTH BRADENTON	4,635	47.92	18,430	3.98	0.37	92,180	19.89	1.83	900	0.19	0.018	1,900	0.41	0.038
WHITAKER BAYOU	5,015	47.66	18,780	3.74	0.35	84,540	16.86	1.56	4,530	0.90	0.084	4,100	0.82	0.076
MATHENY CREEK	3,800	43.98	8,320	2.19	0.22	47,030	12.38	1.24	2,750	0.72	0.073	2,530	0.67	0.067
CATFISH CREEK	3,360	36.59	5,720	1.70	0.21	28,650	8.53	1.03	460	0.14	0.017	1,080	0.32	0.039
NORTH CREEK	1,920	34.16	3,400	1.77	0.23	16,460	8.57	1.11	310	0.16	0.021	600	0.31	0.040
SOUTH CREEK	12,995	29.90	18,380	1.41	0.21	85,380	6.57	0.97	440	0.03	0.005	2,570	0.20	0.029
HUDSON BAYOU	1,595	43.68	4,140	2.60	0.26	21,920	13.74	1.39	1,850	1.16	0.117	1,240	0.78	0.079
SIESTA KEY	1,385	60.31	10,630	7.68	0.56	38,390	27.72	2.03	740	0.53	0.039	1,330	0.96	0.070
ANNA MARIA	919	39.13	2,430	2.64	0.30	11,750	12.79	1.44	580	0.63	0.071	490	0.53	0.060
PERICO	860	48.02	1,340	1.56	0.14	6,570	7.64	0.70	90	0.10	0.010	180	0.21	0.019
LONGBOAT KEY	1697	34.48	3,910	2.30	0.29	18,520	10.91	1.40	560	0.33	0.042	650	0.38	0.049
OTHER ISLANDS	900	39.00	2,290	2.54	0.29	11,250	12.50	1.41	400	0.44	0.050	410	0.46	0.052
DIRECT TO BAY	4,241	41.88	10,970	2.59	0.27	56,020	13.21	1.39	2,960	0.70	0.074	2,530	0.60	0.063
BAY SURFACE	33,280	69.70	78,800	2.37	0.15	430,790	12.94	0.82	3,150	0.09	0.006	76,700	2.30	0.146
TOTAL	129,412	46.63	303,930	2.64	0.27	1,539,940	12.74	1.31	44,550	0.50	0.052	121,410	0.60	0.059

TABLE F-9

DRY YEAR LOADINGS BY WATERSHED
FOR BUILDOUT FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

WATERSHED	AREA	TOTAL RUNOFF	TOTAL P			TOTAL N			LEAD			ZINC		
	(ac)	(in)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)	(lb)	(lb/ac)	(mg/l)
PHILLIPPI CREEK	36,417	17.20	35,810	0.98	0.25	199,910	5.49	1.41	6,110	0.17	0.043	6,650	0.18	0.047
PALMA SOLA 2	1,120	18.13	1,100	0.98	0.24	6,200	5.54	1.35	280	0.25	0.061	240	0.21	0.052
BOWLEES CREEK	6,489	25.25	7,680	1.18	0.21	48,110	7.41	1.30	5,450	0.84	0.147	3,290	0.51	0.089
WEST BRADENTON	4,395	20.46	4,680	1.06	0.23	25,550	5.81	1.25	1,160	0.26	0.057	1,010	0.23	0.050
CEDAR HAMMOCK	1,930	22.72	2,850	1.48	0.29	15,070	7.81	1.52	980	0.51	0.099	710	0.37	0.071
WEST BOWLEES	1,559	19.14	2,040	1.31	0.30	10,580	6.79	1.56	550	0.35	0.081	420	0.27	0.062
PALMA SOLA	900	16.41	800	0.89	0.24	4,540	5.04	1.36	180	0.20	0.054	150	0.17	0.045
SOUTH BRADENTON	4,635	29.09	13,640	2.94	0.45	70,780	15.27	2.32	540	0.12	0.018	990	0.21	0.032
WHITAKER BAYOU	5,015	27.26	12,600	2.51	0.41	54,900	10.95	1.77	2,760	0.55	0.089	2,490	0.50	0.080
MATHENY CREEK	3,800	23.08	4,130	1.09	0.21	25,990	6.84	1.31	1,630	0.43	0.082	1,360	0.36	0.068
CATFISH CREEK	3,360	17.42	2,380	0.71	0.18	13,680	4.07	1.03	260	0.08	0.020	450	0.13	0.034
NORTH CREEK	1,920	15.96	1,440	0.75	0.21	7,850	4.09	1.13	180	0.09	0.026	260	0.14	0.037
SOUTH CREEK	12,995	12.49	6,140	0.47	0.17	34,820	2.68	0.95	220	0.02	0.006	710	0.05	0.019
HUDSON BAYOU	1,595	22.95	2,140	1.34	0.26	11,950	7.49	1.44	1,100	0.69	0.133	680	0.43	0.082
SIESTA KEY	1,385	40.53	8,670	6.26	0.68	29,760	21.49	2.34	490	0.35	0.039	1,000	0.72	0.079
ANNA MARIA	919	19.58	1,190	1.29	0.29	6,230	6.78	1.53	350	0.38	0.086	260	0.28	0.064
PERICO	860	23.32	460	0.53	0.10	2,890	3.36	0.64	50	0.06	0.011	50	0.06	0.011
LONGBOAT KEY	1697	16.09	1,820	1.07	0.29	9,350	5.51	1.51	330	0.19	0.053	300	0.18	0.048
OTHER ISLANDS	900	19.03	1,130	1.26	0.29	6,100	6.78	1.57	240	0.27	0.062	200	0.22	0.052
DIRECT TO BAY	4,241	21.33	5,550	1.31	0.27	30,610	7.22	1.49	1,760	0.41	0.086	1,310	0.31	0.064
BAY SURFACE	33,280	41.70	47,150	1.42	0.15	257,730	7.74	0.82	1,890	0.06	0.006	45,890	1.38	0.146
TOTAL	129,412	25.14	163,400	1.47	0.27	872,600	7.34	1.41	26,510	0.30	0.060	68,420	0.33	0.059

TABLE F-10

WET YEAR AND DRY YEAR LOADINGS BY SOURCE
FOR BUILDOUT FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

SOURCE	RUNOFF (in)	% OF TOTAL	WET YEAR POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	20.44	43.8%	138,030	45.4%	786,810	51.1%	40,500	90.9%	32,980	27.2%
BASEFLOW	6.81	14.6%	59,930	19.7%	199,880	13.0%	570	1.3%	9,990	8.2%
SEPTIC	0.14	0.3%	1,680	0.6%	25,240	1.6%	0	0.0%	0	0.0%
POINT SOURCE	1.30	2.8%	25,490	8.4%	97,220	6.3%	330	0.7%	1,740	1.4%
RAINFALL	17.92	38.4%	78,800	25.9%	430,790	28.0%	3,150	7.1%	76,700	63.2%
TOTAL	46.63		303,930		1,539,940		44,550		121,410	

SOURCE	RUNOFF (in)	% OF TOTAL	DRY YEAR POLLUTANT LOADING TOTAL P (lb)	% OF TOTAL	TOTAL N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SURFACE	12.23	48.7%	82,590	50.5%	470,810	54.0%	24,260	91.5%	19,700	28.8%
BASEFLOW	0.74	2.9%	6,490	4.0%	21,600	2.5%	30	0.1%	1,090	1.6%
SEPTIC	0.14	0.6%	1,680	1.0%	25,240	2.9%	0	0.0%	0	0.0%
POINT SOURCE	1.30	5.2%	25,490	15.6%	97,220	11.1%	330	1.2%	1,740	2.5%
RAINFALL	10.72	42.7%	47,150	28.9%	257,730	29.5%	1,890	7.1%	45,890	67.1%
TOTAL	25.14		163,400		872,600		26,510		68,420	

TABLE F-11

WET YEAR AND DRY YEAR LOADINGS BY JURISDICTION
FOR BUILDOUT FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	WET YEAR POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	17.14	36.8%	123,510	40.6%	615,040	39.9%	16,850	37.8%	23,430	19.3%
SARASOTA CITY	7,844	2.72	5.8%	25,820	8.5%	119,810	7.8%	7,550	16.9%	6,050	5.0%
MANATEE CO.	20,226	6.89	14.8%	55,210	18.2%	287,820	18.7%	14,630	32.8%	12,170	10.0%
ISLANDS	5,761	1.97	4.2%	20,590	6.8%	86,480	5.6%	2,370	5.3%	3,060	2.5%
BAY SURFACE	33,280	17.92	38.4%	78,800	25.9%	430,790	28.0%	3,150	7.1%	76,700	63.2%
TOTAL	129,412	46.63		303,930		1,539,940		44,550		121,410	

JURISDICTION	AREA (ac)	RUNOFF (in)	% OF TOTAL	DRY YEAR POLLUTANT LOADING Total P (lb)	% OF TOTAL	Total N (lb)	% OF TOTAL	LEAD (lb)	% OF TOTAL	ZINC (lb)	% OF TOTAL
SARASOTA CO.	62,301	8.14	32.4%	54,980	33.6%	312,080	35.8%	9,910	37.4%	10,670	15.6%
SARASOTA CITY	7,844	1.49	5.9%	16,120	9.9%	72,970	8.4%	4,550	17.2%	3,530	5.2%
MANATEE CO.	20,226	3.71	14.8%	31,870	19.5%	175,490	20.1%	8,700	32.8%	6,520	9.5%
ISLANDS	5,761	1.07	4.3%	13,280	8.1%	54,330	6.2%	1,460	5.5%	1,810	2.6%
BAY SURFACE	33,280	10.72	42.7%	47,150	28.9%	257,730	29.5%	1,890	7.1%	45,890	67.1%
TOTAL	129,412	25.14		163,400		872,600		26,510		68,420	

TABLE F-12

AVERAGE ANNUAL LOADINGS BY SOURCE AND SEGMENT
FOR BUILDOUT FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

Constituent	Segment Number	Watershed(s)	Average Annual Loadings (lb/yr)					
			Surface Runoff	Baseflow	Septic Tanks	Point Source	Rainfall	Total
Total P								
	1	Anna Maria Island	1,500	260	0	0	3,587	5,347
	2	Perico Island, West Bradenton	6,300	1,700	0	0	3,999	11,999
	3	Palma Sola 2	1,380	340	0	0	2,563	4,283
	5	Longboat Key (40%)	896	228	0	0	6,307	7,431
	6	Palma Sola Creek, South Bradenton	4,800	1,980	0	10,390	9,178	26,348
	7	Longboat Key (40%)	896	228	0	0	8,102	9,226
	8	Cedar Hammock, Bowlees Creek, West Bowlees	15,840	2,250	0	0	8,204	26,294
	10	Longboat Key (20%), Other Islands (50%)	1,108	259	25	0	7,382	8,774
	11	Hudson Bayou, Whitaker Bayou, Direct to Bay	12,160	2,030	120	6,440	4,255	25,005
	13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	49,870	14,330	1,390	7,870	2,667	76,127
	14	Catfish Creek, North Creek, Direct to Bay	5,510	2,360	100	350	3,487	11,807
	16	Other Islands (50%), South Creek, Direct to Bay	7,700	5,875	45	440	1,998	16,058
		Total	107,960	31,840	1,680	25,490	61,730	228,700
Total N								
	1	Anna Maria Island	7,920	860	0	0	19,611	28,391
	2	Perico Island, West Bradenton	35,730	5,670	0	0	21,862	63,262
	3	Palma Sola 2	7,830	1,130	0	0	14,014	22,974
	5	Longboat Key (40%)	4,692	756	0	0	34,476	39,924
	6	Palma Sola Creek, South Bradenton	28,990	6,620	0	51,820	50,173	137,603
	7	Longboat Key (40%)	4,692	756	0	0	44,292	49,740
	8	Cedar Hammock, Bowlees Creek, West Bowlees	94,270	7,460	0	0	44,849	146,579
	10	Longboat Key (20%), Other Islands (50%)	5,761	868	340	0	40,357	47,326
	11	Hudson Bayou, Whitaker Bayou, Direct to Bay	69,220	6,770	1,850	19,310	23,261	120,411
	13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	276,370	47,790	20,820	23,670	14,581	383,231
	14	Catfish Creek, North Creek, Direct to Bay	32,600	7,880	1,500	1,070	19,063	62,113
	16	Other Islands (50%), South Creek, Direct to Bay	47,585	19,580	730	1,350	10,921	80,166
		Total	615,660	106,140	25,240	97,220	337,460	1,181,720

TABLE F-12 (CONTINUED)

AVERAGE ANNUAL LOADINGS BY SOURCE AND SEGMENT
FOR BUILDOUT FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

Constituent	Segment Number	Watershed(s)	Average Annual Loadings (lb/yr)					
			Surface Runoff	Baseflow	Septic Tanks	Point Source	Rainfall	Total
Lead								
	1	Anna Maria Island	450	0	0	0	144	594
	2	Perico Island, West Bradenton	1,580	10	0	0	160	1,750
	3	Palma Sola 2	370	0	0	0	103	473
	5	Longboat Key (40%)	172	4	0	0	252	428
	6	Palma Sola Creek, South Bradenton	880	20	0	50	367	1,317
	7	Longboat Key (40%)	172	4	0	0	324	500
	8	Cedar Hammock, Bowlees Creek, West Bowlees	9,060	10	0	0	328	9,398
	10	Longboat Key (20%), Other Islands (50%)	241	2	0	0	295	538
	11	Hudson Bayou, Whitaker Bayou, Direct to Bay	5,870	20	0	120	170	6,180
	13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	11,160	140	0	150	107	11,557
	14	Catfish Creek, North Creek, Direct to Bay	980	20	0	0	140	1,140
	16	Other Islands (50%), South Creek, Direct to Bay	605	50	0	10	80	745
		Total	31,540	280	0	330	2,470	34,620
Zinc								
	1	Anna Maria Island	320	40	0	0	3,491	3,851
	2	Perico Island, West Bradenton	1,310	290	0	0	3,892	5,492
	3	Palma Sola 2	300	60	0	0	2,495	2,855
	5	Longboat Key (40%)	148	36	0	0	6,138	6,322
	6	Palma Sola Creek, South Bradenton	1,050	330	0	260	8,933	10,573
	7	Longboat Key (40%)	148	36	0	0	7,886	8,070
	8	Cedar Hammock, Bowlees Creek, West Bowlees	5,630	370	0	0	7,985	13,985
	10	Longboat Key (20%), Other Islands (50%)	199	43	0	0	7,185	7,427
	11	Hudson Bayou, Whitaker Bayou, Direct to Bay	3,910	340	0	620	4,141	9,011
	13	Siesta Key, Matheny Creek, Phillippi Creek, Direct to Bay	10,610	2,400	0	790	2,596	16,396
	14	Catfish Creek, North Creek, Direct to Bay	1,120	390	0	30	3,394	4,934
	16	Other Islands (50%), South Creek, Direct to Bay	965	975	0	40	1,944	3,924
		Total	25,710	5,310	0	1,740	60,080	92,840

TABLE F-13

AVERAGE ANNUAL LOADINGS BY WATERSHED AND SOURCE
FOR BUILDOUT FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

Constituent	Watershed	Average Annual Loadings (lb/yr) Surface Runoff	Baseflow	Septic Tanks	Point Source	Rainfall	Total
Total P							
	Phillippi Creek	40,440	12,590	1,170	1,110	0	55,310
	Palma Sola 2	1,380	340	0	0	0	1,720
	Bowlees Creek	9,700	1,330	0	0	0	11,030
	West Bradenton	5,780	1,360	0	0	0	7,140
	Cedar Hammock	3,620	470	0	0	0	4,090
	West Bowlees	2,520	450	0	0	0	2,970
	Palma Sola Creek	1,010	290	0	0	0	1,300
	South Bradenton	3,790	1,690	0	10,390	0	15,870
	Whitaker Bayou	7,520	1,370	120	6,440	0	15,450
	Matheny Creek	4,890	990	140	60	0	6,080
	Catfish Creek	2,450	1,260	30	200	0	3,940
	North Creek	1,460	740	20	140	0	2,360
	South Creek	5,980	5,490	10	430	0	11,910
	Hudson Bayou	2,680	370	0	0	0	3,050
	Siesta Key	2,470	420	0	6,700	0	9,590
	Anna Maria Island	1,500	260	0	0	0	1,760
	Perico Island	520	340	0	0	0	860
	Longboat Key	2,240	570	0	0	0	2,810
	Other Islands	1,320	290	50	0	0	1,660
	Direct to Bay	6,690	1,220	140	20	0	8,070
	Bay Surface	0	0	0	0	61,730	61,730
	Total	107,960	31,840	1,680	25,490	61,730	228,700
Total N							
	Phillippi Creek	222,950	41,960	17,550	3,380	0	285,840
	Palma Sola 2	7,830	1,130	0	0	0	8,960
	Bowlees Creek	61,730	4,410	0	0	0	66,140
	West Bradenton	32,270	4,530	0	0	0	36,800
	Cedar Hammock	19,280	1,550	0	0	0	20,830
	West Bowlees	13,260	1,500	0	0	0	14,760
	Palma Sola Creek	5,690	980	0	0	0	6,670
	South Bradenton	23,300	5,640	0	51,820	0	80,760
	Whitaker Bayou	42,790	4,550	1,850	19,310	0	68,500
	Matheny Creek	30,190	3,310	2,080	180	0	35,760
	Catfish Creek	15,400	4,200	460	600	0	20,660
	North Creek	8,660	2,480	310	440	0	11,890
	South Creek	38,700	18,290	210	1,320	0	58,520
	Hudson Bayou	15,250	1,240	0	0	0	16,490
	Siesta Key	12,260	1,400	0	20,110	0	33,770
	Anna Maria Island	7,920	860	0	0	0	8,780
	Perico Island	3,460	1,140	0	0	0	4,600
	Longboat Key	11,730	1,890	0	0	0	13,620
	Other Islands	6,830	980	680	0	0	8,490
	Direct to Bay	36,160	4,100	2,100	60	0	42,420
	Bay Surface	0	0	0	0	337,460	337,460
	Total	615,660	106,140	25,240	97,220	337,460	1,181,720

TABLE F-13 (CONTINUED)

AVERAGE ANNUAL LOADINGS BY WATERSHED AND SOURCE
FOR BUILDOUT FUTURE LAND USE CONDITIONS
WITH SELECTED MANAGEMENT STRATEGY (ALTERNATIVES 5A, 7 AND 8)

Constituent	Watershed	Average Annual Loadings (lb/yr) Surface Runoff	Baseflow	Septic Tanks	Point Source	Rainfall	Total
Lead							
	Phillippi Creek	7,890	130	0	20	0	8,040
	Palma Sola 2	370	0	0	0	0	370
	Bowlees Creek	7,100	10	0	0	0	7,110
	West Bradenton	1,520	10	0	0	0	1,530
	Cedar Hammock	1,280	0	0	0	0	1,280
	West Bowlees	680	0	0	0	0	680
	Palma Sola Creek	240	0	0	0	0	240
	South Bradenton	640	20	0	50	0	710
	Whitaker Bayou	3,400	20	0	120	0	3,540
	Matheny Creek	2,130	10	0	0	0	2,140
	Catfish Creek	360	10	0	0	0	370
	North Creek	230	10	0	0	0	240
	South Creek	250	50	0	10	0	310
	Hudson Bayou	1,420	0	0	0	0	1,420
	Siesta Key	470	0	0	130	0	600
	Anna Maria Island	450	0	0	0	0	450
	Perico Island	60	0	0	0	0	60
	Longboat Key	430	10	0	0	0	440
	Other Islands	310	0	0	0	0	310
	Direct to Bay	2,310	0	0	0	0	2,310
	Bay Surface	0	0	0	0	2,470	2,470
	Total	31,540	280	0	330	2,470	34,620
Zinc							
	Phillippi Creek	7,980	2,100	0	110	0	10,190
	Palma Sola 2	300	60	0	0	0	360
	Bowlees Creek	4,240	220	0	0	0	4,460
	West Bradenton	1,250	230	0	0	0	1,480
	Cedar Hammock	890	80	0	0	0	970
	West Bowlees	500	70	0	0	0	570
	Palma Sola Creek	180	50	0	0	0	230
	South Bradenton	870	280	0	260	0	1,410
	Whitaker Bayou	2,400	230	0	620	0	3,250
	Matheny Creek	1,730	170	0	10	0	1,910
	Catfish Creek	520	210	0	20	0	750
	North Creek	280	120	0	10	0	410
	South Creek	630	910	0	40	0	1,580
	Hudson Bayou	860	60	0	0	0	920
	Siesta Key	410	70	0	670	0	1,150
	Anna Maria Island	320	40	0	0	0	360
	Perico Island	60	60	0	0	0	120
	Longboat Key	370	90	0	0	0	460
	Other Islands	250	50	0	0	0	300
	Direct to Bay	1,670	210	0	0	0	1,880
	Bay Surface	0	0	0	0	60,080	60,080
	Total	25,710	5,310	0	1,740	60,080	92,840

LEGEND

SUD OWNED / OPERATED FRANCHISES WASTEWATER SERVICES

1 BENT TREE (Previously Southeastern)
2 PLANTATION UTILITY SERVICES
3 SORRENTO

SUD DEPENDENT FRANCHISES WASTEWATER SERVICES

4 ATLANTIC UTILITIES
5 BEE RIDGE UTILITIES
6 BEEKMAN PLACE UTILITIES
7 BENEVA CREEK UTILITIES
8 CENTRAL COUNTY UTILITIES
9 COUNTRY MANOR UTILITIES
10 DOLOMITE UTILITIES
11 FLORIDA CITIES WATER CO.
12 KENSINGTON PARK UTILITIES
13 LAKE FOREST UTILITIES
14 LONGWOOD RUN UTILITIES
15 MEADOWOOD UTILITY
16 PROCTOR ROAD UTILITIES
17 ROBINHOOD UTILITIES
18 SIESTA KEY UTILITY
19 SOUTHEAST UTILITIES (Sewer Metered to Atlantic Utilities)
20 SOUTHFIELD UTILITIES
21 SUNRISE UTILITIES
22 SYLVAN LEA, INC.
23 TAMARON UTILITY
24 VILLAGE OAKS UTILITIES
25 WOODBRIDGE ESTATES ASSOC.
26 WOODLAND PARK UTILITIES

INDEPENDENT FRANCHISES WASTEWATER SERVICES

27 CIRCLEWOOD OWNERS ASSOC.
28 GULFVIEW UTILITIES
29 MIKE CLARKE DEV., INC.
30 MYAKKA UTILITIES
31 PLAZA UTILITIES (Inactive)
32 SKANDIA / HERON BAY
33 SOUTHBAY UTILITIES
34 THE TRAILS ULIMITED
35 VENICE GARDENS UTILITY CORP.
36 VROOM UTILITIES, INC.

ENGLEWOOD WATER DISTRICT FRANCHISES WASTEWATER SERVICES

37 EL JOBEAN PHILHARMONIC
38 ENGLEWOOD GOLF, INC.
39 ENGLEWOOD UTILITIES
40 F.M.F. UTILITIES, INC.
41 MORSTAR UTILITIES CORP.
42 SPROAT KINEY ENTERPRISES (Own Water Supply)
43 TANGERINE WOODS UTILITY

SEPTAGE AREAS (INFORMATION PROVIDED BY SARASOTA COUNTY)

SARASOTA COUNTY FLORIDA 1991

SCALE IN MILES 0 1 2 3

UNIVERSITY PARKWAY
MANATEE COUNTY
SARASOTA BAY
U.S. 301
17TH STREET
CITY OF SARASOTA
FRUITVILLE RD.
BEE RIDGE ROAD
CLARK ROAD
I - 75
U.S. 41
GULF OF MEXICO
CITY OF VENICE
VENICE AVE.
CENTER ROAD
N. RIVER RD.
I-75
S. RIVER ROAD
S.R. 776
NORTH PORT
CHARLOTTE COUNTY
DESOTO COUNTY

BASE MAP PROVIDED BY:
SARASOTA COUNTY GOVERNMENT
1660 RINGLING BLVD. SARASOTA, FL. 34236
UTILITY ENGINEERING DEPARTMENT
MODIFIED BY: CAMP DRESSER & McKEE INC.

BASE MAP UPDATED; AUGUST 1991

LEGEND

SUD OWNED / OPERATED FRANCHISES WASTEWATER SERVICES

1 BENT TREE (Previously Southeastern)
2 PLANTATION UTILITY SERVICES
3 SORRENTO

SUD DEPENDENT FRANCHISES WASTEWATER SERVICES

4 ATLANTIC UTILITIES
5 BEE RIDGE UTILITIES
6 BEEKMAN PLACE UTILITIES
7 BENEVA CREEK UTILITIES
8 CENTRAL COUNTY UTILITIES
9 COUNTRY MANOR UTILITIES
10 DOLOMITE UTILITIES
11 FLORIDA CITIES WATER CO.
12 KENSINGTON PARK UTILITIES
13 LAKE FOREST UTILITIES
14 LONGWOOD RUN UTILITIES
15 MEADOWOOD UTILITY
16 PROCTOR ROAD UTILITIES
17 ROBINHOOD UTILITIES
18 SIESTA KEY UTILITY
19 SOUTHEAST UTILITIES (Sewer Metered to Atlantic Utilities)
20 SOUTHFIELD UTILITIES
21 SUNRISE UTILITIES
22 SYLVAN LEA, INC.
23 TAMARON UTILITY
24 VILLAGE OAKS UTILITIES
25 WOODBRIDGE ESTATES ASSOC.
26 WOODLAND PARK UTILITIES

INDEPENDENT FRANCHISES WASTEWATER SERVICES

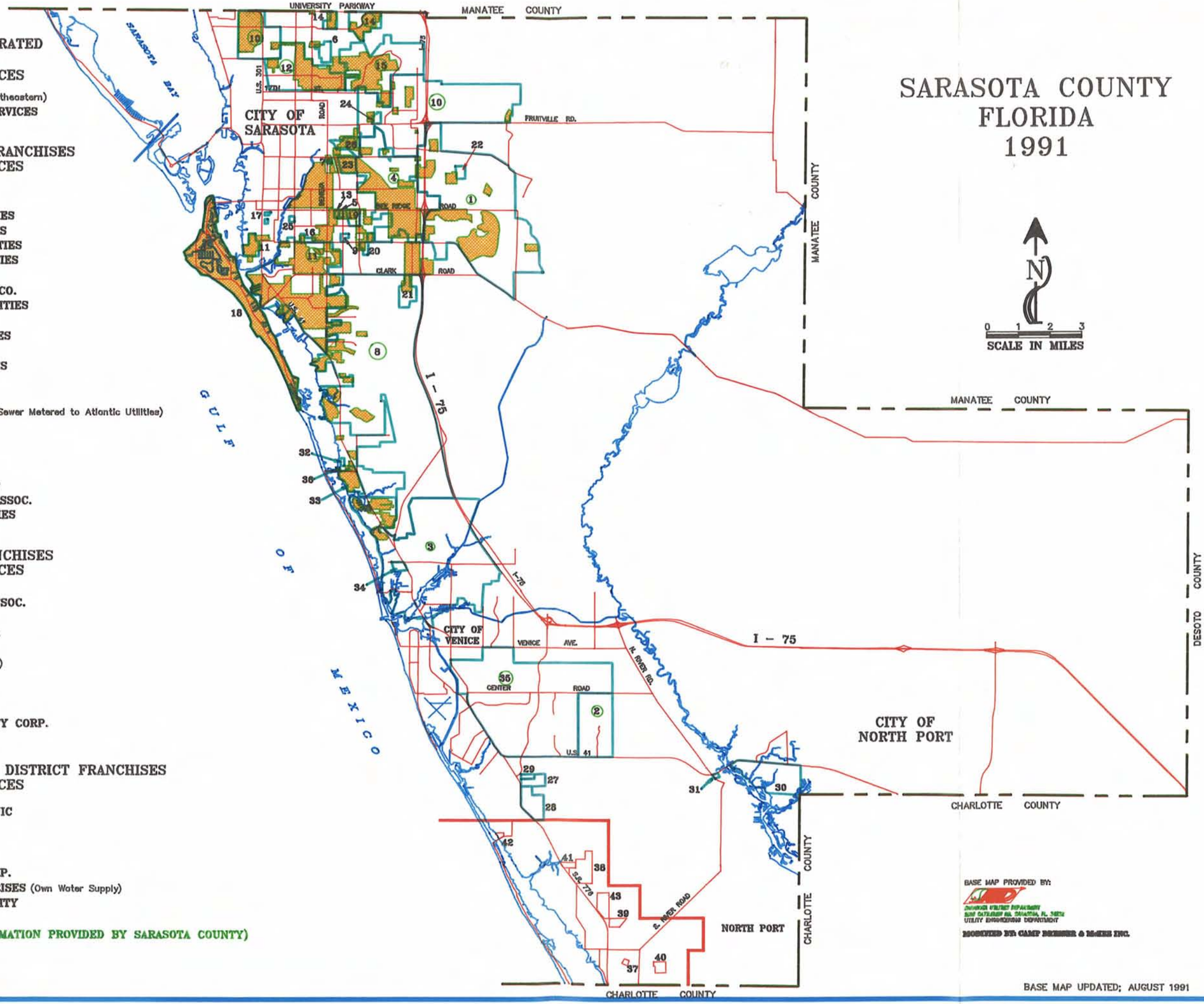
27 CIRCLEWOOD OWNERS ASSOC.
28 GULFVIEW UTILITIES
29 MIKE CLARKE DEV., INC.
30 MYAKKA UTILITIES
31 PLAZA UTILITIES (Inactive)
32 SKANDIA / HERON BAY
33 SOUTHBAY UTILITIES
34 THE TRAILS ULIMITED
35 VENICE GARDENS UTILITY CORP.
36 VROOM UTILITIES, INC.

ENGLEWOOD WATER DISTRICT FRANCHISES WASTEWATER SERVICES

37 EL JOBEAN PHILHARMONIC
38 ENGLEWOOD GOLF, INC.
39 ENGLEWOOD UTILITIES
40 F.M.F. UTILITIES, INC.
41 MORSTAR UTILITIES CORP.
42 SPROAT KINEY ENTERPRISES (Own Water Supply)
43 TANGERINE WOODS UTILITY

SEWERED AREAS (INFORMATION PROVIDED BY SARASOTA COUNTY)

SARASOTA COUNTY FLORIDA 1991



BASE MAP PROVIDED BY:
SARASOTA COUNTY DEPARTMENT
1001 SARASOTA BAL DRIVE, FL. 34236
UTILITY ENGINEERING DEPARTMENT

DIGITIZED BY: CAMP DRESSER & McKEE INC.

BASE MAP UPDATED; AUGUST 1991