Monroe County Sanitary Wastewater Master Plan

Submitted to

Monroe County, Florida

Submitted by

CH2MHILL

in Association with

Lindahl, Browning, Ferrari & Hellstrom, Inc.
Continental Shelf Associates, Inc.
Katz, Kutter, Haigler, Alderman, Marks, Bryant and Yon
Ayers Associates

June 2000

Contents

Items in contents are clickable.

VOLUME 1

Items in contents are clickable.

Chapter **Page**

Items in contents are clickable.

Exhibit **Page**

Exhibit **Page**

Exhibit **Page**

Items in contents are clickable.

Exhibit **Page**

VOLUME 5

VOLUME 6

VOLUME 7

VOLUME 8

Glossary of Terms

Photography Credits: Bill Keough, p. 5-2
Larry Benvenuti, cover and reef scenes throughout this Master Plan

ADF	average daily flow
AMSA	Association of Metropolitan Sewerage Agencies
ASR	aquifer storage and recovery
ATU	aerobic treatment unit
AWT	advanced wastewater treatment
BAT	best available technology
BOD	biochemical oxygen demand
BOCC	Board of County Commissioners
CARL	Conservation and Recreation Lands Program
CBOD	carbonaceous 5-day biochemical oxygen demand
cf^5	cubic feet
cfm	cubic feet per minute
CFR	*Code of Federal Regulations*
COBRA	Coastal Barrier Resources System
DBOOT	design, build, own, operate, and transfer
DIW	deep injection well
DO	dissolved oxygen
DUS	Department of Utility Services
EDU	equivalent dwelling unit
EPA	U.S. Environmental Protection Agency
FAC	Florida Administrative Code
FDBOOT	finance, design, build, own, operate, and transfer
FDEP	Florida Department of Environmental Protection
FDOH	Florida Department of Health
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Administration

FKAA	Florida Keys Aqueduct Authority
FMRI	Florida Marine Research Institute
ft	feet
gal	gallon
GIS	Geographic Information System
gpd	gallons per day
GO	general obligation
I/I	infiltration and inflow
ID	inner diameter
LID	local improvement district
Master Plan	*Sanitary Wastewater Master Plan*
MCDOH	Monroe County Department of Health
MCPHU	Monroe County Public Health Unit
MDWASD	Miami-Dade Water and Sewer Department
MLE	Modified Ludzak-Ettinger Process
mgd	million gallons per day
mg/L	milligrams per Liter
MOU	Memorandum of Understanding
MPCA	Minnesota Pollution Control Agency
MSTU	Municipal Services Taxing Units
MSBU	Municipal Services Benefit Units
N	nitrogen
NPDES	National Pollutant Discharge Elimination System
NPV	net present value
O&M	operation and maintenance
OWMZ	Onsite Wastewater Management Zone
OWNRS	onsite wastewater nutrient reduction system
OWTS	onsite wastewater treatment system
P	phosphorus
PAED	Planning Area Analysis/Enumeration District
PB	performance-based

RE	real estate
RFP	request for proposal
ROGO	Rate of Growth Ordinance (Monroe County)
SA	service area
SBR	sequencing batch reactors
SDI	subsurface drip irrigation system
SFRWQCB	San Francisco Regional Water Quality Control Board
SFWMD	South Florida Water Management District
SRF	State Revolving Fund
SWIS	subsurface wastewater infiltration system
SWMP TAC	Sanitary Wastewater Master Plan Technical Advisory Committee
Task Force	Monroe County Citizens Task Force on Wastewater
TIF	tax increment financing
TMDL	total maximum daily load
TN	total nitrogen
TP	total phosphorus
TSS	total suspended solids
USACOE	U.S. Army Corps of Engineers
USDW	Underground Source of Drinking Water
USGS	Unites States Geological Survey
UV	ultraviolet
WAS	waste activated sludge
WQSC	Water Quality Steering Committee
WWTP	wastewater treatment plant

★★★★★★

Acknowledgements

This Monroe County *Sanitary Wastewater Master Plan* (Master Plan) was mandated by the Monroe County *Year 2010 Comprehensive Plan*, and was prepared by The Sanitary Wastewater Master Plan Team, comprised of the professional engineering consulting firm of CH2M HILL, in association with Ayres Associates; Continental Shelf Associates, Inc.; Hazen & Sawyer, PC; Katz, Kutter, Haigler, Alderman, Bryant and Yon; and Lindahl, Browning, Ferrari & Hellstrom, Inc., under the direction of the Monroe County Department of Marine Resources.

This plan resulted from the contributions and oversight of numerous individuals and organizations over many months, including the Monroe County Board of County Commissioners (BOCC), the Sanitary Wastewater Master Plan Technical Advisory Committee (SWMP TAC), the Florida Keys National Marine Sanctuary Water Quality Steering Committee (WQSC), and the Local Citizen Task Force on Wastewater (Task Force).

Members of the SWMP TAC were provided with copies of each technical support document for review and comment as they were completed. In addition, the SWMP TAC reviewed progress of the team and provided input into the development of this Master Plan in four separate workshops. SWMP TAC members are presented in Exhibit A at the end of this section.

Also, the progress of the development of this Master Plan was reviewed at practically every quarterly WQSC meeting over the 2½-year study period. WQSC members are included in Exhibit B at the end of this section.

The Task Force on Wastewater, appointed by the BOCC, provided invaluable input and guidance into the development of this Master Plan. The dedicated and unselfish giving of these citizens' time is greatly appreciated. They met monthly, and sometimes semi-monthly, for more than 2 years to review and address many wastewater issues related to the County's

Cesspool Identification and Elimination Program and this Master Plan. Members are included in Exhibit C at the end of this section.

Milestones in the development of this Master Plan have been reviewed with the BOCC at their regularly scheduled meetings and special meetings over the past 2½ years.

★★★★★★

EXHIBIT A
SWMP TAC Members

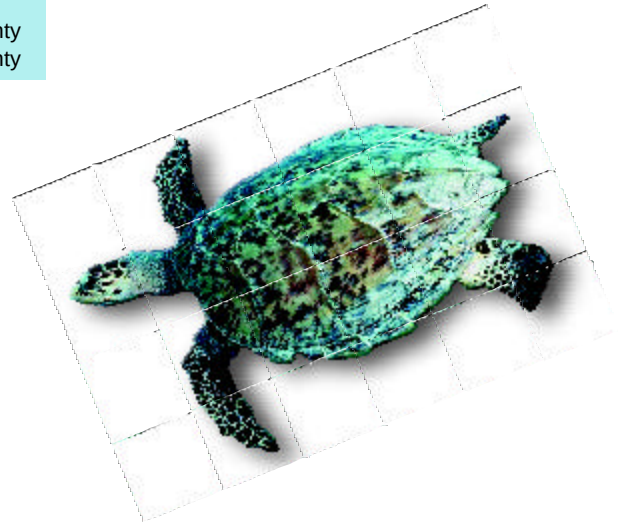
Name	Affiliated Agency or Organization
Rick Alleman	South Florida Water Management District
Charles Baldwin, Village Manager	Islamorada, Village of Islands
Bart Bibler, Bureau Chief	Florida Department of Health
Robert Brock	Everglades National Park
Patrick J. Cotter	Monterey Bay National Marine Sanctuary
Rebecca Jetton	Florida Department of Community Affairs
Richard Drew	FDEP Division of Water Resources
Dave Ferrell	U.S. Fish and Wildlife
Roland Flowers, City Engineer	City of Key West
Robert J. Freeman, Jr.	U.S. Environmental Protection Agency
George Garrett, Director	Monroe County Department of Marine Resources
Ralph Gouldy, Senior Environmental Planner	Monroe County
Rhonda Haag	South Florida Water Management District
R.J. Hebling	Florida Department of Environmental Protection
John Heber, Chief, Onsite Sewage Program	Florida Department of Health
Dave Koppel, County Engineer	Monroe County
Bill Kruczynski, Program Scientist	U.S. Environmental Protection Agency
Clark Lake, Director	Monroe County Department of Solid Waste
Tim McGarry, Director	Monroe County Growth Management Division
Fred McManus	U.S. Environmental Protection Agency
Jim Muller	Consultant to Governor's Office
Debbie Peterson	U.S. Army Corps of Engineers
Jim Reynolds, Deputy Executive Director	Florida Keys Aqueduct Authority
Gus Rios	Florida Department of Environmental Protection
Richard Smith	Florida Department of Environmental Protection
G.P. Schmahl	Florida Keys National Marine Sanctuary
Jack Teague	Monroe County Public Health Unit
Fritz Wettstein	Florida Keys National Marine Sanctuary
Zully Williams	Islamorada, Village of Islands

EXHIBIT B
WQSC Members

Name	Affiliated Agency or Organization
John H. Hankinson, Jr., Regional Administrator	U.S. Environmental Protection Agency, Region IV
Kirby Green, Deputy Secretary	Florida Department of Environmental Protection
Jeff Benoit, Director, Ocean and Coastal Resources Management	National Oceanic and Atmospheric Administration
Bart Bibler, Chief, Onsite Sewage Program	Florida Department of Health
William H. Botten	City of Key Colony Beach
Charles W. Causey	Florida Keys Environmental Fund
Mike Collins, Chairman, Governing Board	South Florida Water Management District
William E. Graham, Governing Board Member	South Florida Water Management Distirct
Sam Hamilton, Assistant Regional Director for Ecological Services	U.S. Fish and Wildlife Service
John Heber, Chief, Onsite Seage Program	Florida Department of Health
Frank Kulisky, Councilman	Islamorada, Village of Islands
Karl Lessard	Monroe County Commercial Fisherman
Colonel Joe R. Miller, District Engineer	U.S. Army Corps of Engineers, Jacksonville District
Commissioner George Neugent, Advisory Council Chair	Board of County Commissioners of Monroe County Florida Keys Aqueduct Authority
James C. Reynolds, Deputy Executive Director	Everglades National Park
Richard G. Ring, Superintendent	Florida Department of Community Affairs
Steve Seibert, Secretary	City of Key West
Honorable Jimmy Weekley, Mayor	Board of County Commissioners of Monroe County
Commissioner Nora Williams	Board of County Commissioners of Monroe County

EXHIBIT C
Local Citizen Task Force on Wastewater

Upper Keys	Middle Keys	Lower Keys
Nick Mulick, Chairman	Bill Smith	James Brady, Sr.
Charles Brooks		David Combs
Dagney Johnson		George Leydic
David Makepeace		Jerry Polverino
William Plummer		Alicia Putney
Paul Winklejohn		



Executive Summary

The marine ecosystem in the Florida Keys is dependent on clear water with low levels of nutrients. However, as population and tourism within the Keys have increased over the years, improvements in wastewater treatment and management practices have not kept pace with this growth, which has resulted in a significant degradation of water quality in canals and nearshore waters surrounding the Keys.

Ongoing research has determined that nutrients from wastewater are one of the major contributors to the decline of the water quality in the Florida Keys, prompting the proposal to provide better sewage treatment practices. In this vein, the Water Quality Protection Program Steering Committee concurred with the following conclusions:

- Cesspits are illegal, provide very little treatment, and are a health hazard
- Sewage discharges from cesspits and septic tanks are a source of nutrients and human pathogens
- Septic tank systems remove a very small amount of nutrients
- Aerobic treatment units (ATUs) and package treatment plants do not remove dissolved nutrients

Moreover, the Monroe County *Year 2010 Comprehensive Plan* mandated that nutrient loading levels be reduced in the marine ecosystem of the Florida Keys. This *Sanitary Wastewater Master Plan* (Master Plan) has been prepared as an initial step towards satisfying that directive.

Goals and Objectives

The objective of this Master Plan is to provide an equitable, ecologically sound, and economical implementation strategy for managing wastewater and improving the water quality in the Florida Keys. The goals of

the final selected plan are to provide responsive, flexible, and cost-effective solutions that improve wastewater management practices throughout the Keys and satisfy the existing and future needs of the community.

Existing Wastewater Facilities

Approximately 23,000 private onsite systems and approximately 246 small wastewater treatment plants (WWTPs) are currently operating throughout the Keys. As illustrated in Exhibit ES-1, the onsite systems are comprised of approximately 15,200 permitted septic systems, 640 ATUs, and 7,200 unknown systems. About 2,800 of the 7,200 unknown systems are suspected to be illegal cesspools.

It is estimated that the onsite systems contribute 4.88 million gallons per day (mgd) of wastewater, and the WWTPs contribute 2.40 mgd of wastewater.

Each of these onsite systems and treatment plants provide minimal nutrient removal, and generally discharge effluent containing nutrient levels of about 20 milligrams per liter (mg/L) of total nitrogen (TN), and 5 mg/L of total phosphorus (TP).

Recommended Sanitary Wastewater Management Plan

The conclusions and recommendations reached in this Master Plan are the results of a comprehensive, 2½-year study effort, which included extensive evaluations of existing systems in the Keys and applicable technologies that would fulfill the objectives of Monroe County and the *Year 2010 Comprehensive Plan.* This wastewater management plan recommends that existing onsite systems located in lower density areas of the Keys be upgraded or replaced with onsite wastewater nutrient reduction systems (OWNRS). The recommended plan also includes 12 community wastewater collection and treatment systems and five regional systems. Five of the 12 community wastewater collection systems feature interim WWTPs that, over time, are recommended to be phased into larger regional systems.

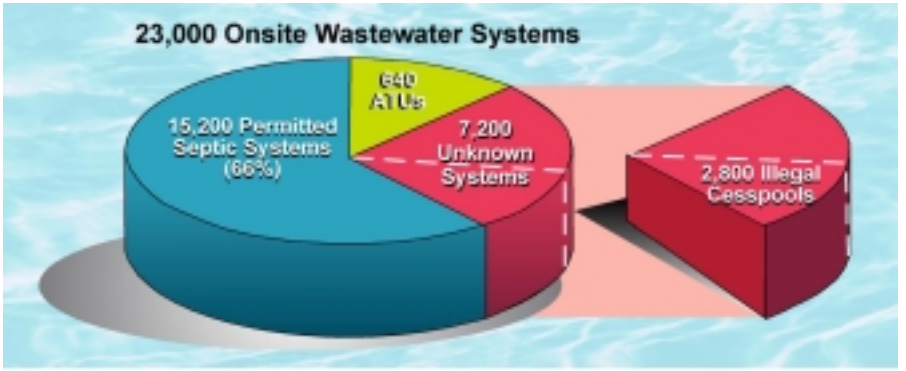


EXHIBIT ES-1
Thirty percent, or 7,200 of the 23,000 onsite wastewater systems in the Keys are not permitted, and may include up to 2,800 illegal cesspools.

Exhibits ES-2 through ES-4 illustrate the recommended implementation plan for the Lower, Middle, and Upper Keys, respectively, and also include "Hot Spot" areas by priority ranking. "Hot Spots" are defined as those areas that will receive a community wastewater collection and treatment system within the next 10-year period, or by the year 2010.

Like any major public works capital program, total funding for implementing this proposed system is a challenge, and a goal of Monroe County officials is to phase this program and seek grant monies to help offset the implementation costs. This strategy will also keep the monthly sewer charges to residents at an affordable level. These central wastewater collection and treatment systems to service designated "Hot Spot" areas will be implemented as grant monies become available, and in the order of priority shown in Exhibits ES-2 through ES-4.

In addition to the new systems and extension of existing systems, it is recommended that 17 existing facilities continue to operate and upgrade their treatment processes to meet the best available technology/advanced wastewater treatment (BAT/AWT) standard by July 1, 2010. These existing systems and the estimated costs of the associated upgrades are summarized in Exhibit ES-5.

Key West Resort Utility Community Service Area [2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
4	Stock Island	Unsewered KW Resort Utility	$3,082,000	Extend wastewater service to unsewered areas of KW Resort Utility franchise area.

Boca Chica Community Service Area [1, 2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
2	Boca Chica	Coppitt/Johnsonville/ Gulfview Porpoise Point/Gulfrest Park and adjacent area along U.S. 1	$11,600,000	Provide wastewater collection service to Hot Spot area. Construct 0.2 mgd WWTP expandable to 0.40 mgd. Other options include negotiate with NAS Key West for capacity or expansion of their WWTP, or negotiate with KW Resort Utilities for capacity or expansion of their WWTP.
14	Boca Chica	Rockland Key	$4,570,000	Provide wastewater collection service to Hot Spot area. Expand WWTP to 0.40 mgd.
16	Boca Chica	Boca Chica Ocean Shores, Tamarac Park	$4,100,000	Provide wastewater collection service to Hot Spot area.
—	—	—	$200,000	Connect package plants to system.

Bay Point Community Service Area [1]

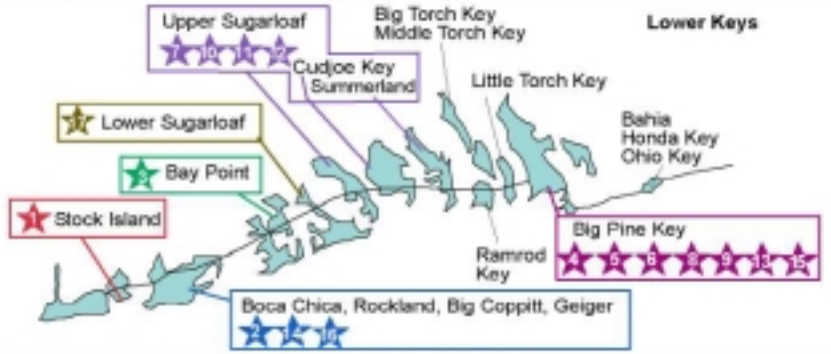
Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
3	Bay Point	Bay Point Subdivision and Saddlebunch Shores	$4,000,000	Provide wastewater collection service to Hot Spot area. Provide 0.06 mgd WWTP, capable of uprating to 0.075 mgd, for this service area.
—	—	—	—	Connect package plant to system; uprate WWTP to 0.075 mgd

Summerland/Cudjoe/Upper Sugarloaf Regional Service Area [1]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
7	Summerland	Summerland Key Cove/ Summerland Cove Isle	$12,860,000	Provide wastewater collection service to Hot Spot area. Provide initial 0.22 mgd WWTP expandable to 0.66 mgd for this regional service area.
10	Cudjoe	Cutthroat Habor Estates, Cudjoe Ocean Shores	$10,420,000	Provide wastewater collection service to Hot Spot area. Expand regional WWTP to 0.44 mgd.
11	Upper Sugarloaf	Indian Mound Estates, Gulf Shores	$3,125,000	Provide wastewater collection service to Hot Spot area.
12	Cudjoe	Cudjoe Gardens	$3,925,000	Provide wastewater collection service to Hot Spot area.
—	—	—	$4,000,000	Expand regional WWTP to 0.66 mgd; connect package plants to system.

Lower Sugarloaf Community Service Area [1, 2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
1	Lower Sugarloaf	Sugarloaf Shores, Orchid Park, adjacent area along U.S. 1	$9,349,000	Provide wastewater collection service to Hot Spot area. Provide 0.12 mgd WWTP for this service area.



Big Pine Regional Service Area [1, 2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
4	Big Pine	Whispering Pines/ Sands/Griesen/Ross Haven/Pat & Mary/Big Pine Cove, adjacent area along U.S. 1.	$11,000,000	Provide wastewater collection service to Hot Spot area. Provide initial 0.30 mgd WWTP, expandable to 0.90 mgd for this regional service area.
5	Big Pine	Doctor's Arm/Lambert/ Tropical Bay, Palma Villa, Whispering Pines	$6,500,000	Provide wastewater collection service to Hot Spot area.
6	Little Torch	Coral Shores, Windward Beach Estates, Mate's Beach, Jolly Roger Estates, and area east of Mate's Beach south to Jolly Roger Estates.	$13,240,000	Provide wastewater collection service to Hot Spot area. Expand regional WWTP to 0.60 mgd.
8	Big Pine	Eden Pines Colony	$5,000,000	Provide wastewater collection service to Hot Spot area. Expand regional WWTP to 0.90 mgd.
9	Big Pine	Big Pine Key, Inc., Tropical Key Colony, Pine Channel Estates, Cahill Pines & Palms, and adjacent area along U.S. 1	$8,300,000	Provide wastewater collection service to Hot Spot area.
13	Ramrod	Breezeswept Beach Estates, Ramrod Shores, Ramrod Shores Marina, and area along U.S. 1	$6,690,000	Provide wastewater collection service to Hot Spot area.
15	Big Pine	Port Pines Heights	$4,750,000	Provide wastewater collection service to Hot Spot area.
—	—	—	$400,000	Connect package plants to system.

[1] The plan recommends phasing out all package plants, and connecting sewers to community or regional systems when all Hot Spots are served.

[2] The plan recommends that some existing facilities continue to operate and upgrade their treatment process to BAT/AWT. For clarity, these facilities are not shown in this exhibit; refer to Exhibit ES-5 for these existing facilities.

[3] Numbers within stars indicate priority rankings of Hot Spot areas, and are further defined in Chapter 6, and in Exhibits 6-1, 6-2, and 6-3.

EXHIBIT ES-2

Recommended Wastewater Management Implementation Plan for the Lower Keys

Conch Key Community Service Area

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
2	Marathon Secondary	Conch Key	$1,750,000	Provide wastewater collection service to Hot Spot area. Provide 0.03 mgd WWTP for this service area.

Hawk's Cay Community Service Area[2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
6	Marathon Secondary	Duck Key	$5,500,000	Provide wastewater collection service to Duck Key. Expand Hawk's Cay WWTP to 0.30 mgd.

Long Key/Layton Community Service Area[2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
7	Long Key/Layton	Long Key Estates, City of Layton, area adjacent to U.S. 1.	$3,540,000	Provide wastewater collection service to Hot Spot area. Provide 0.05 mgd WWTP for this service area.

Marathon Regional Service Area[1]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
1	Marathon Primary	Little Venice (Phase I)	$6,600,000	Provide community wastewater collection system with interim 0.14 mgd WWTP.
3	Marathon Primary	Phased Regional System (Phase II)	$35,480,000	Provide wastewater collection service to Hot Spot area. Provide initial 1.0 mgd WWTP, expandable to 2.0 mgd, for this regional service area. Deactivate Little Venice WWTP and connect into regional system
4	Marathon Primary	Remainder of Regional System (Phase III)	$30,200,000	Provide wastewater collection service to Hot Spot area. Connect all package plants to regional system. Expand regional WWTP to 2.0 mgd.
5	Marathon Secondary	Grassy Key	$5,200,000	Provide wastewater collection service to Grassy Key. Treatment at Marathon Regional WWTP.

[1] The plan recommends phasing out all package plants, and connecting sewers to community or regional systems when all Hot Spots are served.
[2] The plan recommends that some existing facilities continue to operate and upgrade their treatment process to BAT/AWT. For clarity, these facilities are not shown in this exhibit; refer to Exhibit ES-5 for these existing facilities.
[4] Numbers within stars indicate priority rankings of Hot Spot areas, and are further defined in Chapter 6, and in Exhibits 6-1, 6-2, and 6-3.

EXHIBIT ES-3
Recommended Wastewater Management Implementation Plan for the Middle Keys

Capital Costs Required to Implement the Master Plan

As shown in Exhibit ES-6, the capital costs required to improve wastewater management practices, as recommended by this Master Plan, are approximately $438,000,000 and include approximately 45 projects. The capital costs presented in this exhibit reflect implementation of new service areas, as presented in ES-2, ES-3, and ES-4, as well as the costs of upgrading existing facilities, as presented in ES-5. These costs assume that, other than those existing WWTPs that will continue to serve given isolated areas or existing functioning private wastewater utilities, all WWTPs will connect into either the central community or regional wastewater systems once all the "Hot Spot" areas are served, or by 2010, whichever occurs first.

Wastewater Reuse

Although there are advantages associated with wastewater reuse, the high cost associated with additional facilities and the limited availability of suitable areas to irrigate make this option more difficult to implement in the Florida Keys than in other areas. Wastewater reuse requires additional facilities at the treatment plant beyond those required to provide BAT/AWT treatment, including high-level disinfection facilities, reuse water storage facilities, and high service pumping facilities to transmit reuse water from the treatment plant to the reuse site. In addi-

Lower Matecumbe Community Service Area[1]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
1	Lower Matecumbe	Safety Harbor, Toll Gate Shore, Port Antigua, White Marlin Beach, Matecumbe Sandy Beach, Lower Matecumbe Beach	$8,900,000	Provide wastewater collection service to Hot Spot area. Provide 0.18 mgd WWTP for this service area.

Islamorada Regional Service Area[1]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
1	Plantation Key	Area A - Eastern end of Plantation Key including Plantation Key Colony/Rahiki Harbor/Edemaire/ Tavernaero/Tropical Atlantic Shores	$12,280,000	Provide wastewater collection service to Hot Spot area. Provide initial 0.75 mgd WWTP, expandable to 1.50 mgd, for this regional service area.
2	Upper Matecumbe	Entire Study Area	$16,310,000	Provide wastewater collection service to Hot Spot area. Connect all package plants in this Hot Spot area to regional system.
3	Plantation Key	Venetian Shores	$5,050,000	Provide wastewater collection service to Hot Spot area.
4	Windley Key	Entire Study Area	$4,400,000	Provide wastewater collection service to Hot Spot area. Connect all package plants in this Hot Spot area to regional system.
5	Plantation Key	Treasure Harbor, Plantation Ridge Coral Shores	$2,600,000	Provide wastewater collection service to Hot Spot area.
6	Plantation Key	Indian Waterways, Indian Harbor, Plantation Key, Lysiloma, Key Heights, Vacation Village, Aergood Heights, Pearl City	$9,340,000	Provide wastewater collection service to Hot Spot area.
7	Plantation Key	Remainder of Planation Key	$16,030,000	Provide wastewater collection service to Hot Spot area.
——	——	——	$760,000	Connect package plants on Plantation Key to system.

EXHIBIT ES-4
Recommended Wastewater Management Implementation Plan for the Upper Keys

Tavernier/Key Largo Regional Service Area[1, 2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
1	PAED 19/20	Lake Surprise/Sexton Cove, Ocean Isle Estates, and adjacent area on U.S. 1	$11,000,000	Provide community wastewater collection system with interim 0.165 mgd WWTP.
2	PAED 18	Key Largo Trailer Village, Largo Gardens, Hibiscus Park and area adjacent to U.S. 1	$10,270,000	Provide community wastewater collection system with interim 0.165 mgd WWTP.
3	PAED 18	Cross Key Waterway Estates & Largo Sound Park/Anglers Park Shores/South Creek Village and area along U.S. 1	$9,700,000	Provide community wastewater collection system with interim 0.140 mgd WWTP.
4	PAED 16	Area A, Wynken, Blyken & Nod	$1,670,000	Provide wastewater collection service to Hot Spot area. Connect to one of two adjacent existing WWTPs, each of which appears to have adequate excess capacity to serve this Hot Spot.
5	PAED 15	Harris Ocean Park, Palma Sola, Sherrill Park, Hammer Point Park, and along U.S. 1	$8,600,000	Provide community wastewater collection system with interim 0.12 mgd WWTP.
7	PAED 19/20	Remainder of PAED 19/20-Stillwright Point/Paradise Point Cove, Riviera Village, Key Largo Mobile Home Sites, Largo City	$26,640,000	Provide wastewater collection service to Hot Spot area. Initiate regional A/I/T WWTP. Construct 1.50 mgd facility expandable to 2.25 mgd. Deactivate Hot Spot Priority Areas 1, 2, and 3 WWTPs and connect to regional WWTP.
8	PAED 17	Port Largo, Key Largo Beach, Key Largo Ocean Shores, Silver Lake Park, Holiday Homesites, Buttonwood Shores, Buttonwood Cove, Lazy Lagoon, Point Pleasant Sunset Cove	$11,100,000	Provide wastewater collection service to Hot Spot area.
10	PAED 18	Bahia Mar Estates/Pamela Villa/Winston Waterways	$3,500,000	Provide wastewater collection service to Hot Spot area.
11	PAED 17	Pirate's Cove, Rock Harbor Estates, Marion Park, Rock Harbor Manor, Harbor Shores, El Dorado	$6,440,000	Provide wastewater collection service to Hot Spot area.
12	PAED 16	Bay Haven, Lime Grove Estates, Sunrise Point, Abode Casa Court, Seven Acres, Sunset Gardens, Dove Creek	$7,290,000	Provide wastewater collection service to Hot Spot area.
14	PAED 15	Old Tavernier	$11,950,000	Provide wastewater collection service to Hot Spot area. Deactivate Hot Spot Priority Area 5 WWTP and connect to regional WWTP. Expand regional WWTP to 2.25 mgd.
15	PAED 17	Sunset Waterways, Key Largo Park	$6,400,000	Provide wastewater collection service to Hot Spot area.
16	PAED 18	Bermuda Shores, Twin Lakes	$2,500,000	Provide wastewater collection service to Hot Spot area.
——	——	——	$2,300,000	Connect package plants to system.

[1] The plan recommends phasing out all package plants, and connecting sewers to community or regional systems when all Hot Spots are served.
[2] The plan recommends that some existing facilities continue to operate and upgrade their treatment process to BAT/AWT. For clarity, these facilities are not shown in this exhibit; refer to Exhibit ES-5 for these existing facilities.
[3] Numbers within stars indicate priority rankings of Hot Spot areas, and are further defined in Chapter 6, and in Exhibits 6-1, 6-2, and 6-3.

tion, reuse water transmission and distribution piping systems would be required, which adds additional cost.

The high cost of potable water in the Keys limits the practice of potable water irrigation ($4.93/1,000 gallons for monthly use up to 12,000 gallons, and $5.93/1,000 gallons for monthly use over 12,000 gallons). Because there are no potential large-volume reuse customers, such as golf courses, the proportion of potable water that could be replaced with reuse water is relatively low. (The two golf courses that do not use reclaimed wastewater for irrigation have installed reverse osmosis facilities for irrigation water.)

The cost required to provide reuse water for irrigation is expected to be considerably higher than the current cost to provide potable water (an estimated $12.52/1,000 gallons for reuse water vs. $4.93/1,000 gallons for potable water). Consequently, initiating wastewater reuse does not provide a cost-savings incentive to wastewater customers in the Keys. Therefore, a policy mandating wastewater reuse would have to be initiated by local, state, or federal regulatory agencies before full-scale wastewater reuse could be implemented. However, mandating a reuse policy should be carefully considered because it may be more economically sound to produce more potable water from seawater and distribute it to the existing potable water distribution system than to produce and distribute re-

EXHIBIT ES-5
Estimated Costs to Upgrade Existing Treatment Facilities Recommended for Continued Operation throughout the Keys

Study Area	WWTP	Capacity (MGD)	Upgrade to BAT/AWT Standard	Capital Cost ($)
Stock Island	KW Resort Utility	0.50	AWT	760,000
Stock Island	Key Haven Utility	0.20	AWT	500,000
Stock Island	Monroe County[1] Detention Center	0.105	AWT	250,000
	Total for Stock Island			**826,000**
Boca Chica	NAS Key West	0.40	AWT	670,000
	Total for Boca Chica			**670,000**
Bahia Honda	Bahia Honda State Park	0.0083	BAT	98,000
	Bahia Honda State Park	0.010	BAT	102,000
	Sunshine Key Campground	0.060	BAT	187,000
	Total for Bahia Honda			**387,000**
Marathon Secondary	Hawk's Cay[2]	0196	AWT	1,600,000
	Total for Marathon Secondary			**1,600,000**
West End Long Key	Ocean Bay Condominium	0.006	BAT	93,000
	Long Key State Park	0.010	BAT	99,000
	Outdoor Resorts	0.060	BAT	192,000
	Total for West End Long Key			**384,000**
East End Long Key	Oceanside Isle Apartments	0.0070	BAT	94,000
	Fiesta Key Campground	0.060	BAT	192,000
	Total for East End Long Key			**286,000**
Ocean Reef Club (Study Area 27)	No. Key Largo Utility Company	0.55	AWT	1,500,000
	Extend sewer service to unsewered area			4,160,000
	Total for Ocean Reef Club			**5,660,000**
PAED 22 at Jewfish Creek (Study Area 25-2)	Gilbert's	0.010	BAT	100,000
	Anchorage	0.010	BAT	100,000
	Total for PAED 22A (SA 25-2)			**200,000**
PAED 22 at County Line (Study Area 25-1)	Barefoot Cay Treatment Plant	0.045	BAT	164,000
	Barefoot Cay Sewer Extension[3]			300,000
	Total for Barefoot Cay (SA 25-1)			**464,000**

[1]Though located in the City of Key West and beyond the boundaries of this Master Plan, the Detention Center is owned and operated by Monroe County, and therefore, has been included in the Master Plan study.
[2]Upgrade of Hawk's Cay portion of treatment capacity only.
[3]Low pressure sewer grinder pump system to serve unsewered adjacent areas.

EXHIBIT ES-6
Estimated Capital Costs Required to Implement the Sanitary Wastewater Master Plan

Wastewater System Service Areas	Estimated Capital Cost[1]
KW Resort Utility	$3,080,000
Big Coppitt Service Area	$20,500,000
Bay Point Service Area	$4,000,000
Lower Sugarloaf Service Area	$9,350,000
Summerland/Cudjoe/Upper Sugarloaf Regional	$34,300,000
Big Pine Regional	$55,900,000
KW Resort Utility (AWT for non reuse)	$760,000
Key Haven Utility	$500,000
Monroe County Detention Center (AWT for non reuse)	$250,000
NAS Key West (Boca Chica)	$670,000
Bahia Honda	$390,000
Marathon Regional	$72,300,000
Grassy Key (Treatment at Marathon Regional)	$5,200,000
Duck Key (Treatment at Hawk's Cay)	$5,500,000
Conch Key Service Area	$1,750,000
Long Key/Layton Service Area	$3,540,000
Hawk's Cay (Hawk's Cay portion for AWT upgrade)	$1,600,000
West End Long Key	$380,000
East End Long Key	$290,000
Lower Matecumbe Service Area	$8,900,000
Islamorada Regional	$66,800,000
Tavernier/Key Largo Regional	$119,400,000
Ocean Reef Club	$5,660,000
PAED 22 at Snake Creek	$200,000
PAED 22 at County Line	$460,000
Onsite Upgrade of Unknown Systems	$3,520,000
Onsite Systems Upgrade in 2010	$12,750,000
Total	**$437,950,000**

[1]Capital costs include a 20% contingency and include all construction costs, including the costs to decommission existing onsite systems and the costs of new building sewers on private property from the house or building to the street. Capital costs also include all engineering, construction administration and inspection, land acquisition, legal fees, and financing charges.

claimed water through a separate reuse distribution system.

An immediate initial step in determining the practicality and economics of wastewater reuse in the Keys should be to conduct reuse feasibility studies throughout the different service areas. These studies should establish firm amounts of reclaimed water to which reuse customers are willing to commit and pay for.

Offsetting Costs Per Customer

One of the most significant constraints on the ability of the County to implement the wastewater management improvements needed to achieve the water quality goals in and around the Florida Keys is the high cost of the projects per connection or resident served.

The total estimated capital cost of the identified improvements to serve the wastewater service areas in Monroe County is $438 million, or approximately $9,149 per equivalent dwelling unit (EDU). When combined with operation and maintenance (O&M) costs, this is equivalent to an average cost per EDU of approximately $89 per month. These costs well exceed what would generally be considered affordable for wastewater service. They are much higher than is typical not only in Florida, but throughout the United States in general, in which the average rate is about $17.40 per month (see Exhibit ES-7).

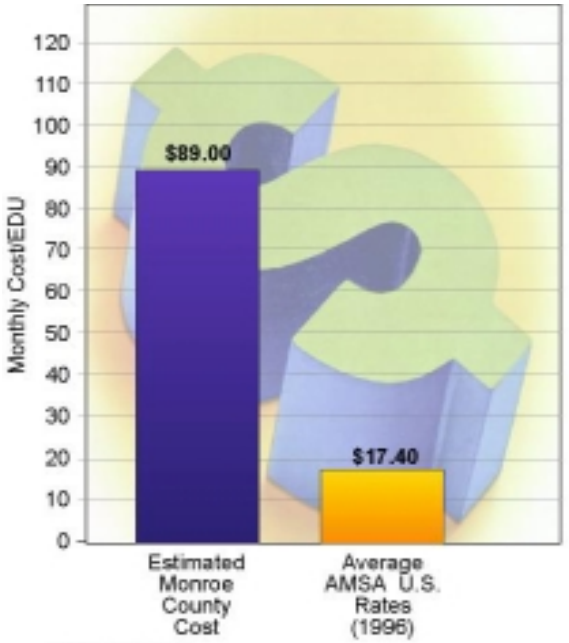


EXHIBIT ES-7
Monroe County's estimated monthly wastewater cost is well above national average wastewater rates.

Fiscal Impact Analysis

As the costs of the wastewater management program are well beyond the financial capability of the residents of the County to afford without outside assistance, the fiscal impact analysis presented herein evaluates the level of grant or external funding that would be needed to make the program financially feasible. It was assumed for this analysis that funding and financing for the wastewater management program would come from four main sources: revenues from rates, connection fees (including impact fees), revenue bonds, and grants. While this analysis only considers the use of these four sources of funding and financing, this should not be interpreted as a recommendation to exclude other sources of funding, and therefore other financing mechanisms should be explored.

The total average amount of grant monies necessary, when all countywide projects are analyzed together, is presented in Exhibit ES-8, and includes the following four scenarios:

Scenario 1: $35 monthly fee
$1,600 connection fee

Scenario 2: $40 monthly fee
$2,500 connection fee

Scenario 3: $50 monthly fee
$2,500 connection fee

Scenario 4: $50 monthly fee
$3,500 connection fee

The projects are estimated to require between $117.1 million to $290.4 million in grants to be financially feasible under these four scenarios. Grants totaling approximately 66 percent of the projects' combined costs, or $290.4 million, would be necessary for the projects to be financially feasible under Scenario 1 ($35 per month and $1,600 connection fee).

With an increase in the monthly charge to $40 per EDU and the connection fee to $2,500 (Scenario 2), the amount of grant funding needed falls by $70 million to $219.9 million, or 50 percent of the total cost.

A $10 per month increase (Scenario 3) further decreases the needed grant funding to $165.0 million (38 percent). Finally, under Scenario 4 ($50/month and a $3,500 connection fee), $117.1 million, or 27 percent of the total capital costs, would need to be raised through grants to support the recommended wastewater improvement projects in the Keys.

Finance Recommendations

It is the recommendation of this Master Plan that the County and Florida Keys Aqueduct Authority (FKAA) aggressively pursue grant funding for virtually all of the projects included in this wastewater management program. Projects that

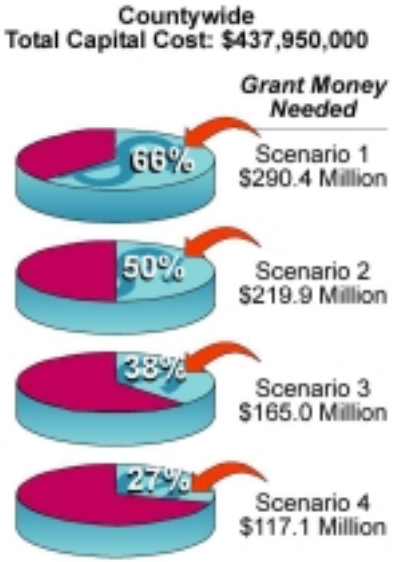


EXHIBIT ES-8
Total Grant Money Needed in the Entire Keys to Fund Wastewater Management Improvements

involve improvements to privately-owned utilities are not typically grant eligible.

Recognizing that it may not be possible to accomplish initially, it is the recommendation of this Master Plan that a major goal of the FKAA and the incorporated areas not under the jurisdiction of the FKAA should be to implement uniform countywide rates and connection/impact fees for all unsewered areas. This would offset the higher cost of implementation presented by some of the smaller and more remote service areas.

Providing affordable uniform wastewater rates to all Monroe County residents is an important issue, and has been further complicated by the recent incorporation efforts. Setting uniform wastewater rates and fees throughout all the unsewered areas of the County is the most equitable rate-setting approach and the recommendation of this Master Plan. To do otherwise poses the danger that more developed areas, where implementation costs tend to be lower, would be implemented first, and would charge lower rates. The smaller or more remote service areas where implementation costs will be higher would then be forced to set higher rates and fees. This has the potential to compromise affordability, and therefore jeopardize implementation of this program in these areas.

The "go it alone" funding and rate and fee setting approach currently being pursued in certain areas is in conflict with the goal of uniform rates throughout all unsewered areas and could undermine the viability of this program. It is recommended that an oversight entity, such as the Water Quality Steering Committee, be charged with the responsibility to oversee the goal of implementing countywide rates and fees to assure all areas equitable and affordable wastewater rates.

Management Structure Implementation

The FKAA's enabling legislation authorizes the FKAA to supply both potable water and wastewater services in Monroe County, including acquiring, financing, operating, and maintaining wastewater collection, transmission, treatment, and disposal systems. A Memorandum of Understanding (MOU) between the Monroe County Board of County Commissioners (BOCC) and the FKAA established the FKAA as the wastewater authority for all of Monroe County, except for the Cities of Key West and Key Colony Beach and Islamorada, Village of Islands. As such, it is the recommendation of this Master Plan that the FKAA would administer and manage all wastewater facilities (publicly-owned WWTPs, privately-owned WWTPs, and OWNRS) throughout the area of their jurisdiction. The FKAA would own all publicly-owned WWTPs and would administer, manage, operate, and maintain all such facilities. In addition, the FKAA would administer and manage, but generally would not own, all onsite systems and privately-owned package plants. By consolidating wastewater management responsibilities under the FKAA, economies of scale in terms of capital, facility, and labor costs should be achieved.

Recommended BOCC Implementation Actions

To accomplish the water quality objectives of the *Year 2010 Comprehensive Plan*, and to move the implementation of this Master Plan forward, the BOCC should take the following actions:

1. Continue to pursue state and federal grant money in association with the FKAA.
2. Request the FKAA to adopt sewer districts as recommended in the Master Plan.
3. Take legal action to establish municipal service districts for the respective sewer districts.
4. Initiate land purchases of wastewater facility sites, as outlined in the Master Plan. This should also include the smaller vacuum station sites and the interim WWTP sites, if additional facilities are required.
5. Develop and adopt interim onsite wastewater system standards and policies for "Hot Spot" areas; this will have to be coordinated with the Florida Department of Health (FDOH).

6. Adopt a policy to address the "double charge" issue. (Paying to upgrade an onsite system to a nutrient reduction system, and then paying again to connect to the sewer system when central sewers are completed.)

★★★★★★

Chapter 1 Introduction

The Florida Keys are a chain of approximately 800 independent islands located in Monroe County off of the southeastern tip of Florida, representing the most southerly point of the continental United States. The more developed islands are connected by U.S. Highway 1, a 110-mile stretch of roadway extending from Key Largo to Key West. All the waters adjacent to the islands have been designated as Outstanding Florida Waters, and include the 2,800-nautical-square-mile Florida Keys National Marine Sanctuary—the second largest national marine sanctuary in the United States.

The Keys is home to a complex and dynamic ecosystem, including the world's third largest coral reef system, and offers a natural beauty that has drawn visitors from around the world. Supporting major fishing and tourist industries, the reef and the entire marine ecosystem are the lifeblood of the Keys, and hence, protecting their existence and vitality is critical to the economic and environmental future of the islands.

Like most natural resources, rapid development, population growth, and ironically, the millions of visitors drawn to the beauty and charm of the Keys have threatened its health and future existence. The deterioration of the reef and the entire marine ecosystem has been the subject of many studies. Scientists concur that one of the principle causes of the Keys' unhealthy state is the elevated level of nutrients in the surrounding canals and nearshore waters. Nutrients, comprised of nitrogen and phosphorus, are found in high levels in raw sewage and secondary treated wastewater discharges. Modern advances in wastewater treatment processes have produced technologies that are capable of reducing the nutrients contained in wastewater, but the high cost of their implementation on a

scale as large as the Keys makes the solution for Monroe County a challenging one.

Consequently, improving wastewater practices within the Keys has received a major focus of attention by health and environmental authorities, the engineering and scientific research communities, as well as concerned residents and environmental groups. Indeed, over the last decade, aggressive steps have been taken by federal, state, and local authorities to help restore and maintain the Keys' natural ecosystem. In this vein, the Monroe County *Year 2010 Comprehensive Plan* called for the development of this countywide *Sanitary Wastewater Master Plan* (Master Plan).

This 2½-year master-planning effort represents a comprehensive study that integrates the multiple facets of environmental science and research, community planning, engineering design and construction, and economics. Throughout the study period, a significant public outreach program was factored into the major study tasks, so that members of the community had ample opportunity to not only learn about the progress of the study and related issues, but could engage and participate in identifying and developing workable solutions.

1.1 Goals and Objectives

The objective of the Master Plan team was to develop a plan that would provide an equitable, ecologically sound, and economical implementation strategy for managing wastewater and improving the water quality in the Florida Keys. The goals of the final selected plan is to provide responsive, flexible, and cost-effective solutions that improve wastewater management practices throughout the Keys and satisfy the existing and future needs of the community. The Master Plan must address affordability and equity issues, and must satisfy environmental and regulatory criteria and guidelines.

1.2 Planning and Study Areas

The planning area of this Master Plan, as illustrated in Exhibit 1-1, includes the entire developed areas of the Florida Keys, except for the Cities of Key West and Key Colony Beach. Since the wastewater master planning efforts began in 1997, the Village of Islamorada (the islands of Lower Matecumbe, Upper Matecumbe, Windley, and Plantation Keys), and the City

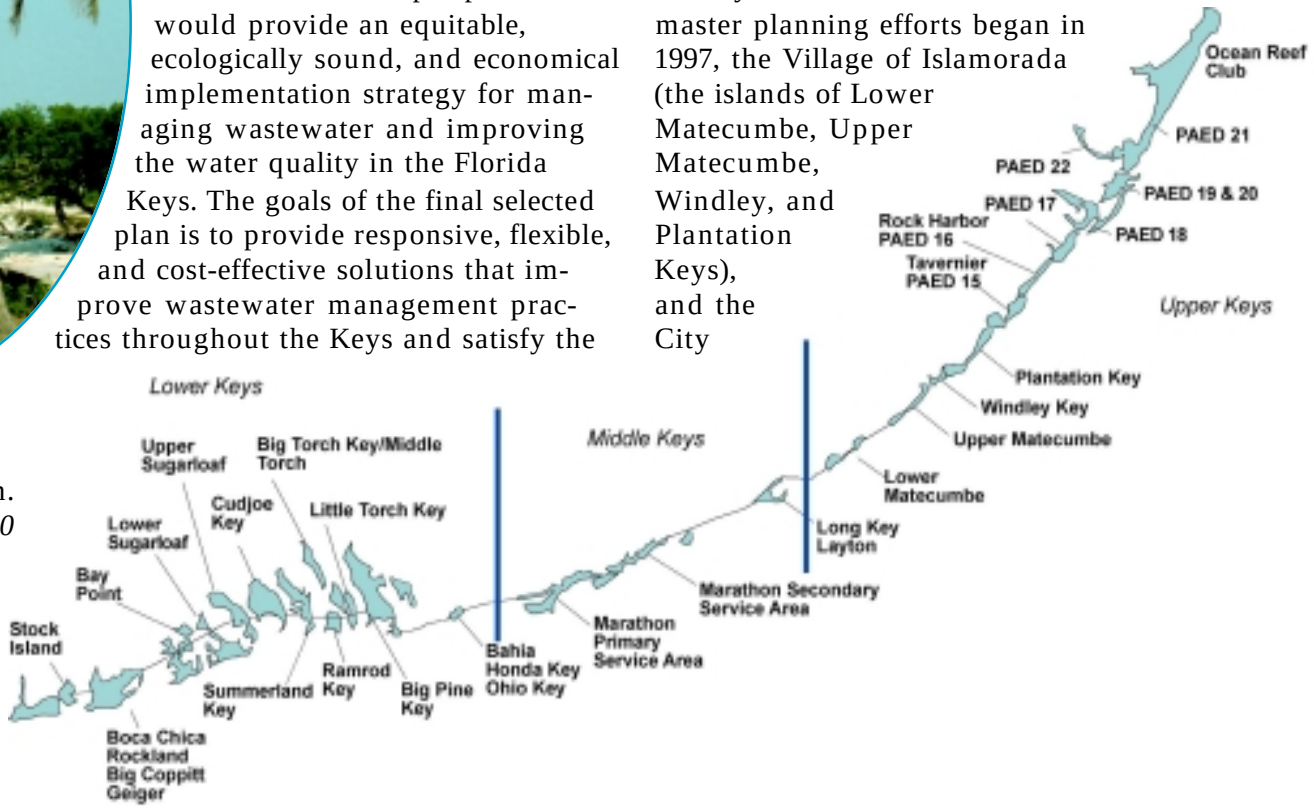


EXHIBIT 1-1
The planning area for the Monroe County Sanitary Wastewater Master Plan extends from Stock Island to the south, up to Ocean Reef Club to the north.

of Marathon (Seven-Mile Bridge to Tom's Harbor Cut) were incorporated. Thus, the planning area includes unincorporated Monroe County in the Florida Keys, as well as the Cities of Layton and Marathon, and Islamorada, Village of Islands.

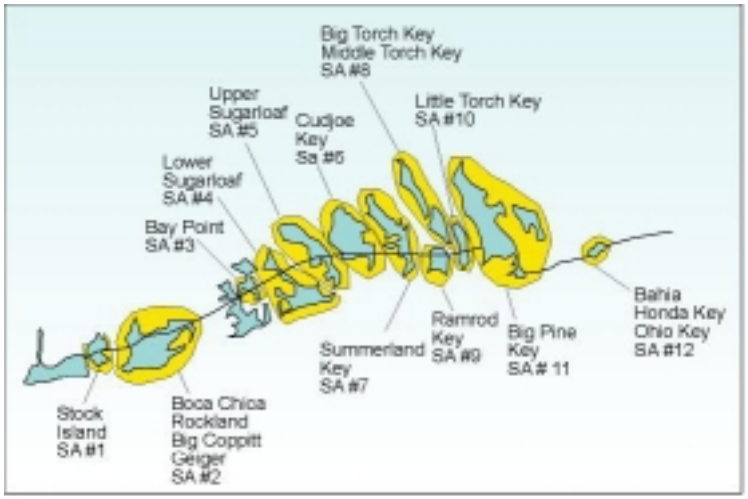


EXHIBIT 1-2
Study Areas in the Lower Keys Area for the Monroe County
Sanitary Wastewater Master Plan

The planning area was divided into 27 study areas, as shown in Exhibits 1-2 through 1-4. Because the Key Largo area in the Upper Keys has no distinct island boundaries, the Monroe County Planning Area Analysis/Enumeration Districts (PAED) were used as study areas. The study areas are used as principle identifiers throughout this Master Plan and in many of the supporting technical documents. All data development, analyses, and documentation were performed by study area, or combinations of study areas.

1.3 Planning Period

The planning period used for developing this Master Plan is the 20-year interval between 1998 and 2018. All cost estimates presented in this Master Plan are 1998 dollars.

1.4 The Decline of Water Quality

The Florida Keys marine ecosystem is dependent on clear water with low levels of nutrients. However, as population and tourism have increased over the years, improvements in wastewater treatment and management practices have not kept pace with this growth. As a result, anthropogenic, or human-produced, nutrient discharges to confined canal and nearshore coastal waters have increased, resulting in a decline in water quality. Ongoing research has determined that nutrients from wastewater are one of the major contributors to the decline of the water quality in the Florida Keys. Scientists agree, based on the wealth of literature and proven, scientific knowledge, that canals and other nearshore waters are affected by human-derived nutrients found in wastewater, and that better sewage treatment practices would improve canal and nearshore water quality.[1,2] Thus, the Water Quality

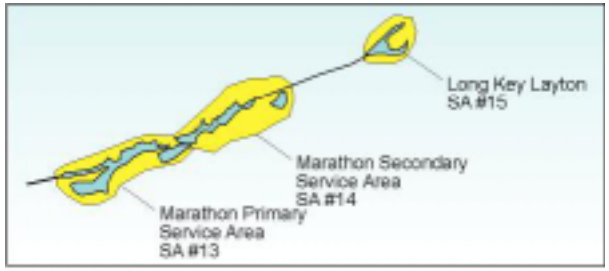


EXHIBIT 1-3
Study Areas in the Middle Keys Area for Monroe County
Sanitary Wastewater Master Plan

EXHIBIT 1-4
Study Areas in the Upper Keys Area for the Monroe County
Sanitary Wastewater Master Plan

Protection Program Steering Committee concurred with the following conclusions:

- Cesspits are illegal, provide very little treatment, and are a health hazard
- Sewage discharges from cesspits and septic tanks are a source of nutrients and human pathogens
- Even properly functioning septic tank systems remove a very small amount of nutrients
- Aerobic treatment units (ATUs) and package treatment plants do not remove dissolved nutrients

Furthermore, during hearings on the water quality aspects of the Monroe County *Year 2010 Comprehensive Plan*[3], the hearing officer determined that the nearshore waters of the Florida Keys have exceeded their capacity to absorb additional nutrient loads as a result of the current wastewater treatment practices. Consequently, the final order of the Administration Commission was to reduce nutrient loading levels in the marine ecosystem of the Florida Keys.

1.5 Background

Approximately 23,000 private onsite systems and approximately 246 small wastewater treatment plants (WWTPs) are currently operating throughout the Keys. As illustrated in Exhibit 1-5, the onsite systems are comprised of approximately 15,200 permitted septic systems, 640 ATUs, and 7,200 unknown systems. About 2,800 of the 7,200 unknown systems are suspected to be illegal cesspools.

It is estimated that the onsite systems contribute 4.88 million gallons per day (mgd) of wastewater, and the WWTPs contribute 2.40 mgd of wastewater.

Each of these onsite systems and treatment plants provide minimal nutrient removal, with effluent from all facilities containing nutrient levels of about 20 milligrams per liter (mg/L) of total nitrogen (TN), and 5 mg/L of total phosphorus (TP).

The onsite systems primarily serve single family residences and small commercial establishments, while the small WWTPs serve condominium and apartment complexes, resorts, motels, restaurants, and other larger commercial establishments where higher volumes of wastewater are generated. Property owners are responsible for managing, operating, and maintaining their individual systems, whether they are onsite systems or small WWTPs.

1.5.1 Year 2010 Comprehensive Plan

The Monroe County *Year 2010 Comprehensive Plan* mandated that a sanitary wastewater master plan be prepared to determine acceptable levels of sanitary service and treatment for all developed and undeveloped areas in Monroe County. More specifically, the intent of the Comprehensive Plan is:

1. To establish more stringent nutrient limits so as not to exceed the maximum

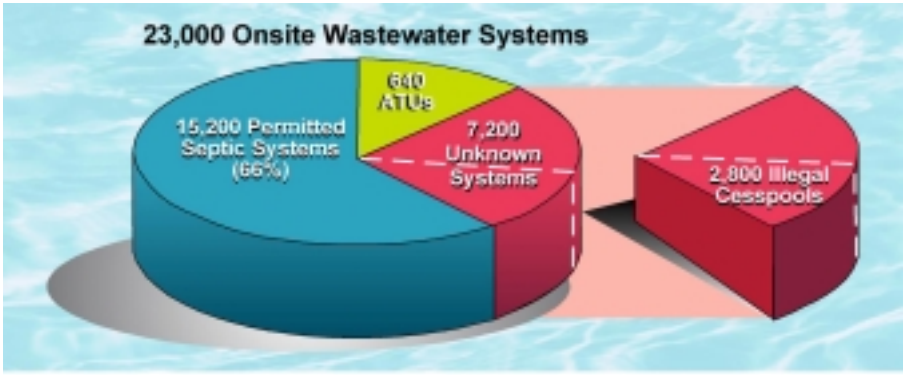
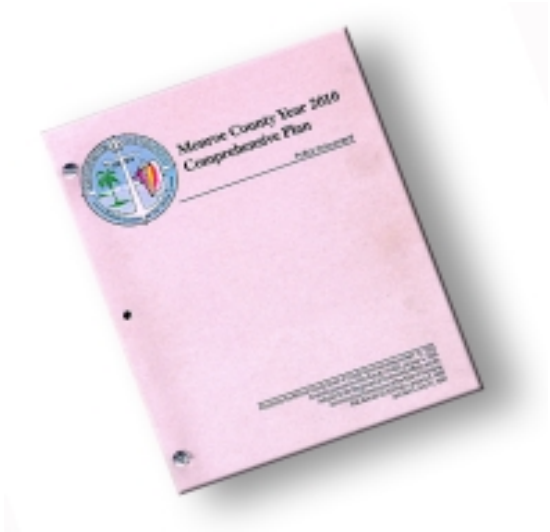


EXHIBIT 1-5
Thirty percent, or 7,200 of the 23,000 onsite wastewater systems in the Keys are not permitted, and may include up to 2,800 illegal cesspools.

[1]U.S. Environmental Protection Agency, *Water Quality Concerns in the Florida Keys: Sources, Effects, and Solutions,* Water Quality Protection Program – Florida Keys National Marine Sanctuary. By William L. Kruczynski, Program Scientist. EPA 904-R-99-005. September 1999.

[2]*Water Quality Concerns in the Florida Keys: Sources, Effects, and Solutions*, referenced in Footnote 1, documents the problem and also provides a good treatise on why nutrients from wastewater, as well as from other sources, are causing a decline in water quality.

[3]Sartin, L.J. Monroe County Administrative Hearing. *Monroe County Year 2010 Comprehensive Plan*. 1995. Final Orders. Case No. 93-4326RGM, 93-4417RGM, and 91-1932GM.



nutrient loads that can be tolerated by the County's nutrient-sensitive waters and ecosystems without experiencing short- or long-term adverse impacts

2. To prevent further degradation to groundwater, as well as confined, nearshore, and offshore waters
3. To ensure improvement of these waters to levels that have been demonstrated to support healthy, diverse, and productive populations of fish and other marine resources (Objective 901.4)[4].

The Governor's Executive Order 98-309[5] charges the relevant agencies and entities to participate and coordinate with Monroe County in carrying out all aspects of the Monroe County *Year 2010 Comprehensive Plan*, including planning and implementation of an improved wastewater management system.

1.5.2 Identification and Elimination of Cesspools (Monroe County Ordinance 031-1999)

Rule 28-20.100 of the Florida Administrative Code defined a Five-Year Work Program for Monroe County, which amended the *Year 2010 Comprehensive Plan* and set forth a schedule for implementing different components of the *Year 2010 Comprehensive Plan*. One of the components emphasized in the Rule is the identification and elimination of cesspools, as required by Objective 901.2 of the Comprehensive Plan.[6] Subsequently, Monroe County Ordinance 03-1997 established a program to identify and eliminate cesspools, concentrating on older developed lots where most of the cesspools are suspected to be located. For several reasons, this original program failed and the cesspool elimination program in Monroe County essentially came to a stop. Consequently, Governor Jeb Bush and his cabinet amended Rule 28-20.100 in 1999 to provide a revised work plan and schedule to carry out the Comprehensive Plan and implement the Cesspool Identification and Elimination Program. Pertinent elements of revised Rule 28-20.100 as it relates to wastewater and the Master Plan are summarized below.

- Accelerate the pace and increase the effectiveness of the cesspool replacement effort through both a regulatory and an incentive-based program
- Establish one priority "Hot Spot" in each Rate of Growth Ordinance (ROGO) area of the Keys (Upper, Middle, Lower), and initiate planning, design, and construction of these community wastewater systems so that each system will begin operating by July 12, 2003
- After these three community wastewater systems in the priority "Hot Spots" become operational, continue implementation of the Master Plan, maintaining an emphasis on "Hot Spots"
- Initiate cesspool identification and elimination outside of the "Hot Spot" areas; elimination of all cesspools outside of "Hot Spots" shall be complete by July 12, 2003

Subsequently, Monroe County rescinded their original Ordinance 03-1997, and adopted a new cesspool identification and elimination ordinance, Ordinance 031-1999, which complies with the guidelines of the revised Work Program. In this new ordinance, the term "Hot Spots" was defined as areas that will receive a community wastewater collection and treat-

[4]Monroe County Florida Board of County Commissioners. *Monroe County Year 2010 Comprehensive Plan*. Adopted by Monroe County Board of County Commissioners April 15, 1993. Amended January 4, 1996. Adopted by the Department of Community Affairs and the Administration Commission of the State of Florida, Part I, January 2, 1996, and Part II, July 17, 1997.
[5]Governor's Executive Order 98-309; issued by Governor Buddy MacKay; Tallahassee, Florida; 1998.
[6]Monroe County, Florida Board of County Commissioners. *Monroe County Year 2010 Comprehensive Plan Policy Document*. Amended January 4, 1996.

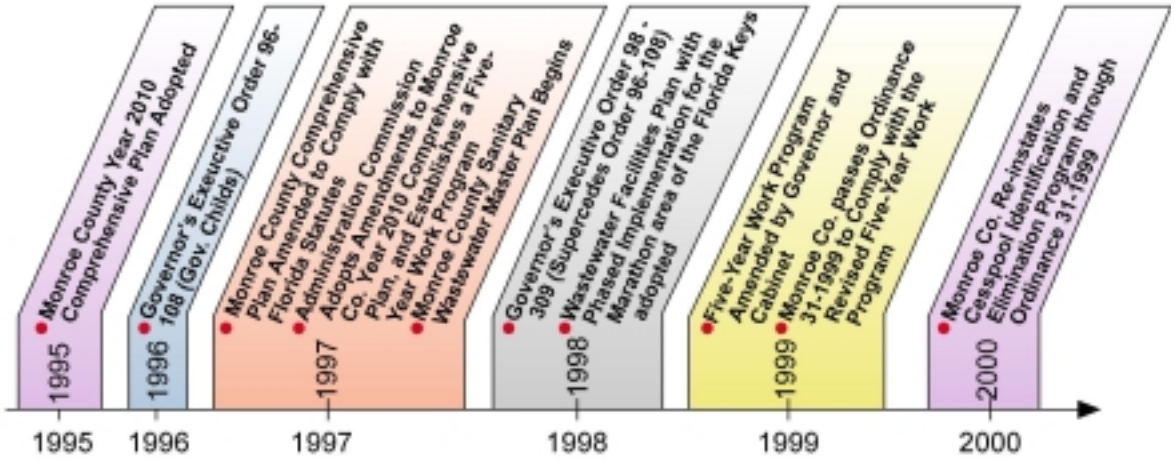


EXHIBIT 1-6
Recent Chronology of Monroe County's Wastewater System Development

ment system within the next 10 years or by the year 2010. Exhibit 1-6 presents a timeline of relevant decisions related to the Master Plan.

1.6 Treatment Standards—Basis for Costs and Recommendations

As a result of the demonstrated effects of wastewater nutrients on the decline of water quality, the *Year 2010 Comprehensive Plan* stated as one of its goals that wastewater treatment facilities would meet either advanced wastewater treatment (AWT) standards, or best available technology (BAT) standards; the standards are defined in Exhibit 1-7.

In further support of this goal, the 1999 Florida Legislature set statutory effluent standards for wastewater treatment systems in Monroe County. Exhibit 1-8 presents these standards for onsite and community wastewater systems, in terms of biological oxygen demand, total suspended solids, total nitrogen, and total phosphorus.

The 1999 Florida Legislature and the Five-Year Work Program also established compliance schedules, as presented in Exhibit 1-9.

The recommendations presented in this Master Plan were developed with the intent of meeting these revised statutory effluent standards and compliance schedules set by the Florida Legislature, both for onsite facilities, as well as for community wastewater collection and treatment systems.

1.7 Cost Estimates

Capital and operation and maintenance (O&M) costs have been estimated for each of the alternative systems evaluated in this Master Plan. Capital cost estimates presented are order-of-magnitude estimates, as defined by the American Association of Cost Engineers, and reflect September 1998 costs.[7]

	mg/L	
	AWT	BAT
Biological Oxygen Demand (BOD)	5	10
Total Suspended Solids (TSS)	5	10
Total Nitrogen (TN)	3	10
Total Phosphorus (TP)	1	1

EXHIBIT 1-7
The Monroe County Year 2010 Comprehensive Plan mandates that all wastewater facilities meet AWT or BAT standards.

[7] The September 1998 cost estimates correspond to the industry trade journal *Engineering News Record* Construction Cost Index of 5,963. These estimates are believed to be accurate within a range of 30 percent below, to 50 percent above, actual costs. Actual costs for any given system would depend on multiple factors, including, but not limited to, actual labor and material costs, market conditions, project scope, and implementation schedule. Unless stated otherwise, capital costs include a 20-percent allowance for contingencies.

EXHIBIT 1-8
Florida Statutory Treatment Standards

	mg/L			
	BOD	**TSS**	**TN**	**TP**
Onsite Systems (BAT)	10	10	10	1
Community Wastewater Collection and Treatment Systems				
Design flows less than or equal to 100,000 gpd (BAT)	10	10	10	1
Design flows greater than 100,000 gpd (AWT)	5	5	3	1

Unless otherwise noted, capital costs include a 20-percent contingency and include all construction costs, including the costs to decommission existing onsite systems and the costs of new building sewers on private property from the house or building to the street. Capital costs also include all engineering, construction administration and inspection, land acquisition, legal fees, and financing charges.

O&M costs are based on unit costs for power, chemicals, and labor deemed appropriate for the Florida Keys, based on historic cost data. These are also order-of-magnitude estimates, and are believed to be accurate within the same range as the capital cost estimates; they include a 20-percent allowance for contingencies.

All cost estimates were prepared by professional cost estimators using standard cost estimating procedures that comply with accepted engineering practice, under the supervision of a professional engineer registered in Florida.

1.8 Master Plan Organization

As the Master Plan was developed, the process was documented in a series of deliverables, including technical memoranda, reports, and analyses, a list of which is provided in Appendix A in Volume 2 of this Master Plan. The referenced deliverables provide additional technical details on the material and conclusions presented in this Master Plan, and are contained in Volumes 3 through 8, *Supporting Documents* of this Master Plan. A copy of these *Supporting Documents* can be reviewed at the Monroe County Marine Resources Department in Marathon, or in any of the Monroe County libraries. All appendices referenced throughout this Master Plan are contained in Volume 2.

★★★★★★

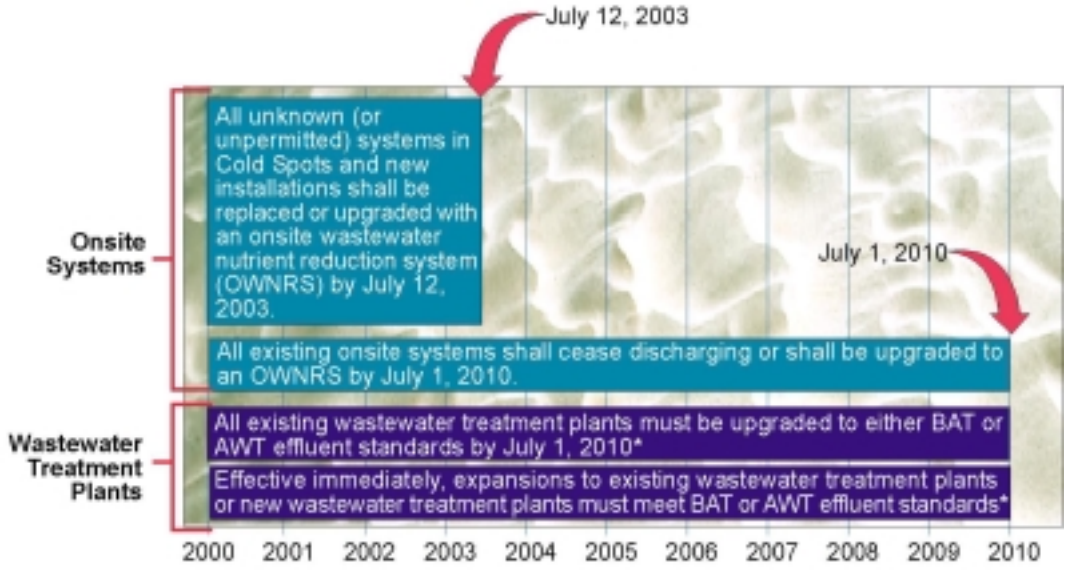


EXHIBIT 1-9
Compliance Schedule for Wastewater Treatment Systems in Monroe County

Chapter 2
Public Involvement Approach

The public involvement program for the Monroe County *Sanitary Wastewater Master Plan* (Master Plan) enabled the project team to gain a comprehensive understanding of community concerns, and to develop a plan that would meet the public's needs, and ultimately, gain the support of the community and the Board of County Commissioners (BOCC). The public involvement program also provided key stakeholders and interested citizens with the opportunity to participate in, and influence, the outcome of the Master Plan.

2.1 Public Involvement Activities

There were numerous public involvement efforts outlined as part of the Master Plan, and they included:

- Public forums and workshops
- Meetings with civic, business, and environmental groups throughout the Keys
- Production and distribution of project fact sheets and brochures
- Media coordination
- Production of two videos
- Development of a project web site

Interaction with the public throughout the project has significantly helped to shape the contents of this Master Plan. Interested citizens and key stakeholders directly influenced the development of the decision models and evaluation processes, identified key issues to be addressed, and defined the elements of what they believed would be an acceptable sanitary

wastewater master plan. Throughout the process, citizens clearly stated that cost was the most critical issue. Secondly, there were several concerns raised by stakeholders regarding the effectiveness and reliability of the chosen wastewater alternatives. Finally, County residents demanded that issues related to potential "double-pay" be addressed.[8] This section summarizes the results of the public outreach program and citizen input.

2.1.1 Public Forums and Workshops

The purpose of holding public forums was to share information about the project and provide an opportunity for meaningful public input into the Master Plan. The initial public forums were held in the Upper, Middle, and Lower Keys on January 26-28, 1998. Methods used to promote and inform the public about the forums included announcements at related meetings, press releases to the media, and mailings to known stakeholders.

A total of 38 members of the public and six members of the media attended the public forums. A list of attendees is presented in Exhibit B-1 located in Appendix B, Volume 2. A report summarizing the forum attendees and each of the topics discussed was prepared and submitted to the County in May of 1998, and is included in Volume 3, *Supporting Documents*.

During the public forums, participants expressed concerns about cost, improved water quality, implementation approaches, alternative technologies, measuring performance, response to public input, public education, and the need for demonstration projects.

A draft of the Master Plan was made available to the public in March 2000, and additional public forums to discuss Master Plan recommendations were held in April and May 2000. These forums provided an opportunity for public questions and comments about the Master Plan recommendations. A report summarizing the forum attendees and each of the topics discussed is included in Volume 3, *Supporting Documents*.

Questions from these latter forums included:

- Could "Cold Spot" areas be designated for community collection systems in addition to the "Hot Spot" areas?
- How would costs for homeowners be derived?
- Could homeowners in "Cold Spot" areas be notified early so that they could begin preparing for replacement or upgrade costs?

Overall, participants were in favor of the recommendations outlined in the Master Plan.

2.1.2 Civic/Business/Environmental Groups Stakeholder Meetings

A number of individuals representing civic, business, and environmental groups were identified at the start of the project and were contacted to attend stakeholder meetings, which were scheduled over a series of four 1-week periods between September 11, 1997, and March 19, 1998. A total of 32 meetings were held and a total of 44 stakeholders participated. A summary report was prepared and submitted to the County in May 1998, and is included in Volume 3, *Supporting Documents*. A complete list of those participating and the organizations they represent can be found in Exhibit B-2, located in Appendix B, Volume 2.

Key issues raised by the individuals who attended these meetings were the decline in water quality, coordination of cesspit replacements, treatment alternatives, costs, increased growth potential, and public health.

Additional meetings were held with 25 stakeholders from Civic/Business/Environmental Groups during December 1999. A list of those who participated in these meetings is included in Exhibit B-3 in Appendix B, Volume 2. Almost 200 people participated in meetings conducted between March 1998 and July 1999. A list of attendees is presented in Exhibit B-4, Appendix B, Volume 2.

[8]Double pay refers to residents having to pay for an upgrade of an onsite system to a nutrient reduction system, and then paying again to connect to the sewer system when central sewers are completed.

EXHIBIT 2-1
Fact sheets describing components of the *Sanitary Wastewater Master Plan* were produced and made available to the public.

In addition, presentations on recommended solutions were given to members of the Marathon Chamber of Commerce, the Lower Keys Property Owners Association, the Key Largo Chamber of Commerce, the Upper Keys Rotary, the Key Largo Residential Property Owners Association, and the Big Pine Civic Association between November 1999 and April 2000. Approximately 300 people participated in these meetings. A report summarizing the stakeholder meetings held with Civic/Business/Environmental Groups since April 1998 is included in Volume 3, *Supporting Documents*.

2.1.3 Rack Cards/Information Booklets

Three, two-page fact sheets were produced and distributed in January of 1998, as shown in Exhibit 2-1. Detailed brochures (rack cards) intended to convey key project milestones and recommendations of the Master Plan were also prepared, as shown in Exhibit 2-2. The first of the three rack cards, which described the decision-making process used throughout development of this Master Plan, was completed in August 1999 and distributed throughout the Keys via mailings and by hand (a copy is included in Volume 3, *Supporting Documents*). Extra copies have been made available to the public in libraries, utility offices, government agencies, chambers of commerce, and other places to which residents have access. The remaining two rack cards summarize the Master Plan recommendations, "Community and Regional Wastewater Systems for Your Neighborhood"

EXHIBIT 2-2
Rack cards describing key project milestones and recommendations of the *Sanitary Wastwater Master Plan* were produced and made available to the public.

EXHIBIT 2-3
Two project videos were produced to describe the program to the public.

and "Addressing Your Environmental and Financial Concerns". These two rack cards were distributed throughout the Keys via mailings and by hand; they were also distributed at the public forums held in April and May 2000.

2.1.4 Media Activities

Media training was conducted in November 1997 for County staff and project team members to develop and finalize key messages and to prepare the team for potential inquiries from the media. A media library of local newspaper articles and newsletters from various organizations concerning the Master Plan has been maintained throughout the project. Lists of stakeholders and the media were developed for comprehensive mailings of press releases, articles, and rack cards.

Press releases were distributed to the media in January 1998, April 1998, October 1998, and August 1999, and contained information on non-water carriage toilets, as well as announcements about the public forums, BOCC meetings, and Sanitary Wastewater Master Plan Technical Advisory Committee (SWMP TAC) meetings. Several meetings were held with reporters, including a meeting in March 1999, which resulted in positive articles that appeared in April 1999.

Radio talk shows were initially identified and prioritized for use during the project. Appearances were made on December 9, 1997, January 22, 1998, and in August 1999 on the US 1 *Radio Morning Show*. Project team members have appeared on local television programs and have answered caller questions during live tapings. These shows include *June Girard's County Line* show on October 13, 1999, and Tom Shumaker's *Live at Five Keynoter* show on December 8, 1999.

2.1.5 Project Videos

A short project video was completed in June 1998, and distributed to the County, SWMP TAC members, and to Channel 16 for regular airing. The video was aired weekdays at 5:00 p.m. from July 1998 until July 1999. A half-hour video program was filmed in December 1999 and was aired on Channel 5 and Channel 16 during April and May 2000.

2.1.6 Internet Connection

Exhibit 2-4 illustrates the web site developed for the Master Plan in April 1998. Regular updates have been made since its completion and will continue to be made until the project is completed. These updates include quarterly progress reports, press releases, presentations made to the BOCC, meeting schedules, and other project information. A contact form on the web site allows the public to communicate with the project team. The website address is: www.keyswastewater.org

2.1.7 Other Activities

In addition to these activities, members of the project team participated in a school-based outreach program at Pigeon Key's Envirothon for middle school students on April 30, 1998. Meetings with several teachers from local schools were held throughout the project.

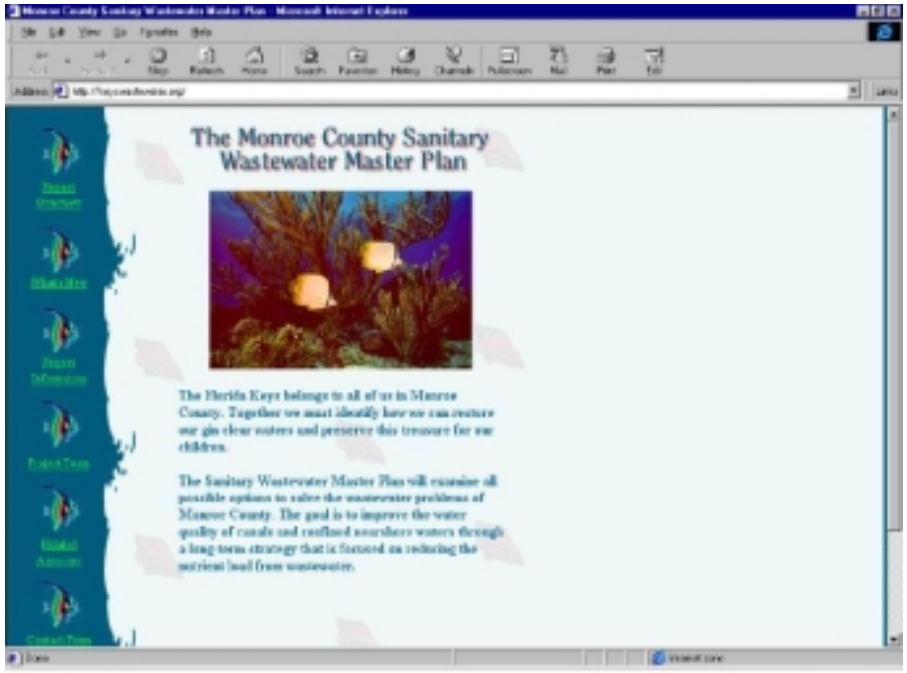


EXHIBIT 2-4
A web site developed for the Master Plan contains up-to-date milestones and information relevant to the project. The web site address is www.keyswastewater.org

A project library of related materials was established and contains materials produced for the Master Plan, as well as reference information that is pertinent to the project. These materials are cataloged and available for public viewing by contacting the Monroe County Department of Marine Resources.

2.2 Decision Models for Siting and Wastewater Management Alternatives

Prioritizing activities and making hard trade-offs between competing objectives is not an easy task. In assessing potential sites and different wastewater treatment management alternatives, the team evaluated several options that had multiple, competing objectives, and featured a wide range of costs, benefits, schedules, risks, and public acceptance.

To help evaluate these numerous wastewater management alternatives, and subsequent facility siting, a decision-making (or prioritization model) approach was developed. This approach incorporated technical information, as well as cost and schedule data, which were merged with the values and concerns expressed by key decisionmakers, stakeholders, and interested members of the public-at-large.

2.2.1 What a Decision Model Does

A decision model is an extremely useful tool that can be used to address complex issues, and thereby helps ease the decisionmaking process. The decision model provides many benefits, including:

- Helps people get their hands around complex technical issues
- Allows an "apples-to-apples" comparison of multiple alternatives
- Reflects key stakeholder concerns and issues
- Provides an objective, structured framework for evaluation
- Utilizes both technical input (i.e., net environmental impacts, costs, and performance estimates) and policy input (i.e., importance of achieving different performance goals)
- Defines the trade-offs between competing objectives
- Gets all the issues "out in the open"
- Ensures a comprehensive evaluation of all relevant performance criteria

There were two decision models developed for the Master Plan; one to screen potential land areas for possible facility siting, and the other to evaluate the wastewater management alternatives. The following description provides an overview of the development process for both models.

2.2.2 How the Decision Models Were Developed (Step-by-Step)

The Monroe County wastewater facilities siting and wastewater management alternatives decision models were developed through a joint, collaborative effort between SWMP TAC, Monroe

County Citizens Task Force on Wastewater (Task Force), and the BOCC. These parties were involved in each step of the process, and provided input and direction, and helped to shape the content of the model, including:

- Identifying and modifying performance criteria
- Expressing key goals and policy objectives
- Defining policy weights (expressing the relative importance of achieving each performance objective)
- Refining model elements leading to a final result

The decision models were also developed through consultation with representatives of the community-at-large, and reflect community needs and concerns, and therefore help to evaluate alternatives that most closely reflect a true combination of stakeholder concerns and technical realities. A series of subsequent meetings with citizen groups were held to review and update the model based on comments received from the public.

An overview of this process is presented in Exhibit 2-5. A more detailed process description can be found in the minutes from the Siting and Wastewater Management Alternatives decision model meetings, located in Volume 3, *Supporting Documents*.

As presented in Exhibit 2-5, the result of the decision model is a ranked list of sites or alternatives with associated benefits and cost estimates. The process allows sites or alternatives to be evaluated against a common framework so that they can be compared more easily, while considering both budget and schedule constraints. Based on this evaluation, sites can be ranked, and an alternative can be recommended. This process also provides insight into what factors most influenced the overall decision. Using these results, decisionmakers can establish "what if" queries by testing different performance assumptions. This allows them to identify unknowns, and avoids making costly decisions for unnecessary expenditures that are typically the result of uninformed decisionmaking.

2.2.3 Siting Decision Model

The siting decision model presented in Exhibit 2-6 resembles an organization chart, and was developed by the stakeholder groups during the public meetings described earlier. It is broken down into three levels. At the top level is the principal project objective of maximizing facility siting benefits. The second level lists a series of key issues that were identified by the stakeholder groups as being important to address, such as Maximizing Beneficial Land Use Characteristics, Maximizing Public Acceptance, Minimizing Environmental Impacts, and Minimizing Cost.

The third level presents a series of performance criteria that measure how well a siting alternative accomplishes the program objective. The numbers in parentheses reflect the weight, or importance, given to each criterion by the stakeholder groups. The higher the number, the more important that criterion is in the evaluation. The graphic demonstrates that stakeholders ranked Maximizing Public

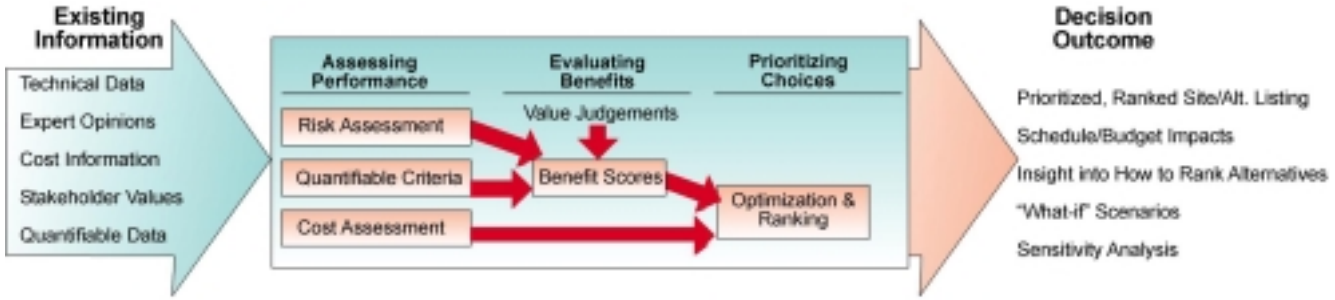


EXHIBIT 2-5
Siting/Wastewater Management Alternatives Decision Process

Acceptance the highest (total score of 210), measured primarily by effects on residential land use. Minimizing costs received the second highest ranking (total score of 80).

2.2.4 Wastewater Management Alternatives Decision Model

In evaluating wastewater management alternatives for Monroe County, decision-makers needed to consider multiple issues, including: cost, technical feasibility, performance, environmental impacts, potential for service disruption, reliability, and implementation. In addition, each management alternative brings with it a host of strengths and weaknesses that must be evaluated fairly and objectively. Finally, there are a series of policy concerns and differences of opinion throughout the stakeholder community, and decisionmakers must also attempt to help resolve these as best as possible.

Like the siting decision model, the evaluation model presented in Exhibit 2-7 resembles a company organization chart. The first level lists the principal objective of maximizing the benefits of the wastewater management alternative. The second level lists a series of issues that stakeholders have identified as being important to address, such as:

- Minimizing Cost
- Maximizing Implementability
- Maximizing Environmental Benefits
- Minimizing Secondary Impacts
- Maximizing Reliability

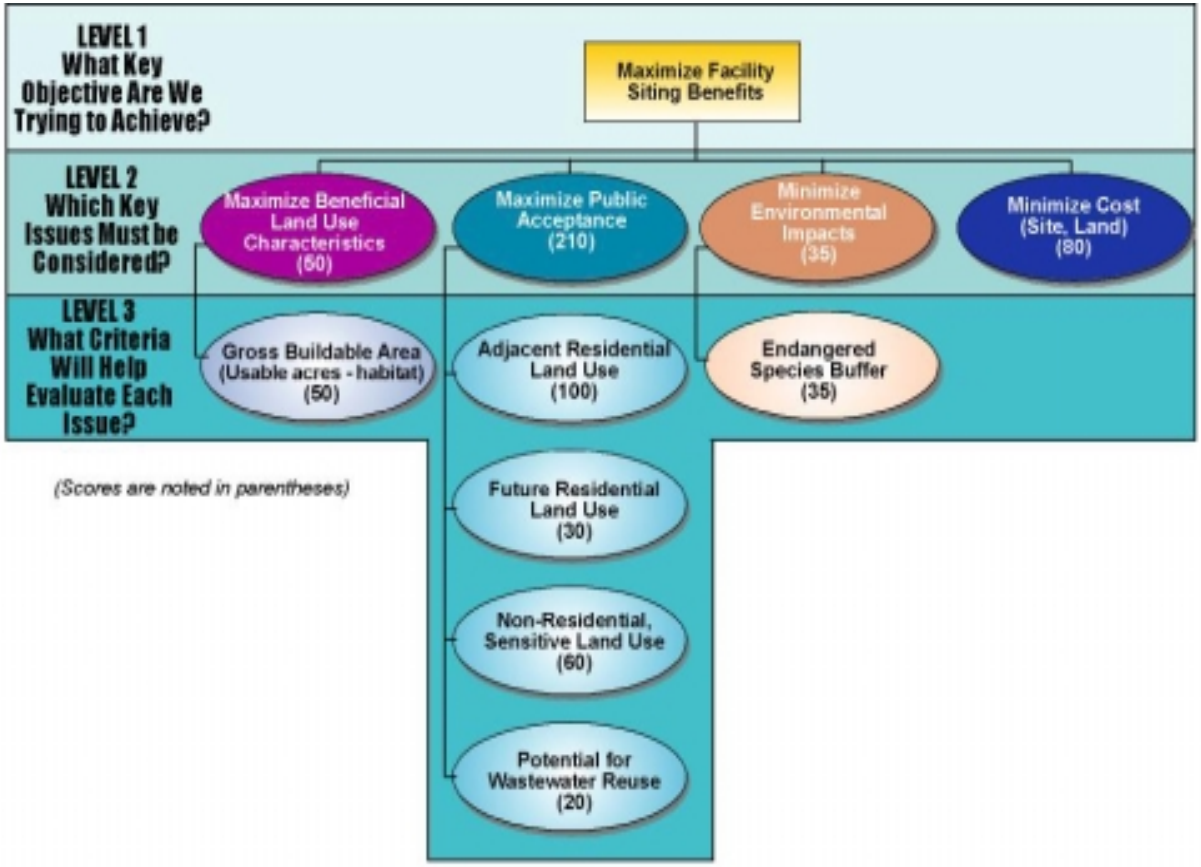


EXHIBIT 2-6
The decisionmaking process for facility siting alternatives ranked "Maximizing Public Acceptance" highest, with a score of 210.

The third level lists the performance criteria that measure how well each wastewater management alternative meets the program objective. As demonstrated in Exhibit 2-7, the combined score (214) of the environmental performance criterion is highest, therefore Maximizing Environmental Benefits is the key issue to be considered in the evaluation of wastewater management alternatives. With a score of 187, Minimizing Costs, was the next most important issue.

★★★★★★

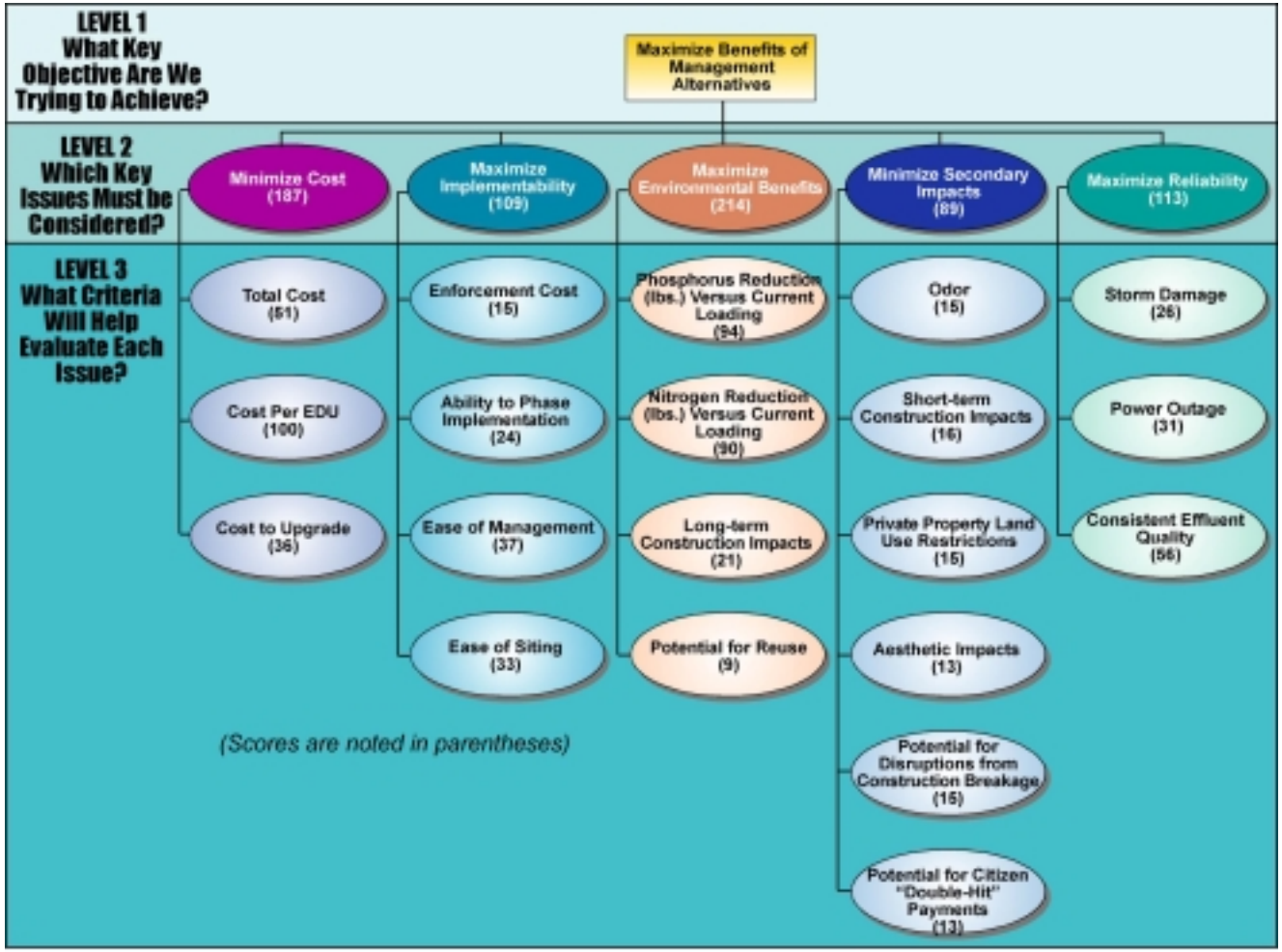


EXHIBIT 2-7
The decisionmaking process for wastewater management alternatives ranked "Maximizing Environmental Benefits" highest, with a score of 214.

Chapter 3 Wastewater Treatment System Evaluation

Modern wastewater collection and treatment systems typically include a number of interconnected processes. Wastewater flushed from homes, businesses, industrial facilities, and institutions drains into a network of below ground pipes, or sewers, which comprise the collection system. In a community or regional system, the collection system transports the wastewater to a treatment plant, where in a series of treatment processes, pollutants are removed from the wastewater and the wastewater is then disinfected, so that it can be safely released into the environment. An alternative to a community or regional system is an onsite wastewater treatment system (OWTS), which treats and disposes of wastewater at, or very near, the site of wastewater generation. OWTS are used at individual homes, small groups of homes, and commercial establishments that are not served by central sewer systems. OWTS serve approximately 25 percent of the U.S. population, and approximately 37 percent of new residential development.[9]

3.1 Existing Wastewater Treatment Facilities in the Keys

Except for the Cities of Key West and Key Colony Beach where regional wastewater systems are in operation, development of wastewater facilities throughout most of Monroe County has occurred with little forethought of regional wastewater planning. Without access to any regional wastewater utilities, each developer or homeowner has had to construct private onsite or package wastewater treatment facilities to serve their development or home. These conditions have resulted in the present mix of approxi-

[9]U.S. Environmental Protection Agency, 1997. Response to Congress on the Use of Decentralized Wastewater Treatment Systems. EPA 832-R-97-001b. Office of Water, Washington, D.C.

EXHIBIT 3-1
Onsite systems and package plants such as these are the present method of wastewater treatment in the Keys.

mately 23,000 onsite systems and 246 small wastewater treatment plants (WWTPs) throughout the Keys, as illustrated in Exhibit 3-2.

3.1.1 FDEP-Permitted Wastewater Treatment Plants

The 246 small WWTPs are permitted by the Florida Department of Environmental Protection (FDEP), and typically serve larger, single developments, such as motels, restaurants, or campgrounds. Generally, each development has constructed, operated, and maintained its own WWTP. In some isolated cases, however, two or more developments share one WWTP. The locations of the 246 FDEP-permitted WWTPs in the Master Plan planning area in 1998 are provided in Exhibit C-1 in Appendix C in Volume 2. All 246 WWTPs were evaluated with respect to their physical condition, capacity, flows, potential to provide continued long-term service, and their potential for expansion or effluent reuse. Exhibit C-2 in Appendix C summarizes these facilities, and a detailed discussion is provided in Technical Memorandum No. 5 in Volume 4, *Supporting Documents*.

These existing WWTPs provide conventional secondary treatment, however none of the plants are designed for nutrient (nitrogen [N] and phosphorus [P]) removal. Only five of the plants are equipped with filtration facilities to produce irrigation quality water. Physical plant and site constraints at most of these plants severely limit the potential to either expand them or upgrade them with advanced treatment processes to meet more stringent effluent standards.

The five largest WWTPs within the planning area in Monroe County have a combined total permitted capacity of 1.75 million gallons per day (mgd), and comprise 35 percent of the total permitted treatment capacity of the entire study area, as summarized in Exhibit 3-3. These five large plants were evaluated for their potential to serve as regional or subregional wastewater treatment facilities. The results of this evaluation are discussed below.

Key Haven WWTP and the Monroe County Detention Center WWTP: These facilities have little or no excess capacity and limited potential for expansion of their service areas.

Key West Resort Utility WWTP: This plant has adequate capacity to serve all of unincorporated Stock Island without any further expansions.

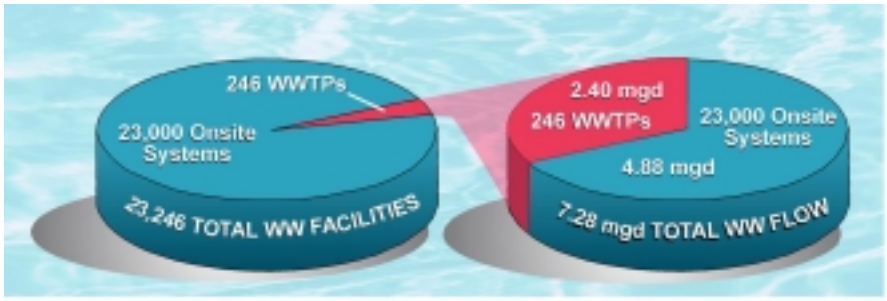


EXHIBIT 3-2
The 246 WWTPs contribute approximately 1/3 or 2.40 mgd of the wastewater flow generated in the Keys.

EXHIBIT 3-3
Capacity of the Five Largest Existing WWTPs in the Study Area

WWTP	Permitted Capacity (mgd)
Key Haven Utility	0.200
Monroe County Detention Center[1]	0.105
Key West Resort Utilities	0.499
U.S. Naval Air Station	0.400
Ocean Reef Club	0.550
	1.754

[1]This facility is within the City of Key West, but has been included as part of this Master Plan because it is owned and maintained by Monroe County.

U.S. Naval Air Station WWTP, Boca Chica: This plant should be capable of continuing to provide long-term treatment for the Naval Air Station, and is expected to have excess capacity. There are large areas of vacant land adjacent to this facility that could be used for expansion of the plant, if necessary.

Ocean Reef Club WWTP: This plant has adequate excess capacity to serve the Ocean Reef Club and Anglers Club developments through their buildout, with 0.19 mgd excess capacity in reserve and adjacent land area available for expansion.

The remaining 241 WWTPs, with a few exceptions, should be capable of providing secondary treatment throughout the 20-year planning period of this Master Plan, provided they are adequately maintained and equipment is replaced as needed. However, the expansion potential of these facilities is generally poor because most of them have limited land available for additional facilities. The potential for using these plants for regional wastewater treatment is limited to providing continued service to an existing, or slightly expanded, service area.

3.1.2 Existing Wastewater Collection Systems

Although the existing wastewater collection systems are not adequate for regional wastewater transmission, they could be used to provide source collection and transmission to a regional collection system. These collection systems and lift stations would most likely remain under private ownership because upgrading these facilities to standards required for a regional utility would be costly. Improvements to reduce collection system infiltration and inflow would be required for some systems, and most of the master lift stations would need to be upgraded before they could be connected to a regional system.

3.1.3 Current Solids Handling Practices

Most wastewater sludge and septic waste generated in the Keys is currently hauled to one of three transfer facilities located on Cudjoe Key, Long Key, and Key Largo. From these transfer stations, sludge and septic waste is hauled to a regional wastewater treatment facility in Miami-Dade County for treatment.

3.1.4 Current Effluent Disposal Practices

The primary method of disposing treated effluent from the WWTPs in the Keys is the shallow (Class V) injection well, illustrated in Exhibit 3-4. Current FDEP rules require these wells to be drilled to a depth of 90 feet and cased to 60 feet, however many of the injection wells are less than 90 feet deep, and many have shallow casings, or are entirely uncased, which increases the possibility of effluent leakage. FDEP is requiring many of these non-complying wells to be replaced prior to issuing new permits for the facilities.

3.1.5 Wastewater Reuse

Wastewater reuse is not widespread because of the cost associated with additional facilities, such as filtration, irrigation system, monitoring, etc., and the limited availability of suitable areas to irrigate. Of the 246 WWTPs in the planning area, only seven were using some form of reuse in 1998. The KW Resort Utility (Study Area 1), Eastwind Apartment

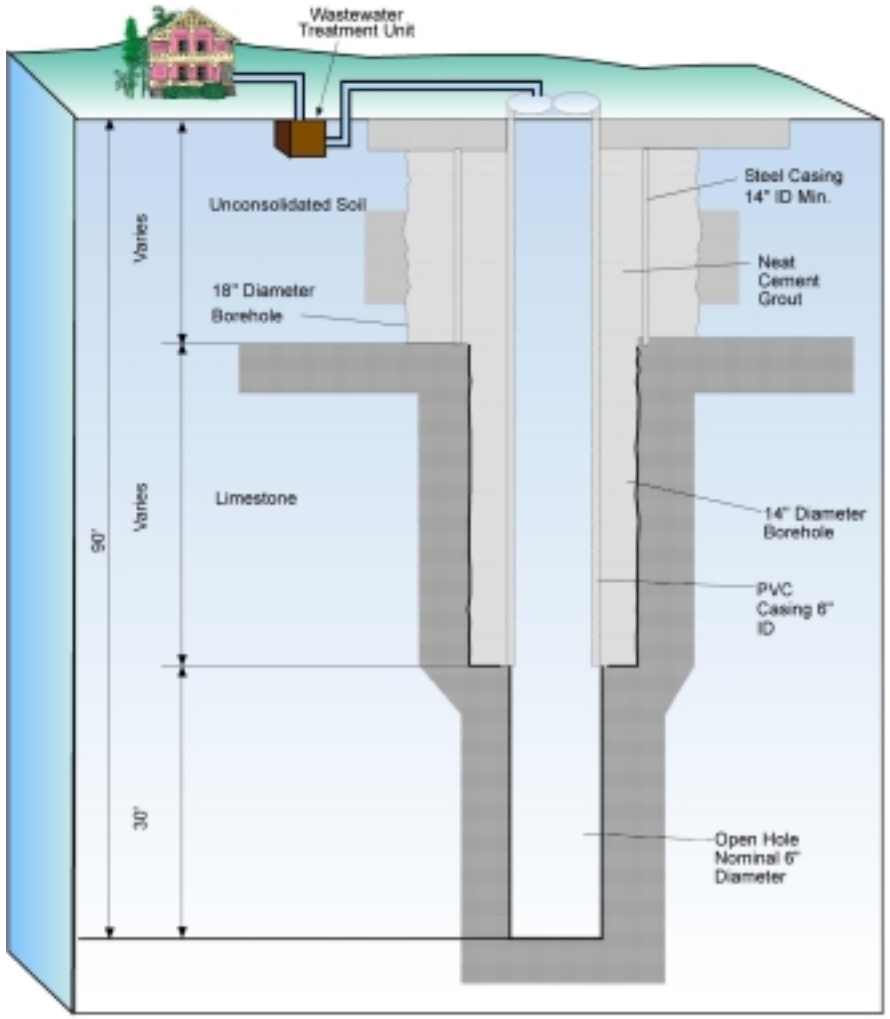


EXHIBIT 3-4
Typical Class V Shallow Injection Well

EXHIBIT 3-5
KW Resort Utility uses golf course spray irrigation for effluent disposal.

(Study Area 13), and Cheeca Lodge (Study Area 17) plants utilized golf course spray irrigation as a primary means of effluent disposal. Approximately 90 percent of the effluent produced by the Monroe County Detention Center WWTP is reused for toilet flushing, and a small amount is used for landscape irrigation. A small percentage of effluent produced by the Hawks Cay WWTP (Study Area 14) is reused for landscape irrigation. The two remaining WWTPs practicing reuse in 1998 were small plants that feature a subsurface drip irrigation system. Subsurface drip irrigation is the only reuse method permitted by FDEP for plants under 0.10 mgd capacity, which include 241 of the 246 WWTPs in the planning area.

3.2 Existing and Projected Wastewater Flows and Customers

Wastewater flow and customer projections were developed from the Florida Keys Aqueduct Authority (FKAA) water use records for each of the 27 Master Plan study areas for the baseline year (1998) and for the 10-year and 20-year planning horizons, 2008 and 2018, respectively. (See Exhibits 3-6, 3-7, and 3-8.) Wastewater flows were divided into residential and

EXHIBIT 3-6
Total Estimated 1998 Wastewater Flows

	mgd	EDU	gpd/EDU
Total Residential Flow	4.5985	31,847	145
Total Non-Residential Flow	2.5475	17,004	
Total Flow[1]	7.1460	48,851	

[1]Excludes small contribution from live-aboard flows.

EXHIBIT 3-7
Total Estimated 2008 Wastewater Flows

	mgd	EDU	gpd/EDU
Total Residential Flow	5.0183	34,613	145
Total Non-Residential Flow	2.6341	17,594	
Total Flow[1]	7.6524	52,207	

[1]Excludes small contribution from live-aboard flows.

EXHIBIT 3-8
Total Estimated 2018 Wastewater Flows

	mgd	EDU	gpd/EDU
Total Residential Flow	5.4208	37,343	145
Total Non-Residential Flow	2.7239	18,208	
Total Estimated Flow[1]	8.1447	55,511	

[1]Excludes small contribution from live-aboard flows.

non-residential components for each of these three flow tabulations. The equivalent dwelling units (EDUs) associated with each flow component were also estimated. Residential flow and EDU components were considered to be the FKAA customer classes of Residential Single Unit, Senior Citizens, and Residential Multi-Units. All other FKAA customer classes were considered to be non-residential. A separate summary of study area flows segregated by treatment method was developed, with separate flow totals provided for cesspools, substandard septic systems, permitted septic systems, aerobic treatment units (ATUs), and FDEP-permitted WWTPs.

In addition to the flow projections for land-based wastewater flows, estimates of 1998 wastewater flows from live-aboard boats in each study area were provided. A more detailed discussion of wastewater flow estimates and the methodology used to obtain these estimates can be found in Technical Memorandum No. 3 in Volume 3, *Supporting Documents*.

3.2.1 1998 Baseline Estimates

Estimated wastewater flows for the 1998 baseline year for the 27 study areas are summarized in Exhibit 3-6, with additional details provided by study area in Exhibit C-3 in Appendix C in Volume 2. The total wastewater flow in each study area was determined by summing the average daily water use within the study area boundaries, using records from the FKAA, geographical information system (GIS) maps, and the wastewater database. The assumption that wastewater flow is equal to water use was based on individual records for 50 developments with package WWTPs and readily identifiable FKAA water accounts, which indicated that the average ratio of wastewater generated to water used was 0.95.

3.2.2 2008 Projections

Flow projections for the 10-year planning horizon (2008) are summarized in Exhibit 3-7, and presented in detail by study area in Appendix C, Exhibit C-4 in Volume 2. Increases in residential EDUs between 1998 and 2008 were determined from historical Rate of Growth Ordinance (ROGO) allocations (by geographic distribution), estimated future ROGO allocations, and the number of future units in each study area that have development potential and were vested or exempt from ROGO. Future residential flow projections for the study areas were calculated by multiplying the increase in EDUs by the average flow per EDU within each study area. The total estimated

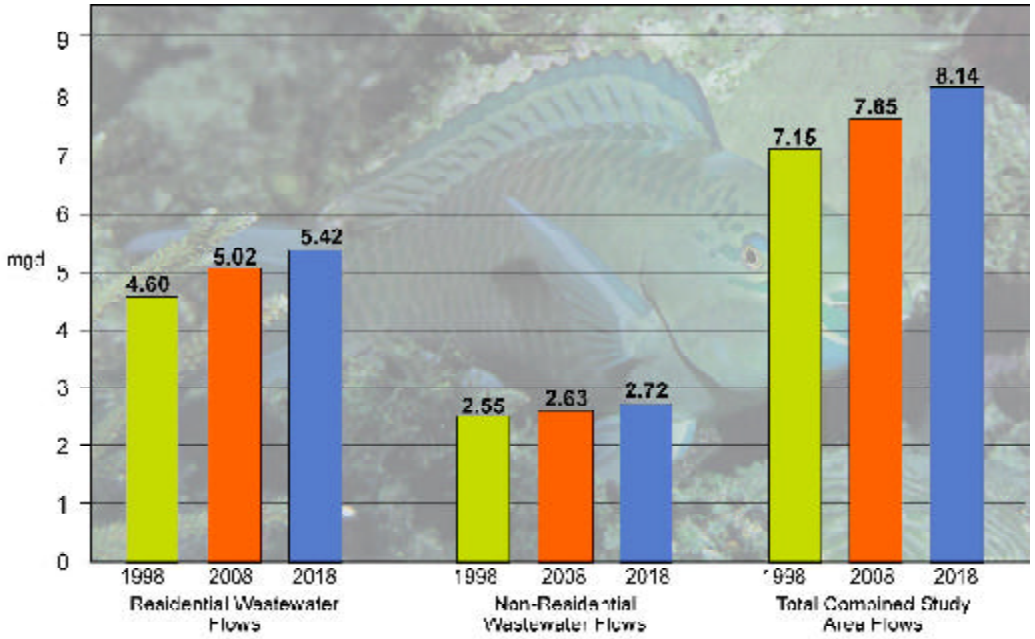


EXHIBIT 3-9
Projected Wastewater Flow Increases Over the 20-Year Planning Period

increase in residential wastewater flows in all 27 study areas for the 10-year planning period (from 1998 to Year 2008) is 0.42 mgd, or about 9 percent.

Increases in non-residential flows within the study areas were estimated by assuming that commercial development would resume in 1999 under the "Commercial ROGO" allocations described in the Monroe County *Year 2010 Comprehensive Plan*, and that this commercial growth would be distributed in proportion to residential growth. This is probably a "worst case" assumption, since a moratorium on all commercial development was in place at the time this Master Plan was prepared, and this moratorium may extend indefinitely in such development-sensitive areas as Big Pine Key. The total estimated increase in non-residential wastewater flows (both residential and non-residential) in all 27 study areas for the 10-year planning period (1998 to Year 2008) at Year 2008 is 0.087 mgd, or about 3 percent. This small increase is not significant with respect to regional wastewater planning. The estimated increase in total wastewater flow (both residential and non-residential) in all 27 study areas for the 10-year planning period (Year 2008) is 0.51 mgd, or about 7 percent.

3.2.3 2018 Projections

Projections of wastewater flows for the 20-year planning horizon (2018) are summarized in Exhibit 3-8, and detailed

EXHIBIT 3-10
Estimated Distribution of Wastewater Flow Treatment Methods

	No. of Systems[1]	Flow (mgd)
ATU	639	0.11
Septic	17,802	3.74
Sub-Std. Septic	1,847	0.41
Cesspool	2,770	0.62
Total Onsite	**23,058**	**4.88**
Total Unknown Systems[2]	7,200	
FDEP-Permitted WWTPs	246	2.40
Live-Aboards	1,589	0.04
Total Wastewater Flow		**7.32**

[1]Number of systems reported, which differs from number of EDUs.
[2]The unknown systems for each study area are included in the numbers of onsite treatment systems in preceding rows.

by study area in Exhibit C-5 in Appendix C in Volume 2. These flows and associated EDUs were estimated in the same manner as described above for the 2008 flow projections. The estimated increase in total wastewater flow in all 27 study areas for the latter 10-year planning period (2008 to 2018) is 0.49 mgd, or about 6 percent.

The estimated increase in total wastewater flow in all 27 study areas for the entire 20-year planning period (1998 to 2018) is 1.0 mgd, or about 14 percent. If the restrictions on development currently imposed by ROGO are changed significantly, these flow projections may need to be revised to reflect those changes. Exhibit 3-9 illustrates the increases in wastewater flows over the 20-year planning period.

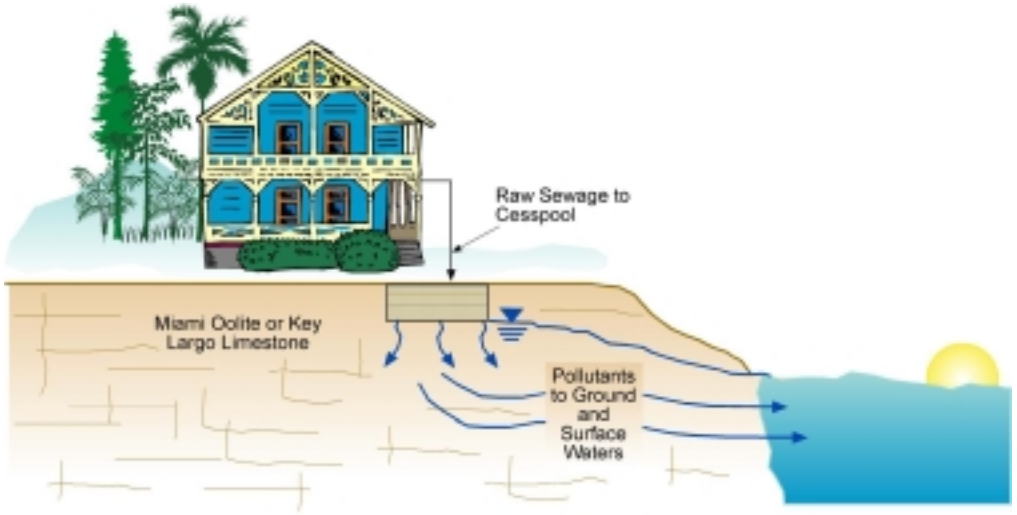


EXHIBIT 3-11
Early onsite wastewater systems in the Keys were cesspools or seepage pits, and provide little, if any, wastewater treatment.

3.2.4 Estimated Distribution of Wastewater Flow by Treatment Method

Within each study area, estimates were developed for total wastewater flows from each type of onsite system, FDEP-permitted WWTPs, and live-aboard boats. A summary of this flow distribution by treatment type or source is provided in Exhibit 3-10, and is detailed by study area in Exhibit C-6 in Appendix C in Volume 2.

3.3 Existing Onsite Wastewater Systems

OWTS are the predominant method of wastewater treatment in the Keys, with approximately 23,000 such systems currently in operation. The discussion that follows describes the various types of OWTS available, including cesspools, conventional OWTS, ATUs, and nutrient reduction systems.

3.3.1 Cesspools and Seepage Pits

Early onsite wastewater systems in the Keys consisted of a cesspool or a seepage pit, which is a large excavation in the ground lined with brick, stone, or block that allowed raw wastewater to seep into the natural rock or groundwater (Exhibit 3-11). Without a significant soil layer, little, if any, treatment of the wastewater occurs in the cesspool, especially if it intercepts groundwater. Pollutant removal is very limited, and nutrient levels approaching raw wastewater are being discharged to groundwater. Approximately 2,800 of these early cesspools are still in operation throughout the Florida Keys, and are a contributor to water quality degradation in the surrounding waters.

3.3.2 Conventional OWTS and Subsurface Wastewater Infiltration Systems

Modern, conventional OWTS are more sophisticated wastewater treatment systems, which, if properly constructed, operated, and maintained over their lifetime, can provide wastewater

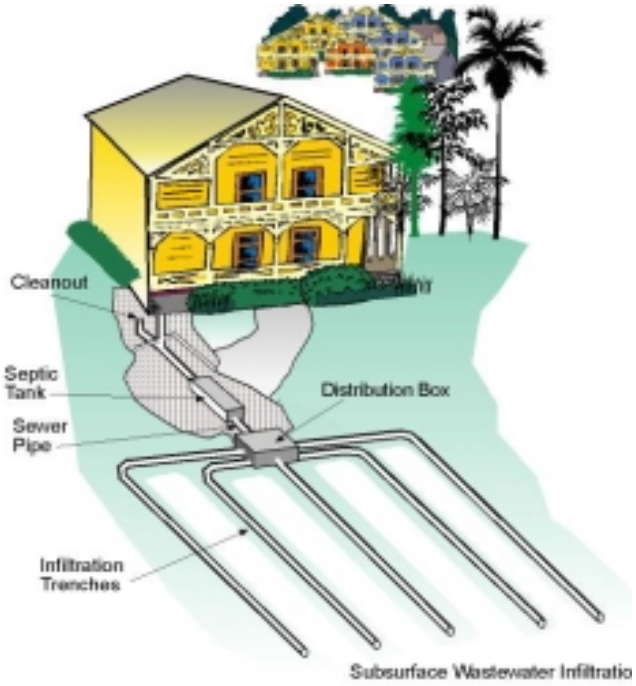


EXHIBIT 3-12
Conventional Septic Tank and Subsurface Wastewater Infiltration System

treatment performance that equals conventional centralized WWTPs. These conventional OWTS consist of a septic tank and a subsurface wastewater infiltration system (SWIS), or drainfield, and rely on naturally occurring soils to provide wastewater treatment (Exhibit 3-12). The drainfield and unsaturated underlying soils are the most critical components of the conventional OWTS and provide most of the treatment. The problem with installing OWTS in the Keys is that very little or no natural soil exists over the ancient coral/limestone rock, and soil must be imported to construct these systems. The limited soils in the Keys thus reduce the treatment effectiveness of these systems, especially for nutrients.

3.3.3 Aerobic Treatment Units

Because of the lack of soil in the Keys, the use of small aerobic biological treatment systems, known as ATUs, has become common, with 640 permitted ATU systems in operation in Monroe County. These systems are essentially miniature WWTPs, which function similarly to centralized wastewater treatment facilities. ATUs require less space than a conventional septic tank system, but also require an effluent disposal system because direct discharge of effluent to surface waters is not permitted in Monroe County. Effluent from these systems is discharged either to a drainfield or to a mineral aggregate filter, then to a shallow injection well, or borehole, drilled to a depth of 90 feet (Exhibit 3-13).

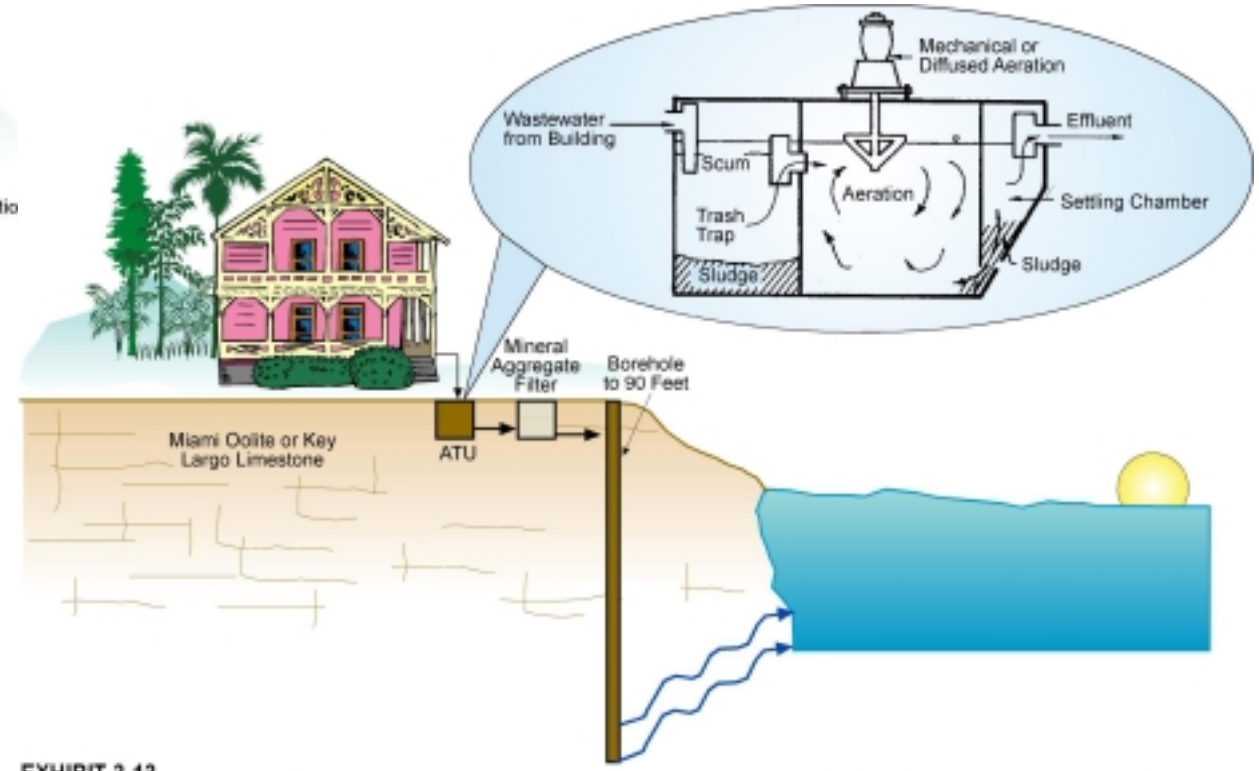


EXHIBIT 3-13
Small aerobic biological treatment units (ATUs) are common in the Keys, and function similarly to centralized secondary wastewater treatment facilities.

3.3.4 Alternative Onsite Wastewater Treatment Systems to Reduce Nutrients

The limitations of cesspits, conventional septic systems, and ATUs in meeting the nutrient removal goals set for the Keys have resulted in investigations into alternative feasible technologies for onsite wastewater treatment in the Florida Keys. Technical Memorandum No. 7 describes numerous OWTS alternatives in detail, and can be reviewed in Volume 4, *Supporting Documents*, of this Master Plan.

3.3.4.1 Recommended Onsite Wastewater Nutrient Reduction Systems

As described earlier in this Master Plan, recent legislation requires OWTS in the Keys to produce effluent that meets the following minimum levels of treatment, or Best Available Technology (BAT):

- **Carbonaceous Biochemical Oxygen Demand ($CBOD_5$) 10 mg/L**
- **Total Suspended Solids (TSS) 10 mg/L**
- **Total Nitrogen (TN), as N 10 mg/L**
- **Total Phosphorus (TP), as P 1 mg/L**

Onsite treatment systems that meet these criteria are referred to as Onsite Wastewater Nutrient Reduction Systems (OWNRS). Based on the results of an OWNRS Demonstration Project on Big Pine Key[10], a biological nitrogen removal system coupled with a physical/chemical phosphorus removal system and a subsurface drip irrigation (SDI) system is the recommended OWNRS combination for Monroe County (see Exhibit 3-14). By utilizing phosphorus adsorption media in the SDI beds, this system combination provides phosphorus adsorption, nutrient uptake by plants, and effluent disposal. For this system to meet the final $CBOD_5$, TSS, TN, and TP effluent limits of 10, 10, 10, 1, respectively, the biological nitrogen removal system (see Step 1 in Exhibit 3-14) must produce effluent quality of 20, 20, 15, 6 or better prior to discharge to the final step, the SDI system.

The OWNRS system described above requires a minimum land area of 400 square feet. For extremely small lots that do not have sufficient area for an SDI system, chemical dosing added to the effluent prior to its discharge to a shallow injection well may be a cost-effective option. However, the potential chemical hazards and routine chemical sludge disposal requirements make this alternative less desirable for individual home systems.

3.3.4.2 Converting OWTS to OWNRS

Little benefit could be gained from converting most of the existing conventional OWTS to OWNRS. Owners of OWTS who have relatively new septic tanks that are in good condition may be able to install an OWNRS that requires a septic tank for primary treatment. In this case, the exist-

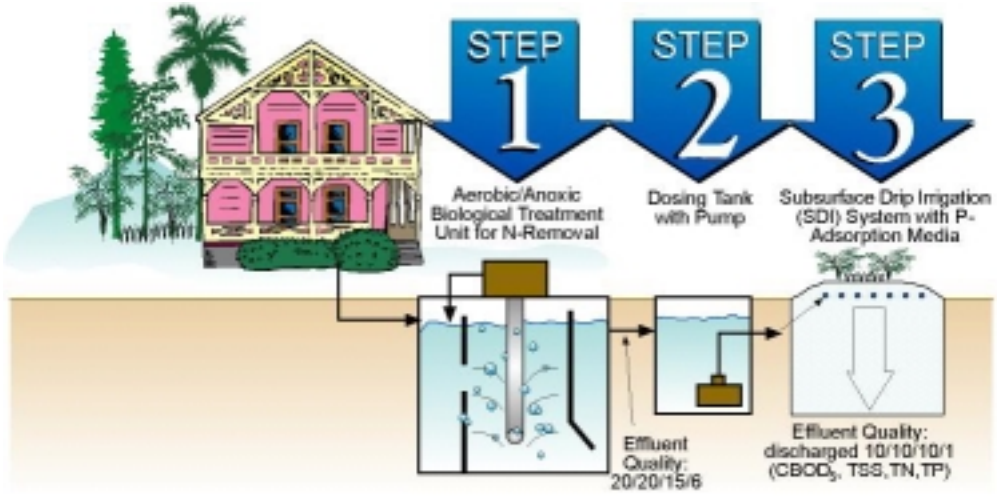


EXHIBIT 3-14
Onsite wastewater nutrient reduction systems (OWNRS) recommended for Monroe County remove nitrogen and phosphorus in a 3-step process.

[10]Ayres Associates. 1998. *Florida Keys Onsite Wastewater Nutrient Reduction Systems Demonstration Project*. Final Report to the Florida Department of Health.

EXHIBIT 3-15
Cost Evaluation of OWNRS and ATU Upgrade to BAT Standards

System	Description	Estimated Costs (1998 $) Per EDU							
		Capital Cost[1]	Cost to Decommission Existing Onsite System	Engineering and Administration[2]	Total Project Capital Cost	Annualized Capital Cost[3]	O&M Cost	Total Annual Cost	$/1000 gal.
New OWNRS • New Construction • Cesspool Replacement • Existing OWTS Upgrade	Nitrification/denitrification biological treatment system discharging to a SDI in phosphorus adsorption media. Effluent standard 10, 10, 10, 1	$11,412	$500	$3,000	$14,912	$1,300	$1,507[4,5]	$2,807	$15.38
ATU Conversion • Existing ATUs in good condition • ATU must nitrify	Existing nitrifying ATU converted to OWNRS by addition of internal recycle or ABF and SDI in phosphorus adsorption media	$8,592[6]	$500	$2,300	$11,392	$993	$1,869[7]	$2,862	$15.68

[1]Estimated capital costs include a 20% contingency for site conditions.
[2]At 27% of treatment system capital cost.
[3]Annualized cost based on 20-year amortization at 6% interest.
[4]Cost includes annual cost for engineered media replacement @ 10 years.
[5]O&M includes $200 for operating permit.
[6]From Technical Memorandum No. 7, p. 6-3 and Table D-1.
[7]O&M is ATU O&M ($1,000) plus additional O&M for ABF and SDI (Technical memorandum No. 7, p. 6-6 and Table D-1), less $200 for operation visits (already in ATU O&M), plus 20% contingency or $1,000 + ($841 - $200) 1.2 = $1,869.

ing septic tank would need to be pumped and inspected prior to its connection to the new OWNRS.

Existing establishments that own nitrifying ATUs and shallow injection wells that are in good condition might incorporate one or both of these components into the new OWNRS system, but this may not be an economical option. To accomplish this, an anoxic biofilter or an internal recycle loop would need to be added to the ATU. Also, a phosphorus removal system would need to be designed and constructed to meet the 10, 10, 10, 1 effluent limits. The feasibility and cost of this conversion option will be very site specific. In many cases, the cost and land requirements for these components may result in only marginal savings over installing a completely new OWNRS system.

3.3.4.3 Cost Evaluation for OWNRS Installation

Costs presented in this section are estimates for installing a new OWNRS system and for upgrading an existing ATU/shallow injection well system to the BAT (10, 10, 10, 1) effluent standards. Capital, operation and maintenance (O&M), and annual costs presented herein were used to compare wastewater alternatives for the various service areas in the Master

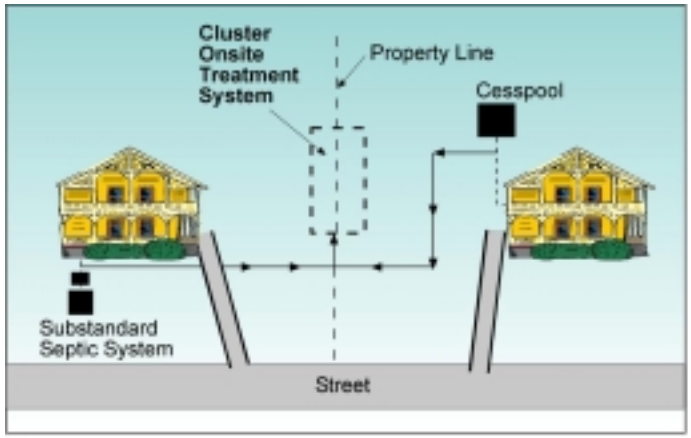


EXHIBIT 3-16
Shared cluster systems are two or more homes connected to an Onsite Wastewater Nutrient Reduction System (OWNRS).

Plan. These costs are presented in Exhibit 3-15 and are based on several assumptions that are described in Technical Memorandum No. 7, in Volume 4, *Supporting Documents*, of this Master Plan. Annual costs were based on a 20-year period at a 6-percent interest rate. The capital and O&M costs were combined to obtain a uniform annual cost to compare alternatives more easily. A unit cost, expressed in dollars per thousand gallons ($/1000 gallon) of treated wastewater capacity, is also provided in Exhibit 3-15, and was obtained by dividing the uniform annual cost by the annual wastewater volume, and is based on a 500-gallon per day (gpd) flow.

It should be noted that it may be misleading to evaluate installation costs of the OWNRS on a "cost per gallon of treatment" basis. This is because the treatment capacity of most commercially available OWNRS treatment units is 500 gpd, and they are capable of handling the flow from several EDUs (equivalent dwelling units). Therefore, if serving only one home, the annual cost per EDU will be significantly higher than if a utility operated an OWNRS that served multiple homes, where the costs would be distributed over more than one customer.

3.3.5 Cluster System Alternatives

An OWNRS that serves multiple homes is commonly referred to as a clustered OWNRS, or cluster system. Several cluster system alternatives were evaluated for use in the Keys, ranging in size from two homes sharing one treatment system, to a centralized system where more than 100 homes were connected to an OWNRS-type treatment facility via low pressure sewers.

Four large cluster systems were evaluated as an alternative to centralized sewers for areas that were somewhat more distant from the main population centers. These cluster areas were located on Upper Sugarloaf Key, Big Pine Key, Conch Key, and North Key Largo, and ranged in size from 41 to 102 homes. Details of these cluster system analyses can be found in Technical Memorandum No. 12 in Volume 5, *Supporting Documents*, of this Master Plan.

In addition to the four larger cluster systems, two types of smaller cluster systems that serve two to ten homes were also evaluated. "Shared" cluster systems refer to small clusters where the wastewater treatment unit is shared between homeowners, but is placed on one or more of the existing properties, such that relatively short runs of re-routed gravity building sewers could be used to connect to the treatment system. Exhibits 3-16 and 3-17 illustrate this concept.

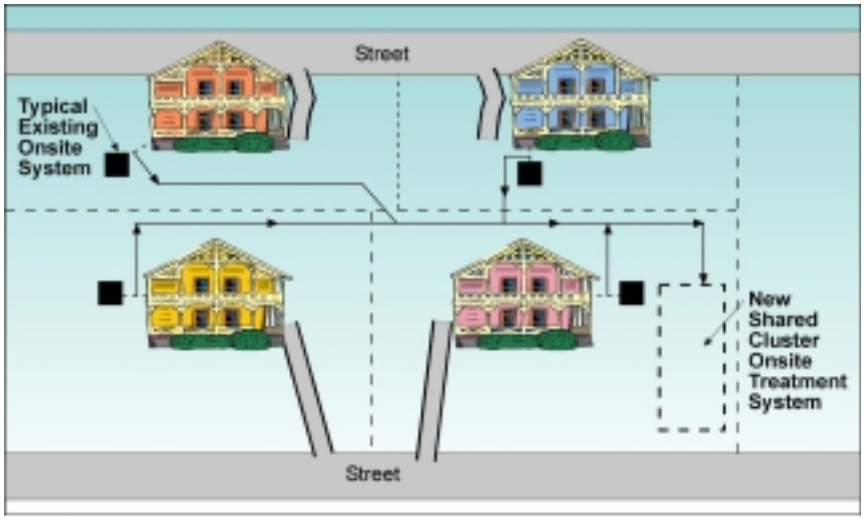


EXHIBIT 3-17
Up to four homes can be connected to a shared cluster system.

"Sewered" cluster systems refer to small clusters where the wastewater treatment system is placed on a separately purchased vacant lot and a low-pressure collection system is used to connect each home to the treatment system. Exhibit 3-18 illustrates this alternative. Descriptions of the six cluster system scenarios evaluated are provided below.

3.3.5.1 Two-Home Shared Cluster System

The two-home shared cluster system could be applied wherever two homes share a common property line, have an adequate, unobstructed area to install the OWNRS on one or both properties, and the two neighbors agree to share a common treatment system. The estimated total average daily flow (ADF) for the two homes could vary from 220 gpd to 400 gpd, depending on the specific area within the Keys. An average flow for two homes throughout the Keys is 290 gpd. A 500-gpd OWNRS would be adequate to serve this two-home cluster system. It was assumed that the flow from each house to the treatment unit would be through a gravity pipeline, and the existing building sewers would be re-routed to the treatment unit.

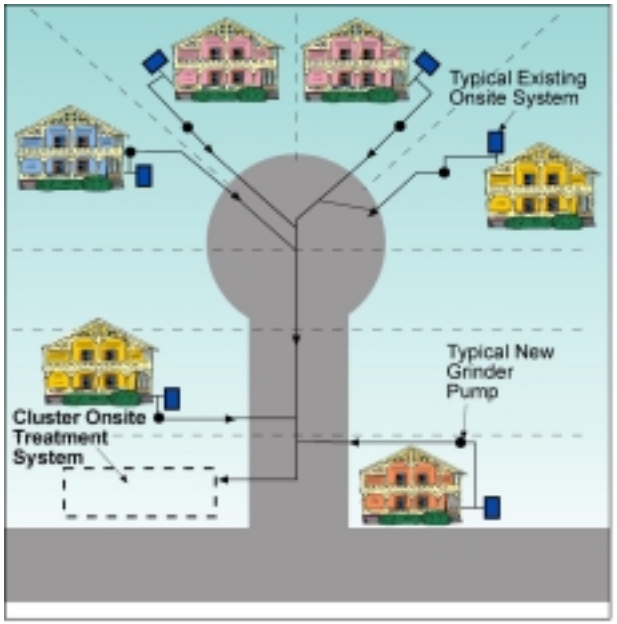


EXHIBIT 3-18
Multiple home cluster systems are connected by low pressure sewers and grinder pumps.

3.3.5.2 Three-Home Shared Cluster System

The three-home shared cluster system could be applied wherever three homes share common property lines, one or more property owners agree to have the treatment system on their property, and the three neighbors agree to share a common treatment system. The estimated total ADF for the three homes could vary from 330 gpd to 600 gpd, depending on the specific area within the Keys. An average flow for three homes throughout the Keys is 435 gpd. A 750-gpd OWNRS would be adequate to serve this three-home cluster system. It was assumed that flow from each house to the treatment unit would be through a gravity pipeline, and the existing building sewers would be re-routed to connect to the treatment unit.

3.3.5.3 Four-Home Shared Cluster System

The four-home shared cluster system could be applied wherever four homes share common property lines, one or more property owners agree to have the treatment system on their property, and the four neighbors agree to share a common treatment system. The estimated total ADF for the four homes could vary from 440 gpd to 800 gpd, depending on the specific area within the Keys. An average flow for four homes throughout the Keys is 580 gpm. A 900-gpd OWNRS would be adequate to serve this four-home cluster system. It was assumed that flow from each house to the treatment unit would be by a gravity pipeline, and the existing building sewers would be re-routed to the treatment unit.

3.3.5.4 Sewered Cluster System

Because "sewered" cluster system costs are very site specific, selected areas representative of islands that are distant from the more populated centers were used to evaluate these systems. Port Pine Heights on Big Pine Key was the selected area; the results are described in the following sections.

Three-Home Sewered Cluster System—Park Street and Gulf Boulevard, Port Pine Heights: The estimated ADF from the three homes is 396 gpd. A low-pressure collection system and a 900-gpd OWNRS was assumed adequate to serve this three-home cluster system; the treatment system would be located on a separate lot.

Five-Home Sewered Cluster System—Atlantic Street, Port Pine Heights: The estimated

ADF from the five homes is 660 gpd. A low-pressure collection system and a 900-gpd OWNRS was assumed adequate to serve this five-home cluster system; the treatment system would be located on a separate lot.

Ten-Home Sewered Cluster System—Blue Lagoon Street, Port Pine Heights: The estimated ADF from the ten homes is 1,320 gpd. A low-pressure collection system and a 2,000-gpd OWNRS was assumed adequate to serve this ten-home cluster system; the treatment system would be located on a separate lot.

3.3.6 Costs of Cluster Systems

Based on an analysis of the performance of the cluster systems in these areas, capital and O&M costs were developed for each cluster system. The details of this analysis can be found in Technical Memorandum No. 12 in Volume 5, *Supporting Documents*, of this Master Plan.

Total annual costs for the sewered cluster systems ranged from $2,100 to $3,900 per EDU, with the smaller ”sewered” cluster systems (3 to 10 homes) being the most expensive, at $2,400 to $3,900 per EDU. These smaller “sewered” cluster systems can be more expensive than individual OWNRS for two reasons: 1) the cost of land acquisition for the wastewater treatment system, and 2) the cost of the pressure sewer system.

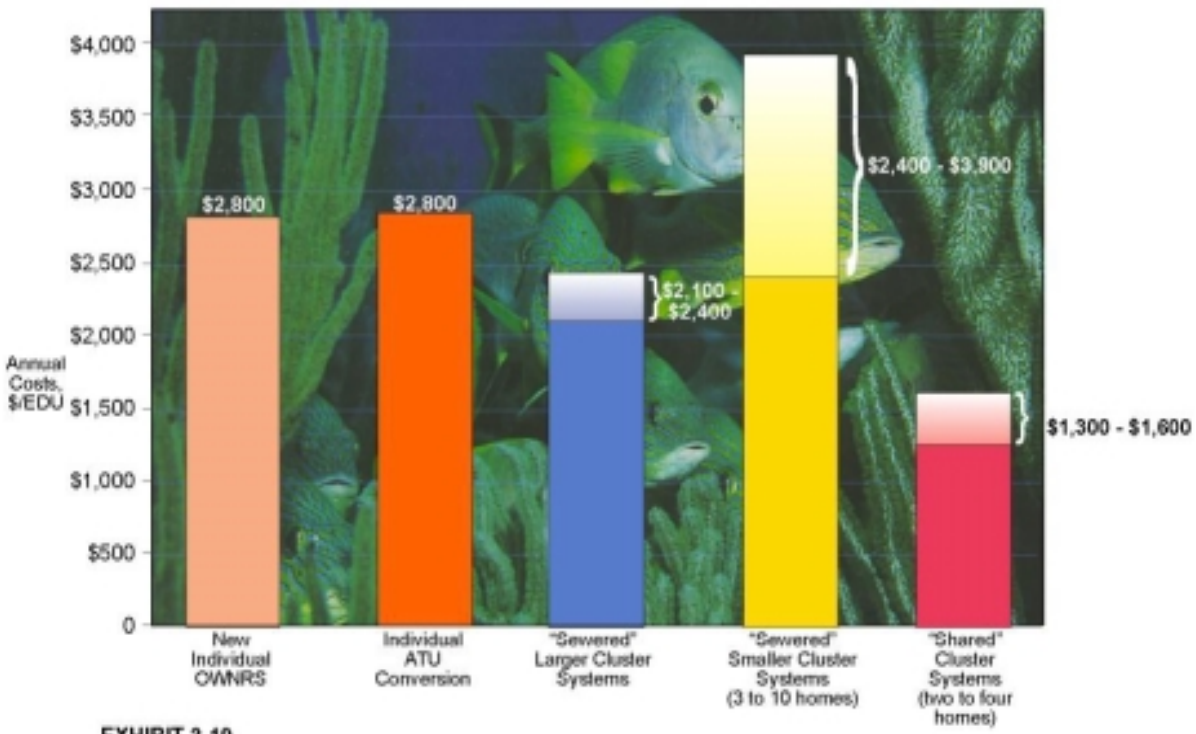


EXHIBIT 3-19
Comparison of Annual Costs of Individual OWNRS vs. Cluster OWNRS Systems

Although the larger “sewered” cluster systems are less expensive than the smaller “sewered” cluster systems, they are more costly than the community collection and treatment plant alternative (which is evaluated in Chapter 5 of this Master Plan).

The total annual costs for the shared cluster systems ranged from $1,300 to $1,600 per EDU, and were considerably less costly than locating individual OWNRS at each home. Under certain circumstances, shared cluster systems may be less costly than the community wastewater collection and treatment plant alternatives, and should be considered in service areas where wastewater collection/treatment plant annual costs exceed approximately $1,300 per EDU. (See Chapter 5 of this Master Plan.)

3.3.7 Summary of Onsite Wastewater Treatment System Alternatives Costs

The summary of total annual costs per EDU presented in Exhibit 3-19 shows that shared cluster systems for two to four homes are the most economical

onsite system options. These costs are lower than the individual OWNRS costs presented in Exhibit 3-15, (approximately $2,800/year), but are generally higher than the community wastewater collection and treatment plant alternatives. (See Chapter 5 of this Master Plan.)

A summary of the capital costs for the onsite systems, including the various cluster systems evaluated, is provided in Exhibit 3-20. A summary of the total annual costs, including O&M, of these onsite and cluster systems is provided in Exhibit 3-21, and is based on the capital costs provided in Exhibit 3-20.

3.4 Wastewater Treatment Plant Process Alternatives

The evaluation of wastewater treatment processes for Monroe County entailed consideration of many factors, including required effluent standards, water quality goals, the size of the area served, the proposed size of the treatment plant, and costs. This section describes evaluations performed of the alternative processes, and includes a discussion of liquids treatment, effluent disposal, and solids handling systems.

3.4.1 Range of Plant Sizes Evaluated

Community and regional treatment plant processes and costs were evaluated for nine different sizes of WWTPs: 4,000; 10,000; 25,000; 50,000; 100,000; 500,000; 1,000,000; 2,000,000; and 6,000,000 gpd. The upper end of

EXHIBIT 3-20
Summary of Onsite and Cluster Wastewater Treatment System Capital Costs[1,4]

Treatment System	Building Sewer or Collection System	OWNRS Wastewater Treatment	Engineering and Administration[2]	Land Acquisition	Total[3]	Cost per EDU
Generic Systems						
Individual OWNRS	$500	$11,500	$3,000	-0-	$15,000	$15,000
Two-Home (Shared)	$3,500	$11,500	$4,050	-0-	$19,000	$9,500
Three-Home (Shared)	$5,250	$18,900	$6,000	-0-	$30,000	$10,000
Four-Home (Shared)	$7,000	$18,900	$7,000	-0-	$33,000	$8,200
Specific Systems						
Three-Home (Sewered)[5]	$22,000	$18,900	$11,000	$50,000	$102,000	$34,000
Five-Home (Sewered)[5]	$41,000	$18,900	$16,200	$50,000	$126,000	$25,200
Ten-Home (Sewered)[5]	$84,000	$33,800	$31,800	$50,000	$200,000	$20,000
Upper Sugarloaf (41 connections)[6]	$417,488	$116,693	$144,229	$140,500	$819,000	$19,980
Big Pine Key (42 connections)[6]	$341,704	$82,969	$114,662	$70,250	$715,000	$17,020
Conch Key (102 connections)[6]	$868,295	$402,343	$343,072	$281,000	$1,895,000	$18,580
North Key Largo (41 connections)[6]	$290,527	$84,170	$101,168	$70,250	$675,000	$16,460

[1]Costs include a 20% contingency.
[2]At 27% of collection and wastewater treatment system capital cost.
[3]Total number is rounded to nearest thousandth.
[4]To provide a representative and more accurate cost comparison, engineering and administrative costs were estimated and applied to all onsite system capital costs, and land acquisition was included for clustered systems, where required.
[5]Evaluations of sewered cluster systems are based on analysis of Port Pine Heights development on Big Pine Key.
[6]Four large cluster systems were evaluated in Upper Sugarloaf, Big Pine Key, Conch Key and North Key Largo as areas that were representative of islands that were distant from more populated centers.

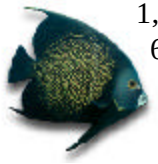


EXHIBIT 3-21
Summary of Onsite and Small Cluster System Annual Costs[1]

Treatment System	Annualized Capital Cost[1]	Annual O&M Cost	Total Annual Cost Per EDU	Total Monthly Cost Per EDU
Generic Systems				
Individual OWNRS	$1,308	$1,507	$2,815	$234
Two Home (Shared)	$1,656	$1,507	$1,582	$132
Three-Home (Shared)	$2,615	$2,182	$1,599	$133
Four Home (Shared)	$2,877	$2,812	$1,265	$105
Specific Systems				
Three-Home (Sewered)[2]	$8,892	$2,844	$3,912	$326
Five-Home (Sewered)[2]	$10,985	$3,292	$2,855	$238
Ten-Home (Sewered)[2]	$17,436	$6,261	$2,370	$197
Upper Sugarloaf (41 connections)[3]	$71,420	$26,810	$2,400	$200
Big Pine Key (42 connections)[3]	$62,350	$27,310	$2,130	$178
Conch Key (102 connections)[3]	$165,240	$69,650	$2,300	$192
North Key Largo (41 connections)[3]	$58,860	$28,880	$2,140	$178

[1]Capital costs are based on those presented in Exhibit 3-20. Annualized costs were based on an interest rate of 6.0% over 20 years.
[2]Evaluations of sewered cluster systems are based on analysis of Port Pine Heights development on Big Pine Key.
[3]Four large cluster systems were evaluated in Upper Sugarloaf, Big Pine Key, Conch Key and North Key Largo as areas that were representative of islands that were distant from more populated centers.

this range (500,000 to 6,000,000 gpd) represents regional facilities that would serve the larger, consolidated study areas. The lower range (4,000 to 500,000 gpd) represents sub-regional or community facilities that would serve the smaller study areas. Because of the non-industrial character throughout the Keys, typical domestic wastewater was assumed in sizing treatment facilities, and is based on low-to-moderate levels of infiltration / inflow present in the system.

3.4.2 Required Level of Treatment

Discharges from WWTPs in Monroe County are subject to general state rules, as well as specific County effluent standards set by the 1999 Florida Legislature. These standards vary by the method of disposal and by plant size, as summarized in Exhibit 3-22.

3.4.3 Selection of Liquid Treatment Processes

Liquid treatment processes were selected to meet Florida's statutory effluent standards for discharge to Class V injection wells, which has been, and will continue to be the predominant disposal method in Monroe County. Processes that would meet these standards include preliminary treatment, secondary treatment, biological nitrogen removal, chemical or biological phosphorus removal, effluent filtration, and disinfection. These processes are briefly described below, and are illustrated in Exhibit 3-23.

EXHIBIT 3-22
Treatment Requirements for Community and Regional Wastewater Treatment Plants in Monroe County

Disposal Method	WWTP Effluent Quality Standards (mg/L) BOD	TSS	TN	TP
Class V Injection Well (90 ft)				
WWTP Capacity Less Than or Equal to 100,000 gpd	10	10	10	1
WWTP Capacity Greater than 100,000 gpd	5	5	3	1
Class V Injection Well (2,100 ft)				
WWTP Capacity Equal to or Greater than 1,000,000 gpd	5	5	3	1
Class I Injection Well >1 mgd	20	20	--	--
Land Application Reuse System				
WWTP Capacity less than 100,000 gpd	20	10	--	--
WWTP Capacity Equal to or greater than 100,000 gpd	20	5	--	--

3.4.3.1 Preliminary Treatment

Preliminary treatment includes screening as an essential process to remove debris and coarse solids. Different types of screens are available; the types selected for cost estimating purposes were: a) manual bar screens for plant capacities up to 0.1 mgd; b) rotary drum screens mounted on the aeration basin structure for the 0.5- and 1.0-mgd sizes; and c) mechanical climber screens at the 2- and 6-mgd sizes. The screening and influent discharge areas were assumed to be covered with a fiber-glass enclosure and vented to a biofilter to control odors.

In addition to screening, grit removal facilities are frequently provided as a preliminary treatment process in plants larger than those required for Monroe County; they are not essential in plants of the size required for Monroe County and therefore, were not included in the systems recommended.

3.4.3.2 Secondary Treatment

In secondary treatment processes, organic material in the wastewater is stabilized through biochemical oxidation. The oxidation occurs as a result of micro-organisms using the organic matter as a food source. This process produces biological solids, which are removed prior to discharging the treated effluent.

Many variations of secondary treatment processes exist. The most common version, referred to as the activated sludge process,

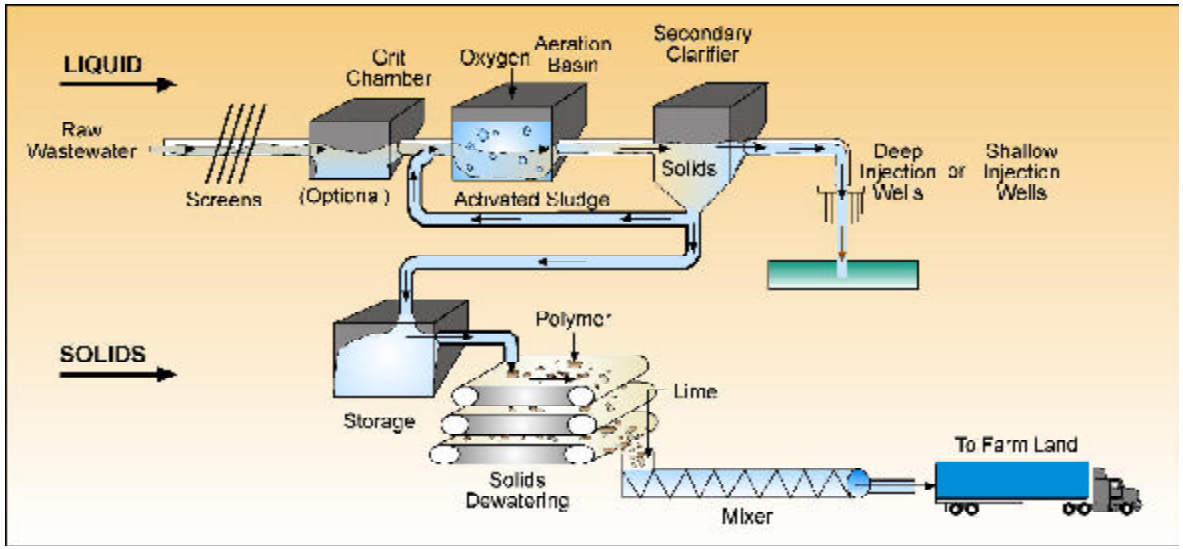


EXHIBIT 3-23
Process Schematic of a Typical Wastewater Treatment Process

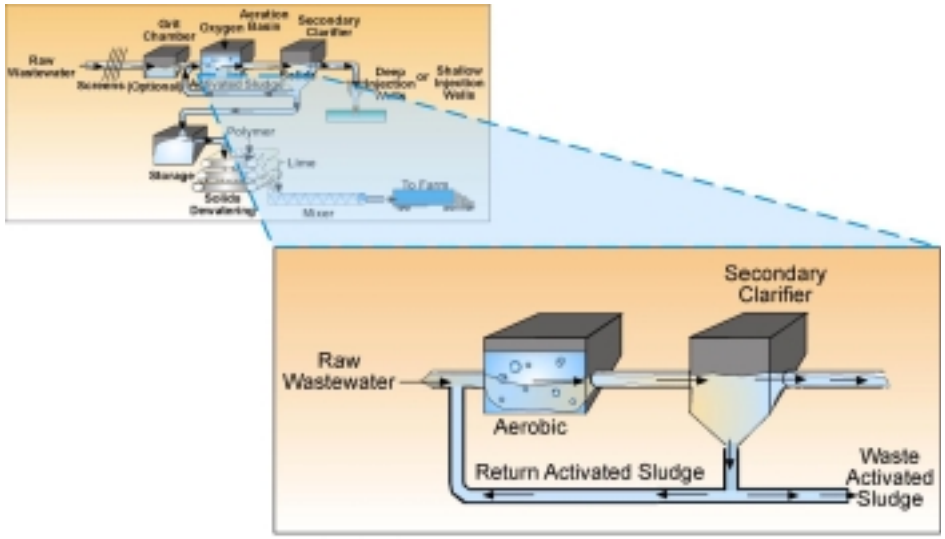


EXHIBIT 3-24
Activated Sludge Process

typically consists of an aerated basin and secondary clarifier, as shown in Exhibit 3-24. This process was selected as the basis for all of the community WWTPs recommended for Monroe County. It is capable of meeting effluent BOD and TSS standards of 20 mg/L, which is sufficient for Class I injection well disposal, but requires supplemental nitrogen, phosphorus, and suspended solids removal, as described below, to meet the required effluent standards for Class V injection. Variations of the activated sludge process and other types of systems could also be used (sequencing batch reactors [SBRs], intermittent-cycle systems, attached-growth systems, and aquatic systems). Final system selection should be based on site-specific factors.

3.4.3.3 Biological Nitrogen Removal

Biological nitrogen removal can be achieved during or following secondary treatment, by converting nitrate-nitrogen to nitrogen gas in a biochemical reaction called denitrification. The denitrification takes place in an anoxic (absence of dissolved oxygen) basin or filter, from which the nitrogen gas is released into the atmosphere. Typical biological nitrogen removal processes recommended for use in Monroe County include:

- Modified Ludzak-Ettinger (MLE) Process: Features a single anoxic reactor, typically located upstream of the aerobic treatment unit. The process is capable of reducing nitrogen in the effluent to less than 10 mg/L, as required for plants of 0.1 mgd capacity or less.
- Four-Stage Bardenpho Process: Includes two sets of anoxic and aerobic reactors in series. The process is capable of reducing nitrogen in the effluent to less than 3 mg/L, as required for plants of greater than 0.1 mgd capacity.

Exhibits 3-25 and 3-26 illustrate the biological nitrogen removal processes listed above. Various other types of biological nitrogen removal systems are marketed and should not be excluded from consideration. For example, a deep-bed filter used as a tertiary treatment process to remove combined nitrogen and suspended solids is competitive on a cost and performance basis. The process is capable of reducing nitrogen in the effluent to less than 10 mg/L, or to less than 3 mg/L when used in conjunction with the MLE process described above.

3.4.3.4 Phosphorus Removal

Additional phosphorus removal can be achieved during secondary treatment processes through either chemical or biological means. In the chemical process, phosphorus is removed through precipitation by the addition of metal salts; this process produces a sludge (precipitate), which is removed along with the biological solids. The process is capable of reducing phosphorus levels in effluent to below 1 mg/L with effluent filtration, and is the recommended method for plants

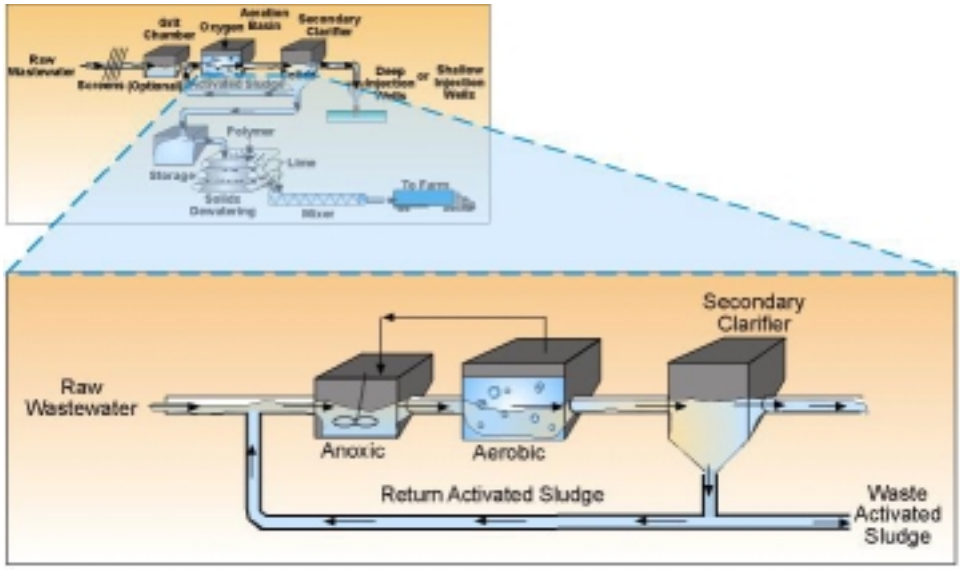


EXHIBIT 3-25
Nitrogen Removal Using Modified Ludzak-Ettinger (MLE) Process

with a capacity of 0.1 mgd or less because of its operational simplicity and reliability.

Biological phosphorus removal does not involve the addition of chemicals; it requires adding an anaerobic (absence of dissolved oxygen and nitrate-nitrogen) basin at the upstream end of the process train. This biological process removes phosphorus at levels comparable to chemical precipitation, without the additional sludge production, but adds operational complexity to the overall treatment process. As a result, it is recommended only for larger plants of at least 0.5 mgd capacity, with chemical phosphorus removal facilities included for backup use. Exhibit 3-27 demonstrates a typical biological nitrogen and phosphorus removal process.

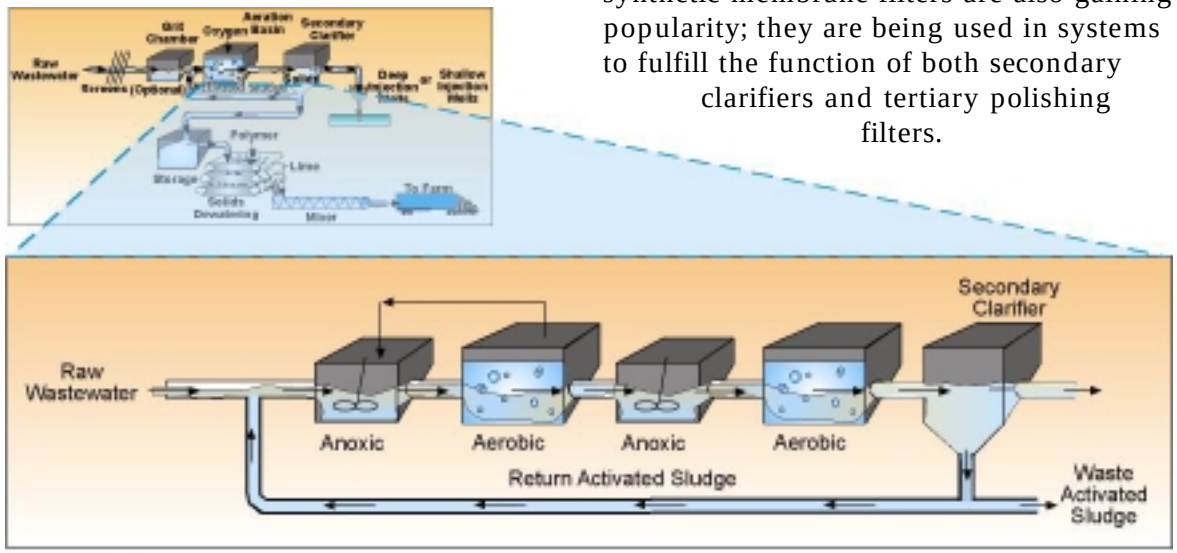


EXHIBIT 3-26
Nitrogen Removal Using Four Stage Bardenpho Process

3.4.3.5 Filtration

Filtration is needed for all plant sizes to "polish" the effluent and meet the required effluent discharge quality standards. Cost estimates were based on the use of conventional shallow-bed filters as a tertiary treatment process. These types of filters employ sand media or sand-and-anthracite media, which overlay a gravel and/or porous underdrain system. Various other types of filters may be appropriate in specific applications. For example, deep bed filters with 6 feet or more of media may be applicable when denitrification is to be accomplished, particularly in retrofit applications. Fabric-media and synthetic membrane filters are also gaining popularity; they are being used in systems to fulfill the function of both secondary clarifiers and tertiary polishing filters.

3.4.3.6 Disinfection

Disinfection is the final step in the wastewater treatment process, and refers to the selective inactivation and/or destruction of disease-causing organisms, including bacteria, viruses, amoebic cysts, and protozoan cysts. Basic level disinfection to achieve fecal coliform values below 200 mg/L is required for surface water disposal, or shallow well injection. High level disinfection, consisting of filtration plus disinfection to achieve TSS levels equal to or less than 5 mg/L and fecal coliform values below detectable limits, is required for effluent disposal through public access irrigation. While disinfection is not required for deep well injection systems, it is frequently used to control biological growth in the well. Thus, disinfection was assumed to apply to every WWTP.

Chlorination and ultraviolet (UV) irradiation are the two main methods of disinfection, with chlorination predominating but losing favor in recent years. For planning purposes, chlorine disinfection using a tablet chlorinator and a dual-channel contact tank was assumed for plant capacities of 0.025 mgd or less. For all other plant sizes, costs were based on UV disinfection for achieving basic level disinfection.

3.4.3.7 Summary of Liquid Treatment Processes

The treatment processes selected as the basis for cost estimates are presented in Exhibit 3-28.

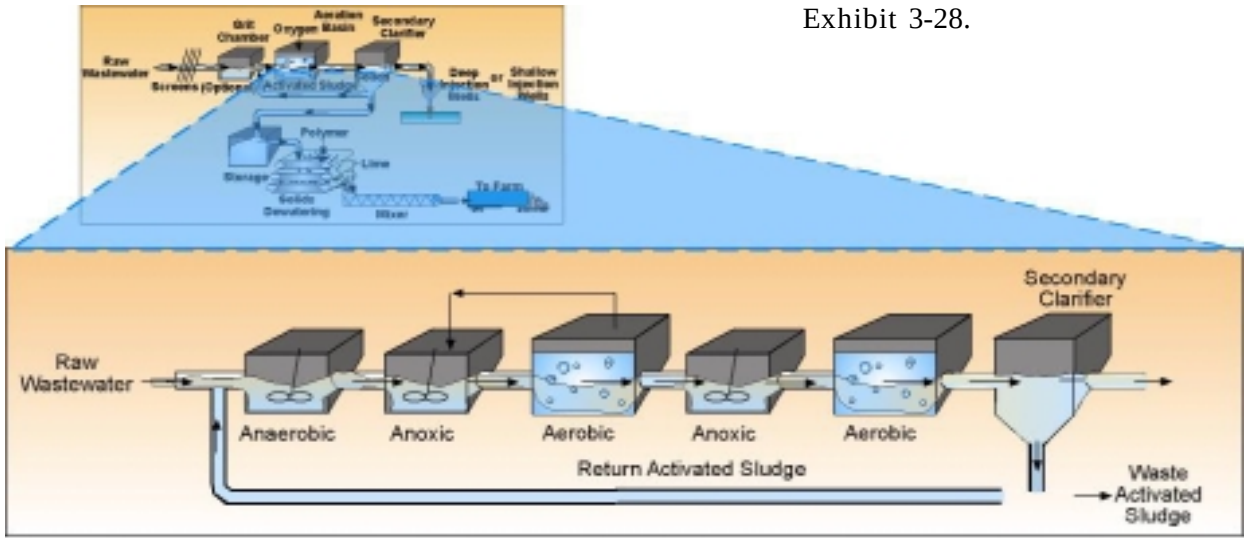


EXHIBIT 3-27
Nitrogen and Phosphorus Removal Using Five-Stage Bardenpho Process

3.5 Selection of Effluent Disposal Methods

Requirements for effluent disposal in Monroe County were amended by the 1999 Florida Legislature, prohibiting new or increased discharges into surface waters, and mandating the elimination of existing discharges to surface waters by July 1, 2006. The legislation allows effluent reuse systems, but otherwise requires the use of underground injection for effluent disposal, as follows:

- If the design capacity of the facility is less than 1 mgd, the injection well must be at least 90 feet deep and cased to a minimum depth of 60 feet (a shallow injection well).
- If the design capacity of the facility is equal to or greater than 1 mgd, the injection well must be cased to a minimum depth of 2,100 feet (a deep injection well).

The three methods of effluent disposal—reuse, shallow well injection, and deep well injection—are discussed below.

3.5.1 Effluent Reuse

The FDEP authorizes effluent reuse for various purposes, but slow-rate land application is the principal type of reuse system used in Florida. Land application involving public access spray irrigation systems is restricted to plants equal to, or greater than, 0.1 mgd capacity, and the wastewater must be treated to

EXHIBIT 3-28
Summary of Recommended Liquid Treatment Processes

Type of Plant	Capacities (mgd)	Effluent Limits BOD/TSS/TN/TP	Recommended Liquid Process
New Plants	0.004 0.01 0.025 0.05 0.1	10/10/10/1	Screening 2-Stage MLE process, with chemical phosphorus removal Granular Media Filtration UV Disinfection[1]
New Plants	0.5 1.0 2.0 6.0	5/5/3/1	Screening 5-Stage Bardenpho process, with backup chemical phosphorus removal Granular Media FIltration UV Disinfection
Small Plant Retrofits[2]	0.004 0.01 0.025 0.05 0.1	10/10/10/1	Screening Retrofit 2-Stage MLE process, with chemical phosphorus removal Effluent Filtration

[1]Chlorine disinfection for 0.025 mgd and less.
[2]Retrofits of larger plants were not evaluated.

secondary standards for BOD (20 mg/L), but to 5 mg/L for TSS, followed by high level disinfection. Land application by subsurface application systems can be used for any plant size and has reduced effluent quality requirements: the effluent TSS limitation is 10 mg/L instead of 5 mg/L and only basic disinfection is required. Because of the nutrient benefits to the land, nitrogen and phosphorus removal are not required for land application systems.

The chief drawback to land application reuse systems is that they require full storage or backup disposal systems whenever treatment requirements are not achieved, or when the land application site cannot take reclaimed effluent, including extended periods of wet weather. Additionally, relatively large tracts of land are required to accommodate the effluent being disposed. Such tracts may be distant from the plant site, causing high transmission piping costs. Since the land owner receiving the reuse water must pay for it, this alternative is also dependent on the willingness of users to pay for the reclaimed water. Thus, the feasibility of effluent reuse is limited. Exhibit 3-29 illustrates the reuse capacity for the Keys' existing WWTPs.

3.5.1.1 WWTP Capacities Greater Than 0.1 mgd

Of the five existing plants in the planning area that have a capacity greater than 0.1 mgd, three are currently practicing

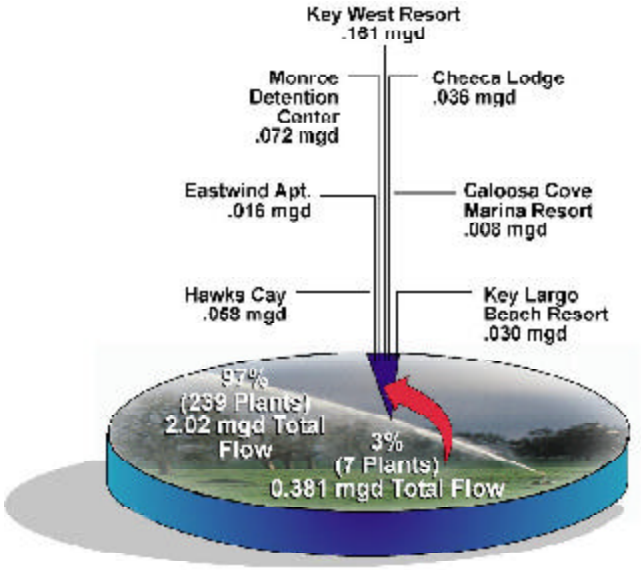


EXHIBIT 3-29
Effluent reuse potential for 97% of Monroe County's active WWTPs is poor because of the high associated cost and difficulty in meeting effluent water quality standards.

reuse and have good potential to continue doing so. These include:

- KW Resort Utilities—Nearly all of the 0.16 mgd of effluent from this facility is spray-irrigated on the Key West Golf & Country Club golf course.
- Monroe County Detention Center—A small amount of the 0.072 mgd of effluent discharged by this facility is used for irrigation of landscape areas; most is reused as toilet flush water in the Detention Center.
- Hawks Cay—A small percentage of the effluent from this facility is reused for landscape irrigation.

3.5.1.2 WWTP Capacities in the 0.02- to 0.10-mgd Range

Only four active plants in the 0.02 to 0.10 mgd range practice reuse because of cost and the difficulty of meeting regulatory requirements. Of the four facilities practicing reuse, Cheeca Lodge and Eastwind Apartments produce irrigation quality effluent that is spray-irrigated onto golf courses. The two other facilities, Caloosa Cove Marina Resort and Key Largo Beach Resort, utilize subsurface drip irrigation to a limited extent.

3.5.1.3 WWTP Capacities Less Than 0.02 mgd

None of the plants with capacities of less than 0.02 mgd currently practice reuse, and the potential for future reuse among these plants was rated as "poor."

3.5.2 Underground Injection Through Shallow Wells

Most WWTPs in the Keys dispose of their treated effluent into shallow injection wells, which extend 90 feet below ground and contain a PVC casing for the first 60 feet. The effluent flows by gravity through the cement encased well, and out the bottom 30-foot portion of the well, which opens to a portion of the earth called Miami Oolite or Key Largo Limestone, both porous, limestone formations.

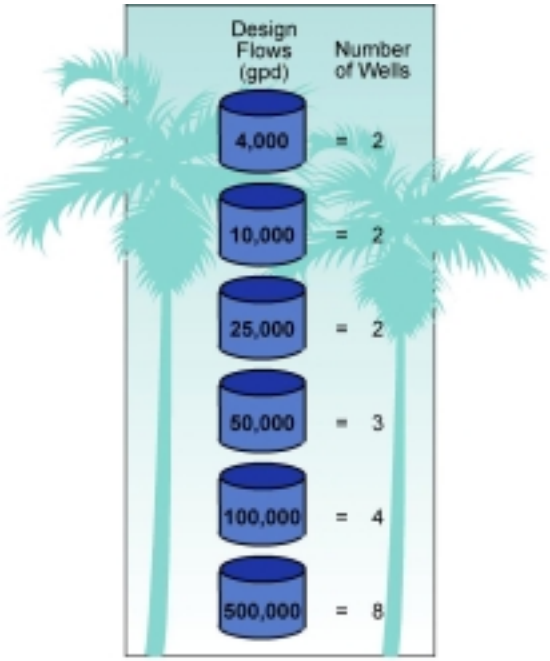


EXHIBIT 3-30
Number of Shallow Injection Wells Required for Selected WWTP Capacity

Shallow wells have been considered the disposal method for all plants with a capacity of less than 1.0 mgd. The number of wells required for the various plant sizes considered in this Master Plan is presented in Exhibit 3-30. Additional facilities required for injection well effluent disposal include a monitoring well, wellhead facilities, and piping from the treatment plant to the wells.

Shallow injection wells considered for effluent disposal are considered Class V wells. As indicated previously in Exhibit 3-22, effluent that is discharged to Class V injection wells from WWTPs with capacities less than or equal to 0.1 mgd must meet BAT limitations of 10/10/10/1 for BOD/TSS/TN/P, respectively.

Effluent discharged to Class V injection wells from WWTP with capacities greater than 0.1 mgd must meet advanced wastewater treatment limitations of 5/5/3/1 for BOD/TSS/TN/P, respectively.

3.5.3 Underground Injection Through Deep Wells

As opposed to shallow wells, which reach depths of only 90 feet, deep injection wells are cement and steel encased wells that reach depths of up to 3,000 feet below ground. Exhibit 3-31 illustrates both shallow and deep injection wells. Treated effluent is pumped from the treatment plant directly into the wells. Once the effluent reaches the open hole at the bottom of the well, it flows into the

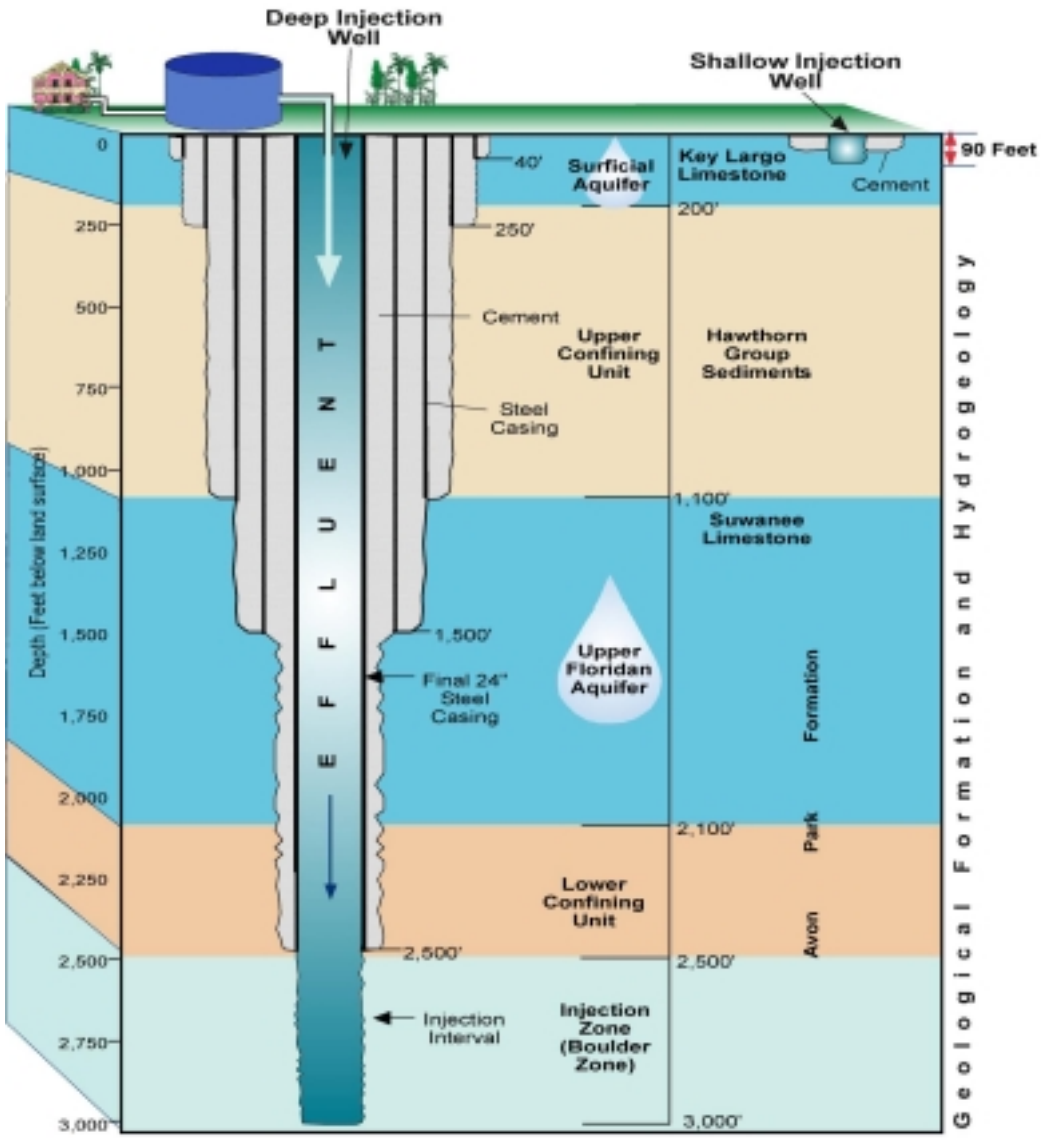


EXHIBIT 3-31
Comparison of a Deep Injection Well with a Shallow Injection Well

Boulder Zone, a cavernous limestone rock formation. The geological formations through which the wells traverse serve as natural safeguards that prevent leakage of treated effluent upward and out of the Boulder Zone.

Deep well injection is mandated in Monroe County for effluent discharged from plants of 1 mgd capacity and greater. Because deep well injection eliminates all wastewater nutrients from the environment, deep well injection was also evaluated for the 0.5 mgd plant size but was found to be more expensive than shallow well injection.

Deep injection wells constructed in Monroe County are expected to be classified as Class V wells, a designation for wells that will not impact aquifers designated as an Underground Source of Drinking Water (USDW).

The more stringent Class I well construction and monitoring requirements may be imposed on Class V wells in Monroe County. These include the need for a monitoring well and a backup disposal method to accommodate periodic mechanical integrity testing. These more stringent requirements were assumed for planning and cost estimating purposes. A second deep well was assumed as a backup disposal method. Other required deep injection system facilities include injection pumps, a surge control system, header piping, air release valve at the wellhead, flow-control valve, venturi

flowmeters, and electrical instrumentation and control systems. It was further assumed in cost estimating that deep injection wells would be located adjacent to the WWTP to minimize piping costs.

3.5.4 Summary of Effluent Disposal Methods

The cost estimates prepared in this Master Plan are based on effluent disposal methods presented in Exhibit 3-32. While effluent reuse systems could be used at any WWTP, because of the need to provide full backup disposal capacity with shallow or deep injection wells, effluent reuse may not be cost effective.

3.6 Selection of Solids Handling Systems

In addition to liquid effluent, WWTPs also produce a solids residual, or sludge. Alternative methods for processing and disposing of residual wastewater solids that were evaluated for the Monroe County planning area include various processes for stabilizing, dewatering, transporting, and disposing of solids. In accordance with current accepted terminology, the term *biosolids* is used to denote WWTP residual solids that have been stabilized and made into a product that can be beneficially recycled. Prior to the stabilization step, the residual solids may be variously referred to as *biological solids, secondary solids, waste-activated sludge (WAS), solids,* or *sludge*. The term *chemical solids* is used to designate the chemical precipitate formed when metal salts are added to wastewater for phosphorus removal.

3.6.1 Regulatory Considerations

New Florida regulations covering all forms of wastewater solids disposal, except landfilling, took effect in 1998. These regulations mirror the 40 *Code of Federal Regulations* (*CFR*) Part 503 Sewage Sludge Regulation published in 1995 by the U.S. Environmental Protection Agency (EPA). Both sets of regulations address pathogen reduction, vector attraction reduction, and heavy metals limits.

The regulations specify two alternative levels of pathogen reduction: Class A or Class B. Class A biosolids can be applied via bulk application to public access areas, including private lawns and home gardens, whereas Class B biosolids are prohibited from such application. Both Class A and Class B biosolids can be applied to agricultural land, but more stringent site restrictions are imposed when Class B biosolids are applied.

The regulations specify that one or more of ten requirements must be met for demonstrating satisfactory vector attraction reduction. The applicable requirements depend on the type of solids treatment/disposal employed. With respect to metals content, biosolids generated in Monroe County are expected to comply with Florida's most stringent classification, designated Class AA.

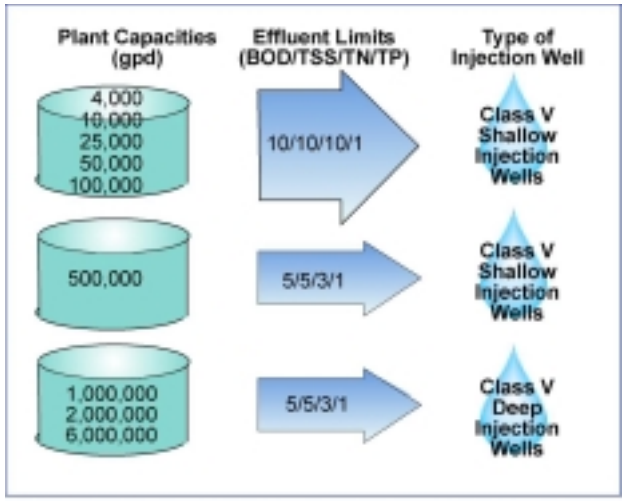


EXHIBIT 3-32
Summary of Recommended Effluent Disposal Methods

3.6.2 Existing Solids Handling Practices in Monroe County

Most of the sludge produced by WWTPs in Monroe County, as well as septage, is collected in unstabilized, semi-liquid form by private haulers and conveyed to one of three Monroe County Solid Waste Transfer Stations. The haulers pay Monroe County a per gallon fee for disposal at these transfer stations. From the transfer stations, the solids are trucked to the Miami-Dade Water and Sewer Department (MDWASD) South District WWTP by a private contractor under contract to Monroe County. This existing solids handling and disposal method was used as a baseline for comparison of other alternatives in this solids management study. However, MDWASD's will-

ingness to continue to accept the solids in the future remains to be established.

The Key West WWTP dewaters partially-stabilized secondary solids, which are disposed via a private hauler at an agricultural land application site near Okeechobee, Florida. Because the solids are only partially stabilized, they are incorporated into the soil the same day they are applied to meet FDEP vector attraction reduction requirements.

Detailed evaluations and cost comparisons of nine different solids handling and disposal alternatives were investigated in Technical Memorandum No. 10 (see Volume 4, *Supporting Documents*), and many treatment and disposal methods were eliminated on the basis of cost, operational complexity, implementation issues, and/or uncertain end-product marketability. Dewatering/Lime Stabilization/Cake Haul was generally least costly for WWTPs of 100,000 gpd capacity and larger. Digestion alternatives were cost-competitive options throughout this range and should be considered as a viable means of solids disposal. Hauling liquid sludge to the Monroe County Solid Waste Transfer Station was the most economical option for facility sizes below 100,000 gpd.

Sludge dewatering would be accomplished with the use of belt filter presses for facility sizes of 1 mgd and greater, with onsite covered storage provided for the filter cake. For the smaller plants, conventional sand drying beds would be used. The lime stabilization systems would incorporate a silo and automatic feed system for facility sizes of 0.5 mgd and larger, with bagged lime and a bag dump station used for the smaller plants. Wet scrubbers would be provided for odor control for the larger lime stabilization systems of 1.0 mgd and greater.

3.6.3 Summary of Solids Handling Systems

The following solids handling systems were selected as the basis for cost estimates.

- Plants with capacities of 4,000; 10,000; 25,000; and 50,000 gpd—temporary storage of decanted sludge in an aerated holding tank, and truck hauling the liquid sludge to the Monroe County Solid Waste Transfer Station.
- Plants with capacities of 100,000, 500,000, 1,000,000, 2,000,000, and 6,000,000 gpd—belt filter press dewatering, Class B lime stabilization, and truck hauling of dewatered cake to a remote agricultural land application site.

3.7 WWTP Cost Estimates

3.7.1 Cost Estimates for New WWTPs

Exhibit 3-33 summarizes the estimated construction costs and annual O&M costs for new BAT/AWT WWTPs at the nine different WWTP capacities. Annual costs and the cost to treat 1,000 gallons of wastewater are also illustrated. The estimates are based on the process selections described in the previous section for liquid treatment, effluent disposal, and solids handling. Costs of wastewater collection and influent pumping are not included in this exhibit, but are presented later in Section 3.8.

For capacities of 1,000,000 gpd and below, pre-engineered, field-erected steel units are

EXHIBIT 3-33
Construction and O&M Costs of New BAT/AWT WWTPs at Various Design Capacities

Plant Capacity (gpd)	Construction Cost ($)	O&M Cost ($/year)	Total Annual Cost ($/year)	Cost per 1,000 Gal[1] ($/1,000 gal)
4,000	261,000	30,500	53,200	45.55
10,000	311,000	35,500	62,600	21.44
25,000	422,000	49,500	86,300	11.82
50,000	601,000	66,500	119,000	8.15
100,000	874,000	100,000	176,000	6.03
500,000	4,170,000	440,000	804,000	5.51
1,000,000	10,100,000	690,000	1,570,000	5.38
2,000,000	12,570,000	940,000	2,040,000	3.49
6,000,000	21,970,000	1,920,000	3,840,000	2.19

[1]Assumes that plants are operating at 80% of capacity.

recommended, with basins of concrete construction. Conventional cast-in-place concrete construction was assumed for the 2,000,000 and 6,000,000 gpd plant sizes. An electrical and operations/control building is included for each plant size, along with site work and fencing. Costs include a 20-percent Florida Keys area allowance and a 20-percent project contingency, but do not include costs for engineering, services during construction, legal services, and land acquisition.

O&M cost estimates include labor, administration, materials, electricity, laboratory analyses, UV disinfection costs, chemicals, and biosolids hauling costs. The estimates were developed assuming that the plant was operating at 80 percent of capacity.

3.7.2 Cost Estimates for Plant Retrofits

Exhibit 3-34 summarizes construction costs and annual O&M costs for plant retrofits at five different WWTP capacities up to 100,000 gpd. These costs represent the incremental costs for upgrading existing conventional secondary treatment plants to meet the required 10/10/10/1 standards. The retrofitted facilities include an anoxic basin and associated mixers and recirculation systems for nitrogen removal, chemical feed system for phosphorus removal, and effluent filters for suspended solids removal. Retrofit cost estimates were not developed for the larger plants because of their limited number.

3.7.3 Cost Estimates for Wastewater Reuse

Wastewater reuse requires additional facilities at the treatment plant beyond those required to provide BAT/AWT treatment. These facilities include high level disinfection facilities, reuse water storage facilities, and high service pumping facilities to transmit the reuse water from the treatment plant to the reuse site. Exhibit 3-35 compares the additional costs to provide these required wastewater reuse facilities at the nine different BAT/AWT WWTP capacities. These costs are for required reuse facilities at the WWTP only, and do not include reuse water transmission or distribution piping costs, which are very site specific to a particular reuse project.

Costs to provide wastewater reuse facilities to a specific project area were evaluated in the Marathon Facilities Plan[11], where reuse infrastructure was assumed to be provided in the entire primary service area at the same time the proposed regional wastewater collection system was constructed. These reuse system costs are summarized in Exhibit 3-36.

Because of the high cost of potable water in the Keys ($4.93/1,000 gallons for monthly use up to 12,000 gallons, and $5.93/1,000 gallons for monthly use over 12,000 gallons), limited potable water irrigation is practiced. In addition, there are no potential large-volume reuse cus-

EXHIBIT 3-34
Incremental Construction and O&M Costs to Upgrade Existing Secondary WWTPs to Nutrient and Suspended Solids Removal Facilities at Various Design Capacities

	Construction Cost			O&M Cost		
Plant Capacity (gpd)	Typical Secondary Construction Cost ($)	Cost to Upgrade ($)	(% of Secondary Construction Cost)	Typical Secondary O&M Cost ($/year)	Increased O&M ($/year)	(% of Secondary O&M Cost)
4,000	185,000	71,000	38	21,300	15,300	72
10,000	228,000	78,000	34	25,800	15,900	62
25,000	310,000	105,000	34	38,400	17,900	47
50,000	462,000	134,000	29	51,000	22,500	44
100,000	673,000	188,000	28	76,400	26,000	34

[11]CH2M HILL, Lindahl, Brown Ferrari & Hellstrom, and Continental Shelf Associates. Prepared for Monroe County, Florida. *Wastewater Facilities Plan with Phased Implementation for the Marathon Area of the Florida Keys*. June 1998.

tomers, such as golf courses (the two golf courses that do not use reclaimed wastewater for irrigation have installed reverse osmosis facilities for irrigation water). Consequently, the proportion of potable water that could be replaced with reuse water is relatively low.

Reuse feasibility studies should be performed to determine how much reclaimed water would likely replace potable water in each of the different service areas. Even if as much as 20 percent of the potable water use in Marathon could be replaced with reclaimed water, the cost to produce the reclaimed water would be $12.52/1,000 gallons, based on the capital and O&M costs in Exhibit 3-36. This cost is two and one-half times the base rate for potable water of $4.93/1,000 gallons. For an average residential customer using 4,900 gallons/month of potable water, replacing 20 percent of potable water consumption with reclaimed water would increase the average cost for water (potable plus reclaimed) from $24.16/month to $31.59/month, a 31-percent increase.

EXHIBIT 3-35
Construction and O&M Costs for Wastewater Reuse Facilities

BAT/AWT WWTP Costs				Reuse Facilities Costs					
Plant Capacity	Construction Cost	O&M Cost	Total Annual Cost	Construction Cost[1]		O&M Cost[1]		Total Annual Cost	
(gpd)	($)	($/year)	($/year)	($)	(%)[2]	($/year)	(%)[2]	($/year)	(%)[2]
4,000	261,000	30,500	53,200	--[3]	--[3]	--[3]	--[3]	--[3]	--[3]
10,000	311,000	35,500	62,600	117,000	38	7,000	20	17,200	27
25,000	422,000	49,500	86,300	175,000	41	9,000	18	24,200	28
50,000	601,000	66,500	119,000	262,000	44	14,000	21	37,000	31
100,000	874,000	100,000	176,000	350,000	40	21,000	21	51,000	29
500,000	4,170,000	440,000	804,000	528,000	13	44,000	10	90,000	11
1,000,000	10,100,000	690,000	1,570,000	738,000	7	77,000	11	141,000	9
2,000,000	12,570,000	940,000	2,040,000	1,327,000	11	124,000	13	239,000	12
6,000,000	22,000,000	1,920,000	3,840,000	2,360,000	11	320,000	17	525,000	14

[1]Only costs for reuse facilities at WWTP included; costs for transmission and distribution pipelines not included.
[2]Additional cost for reuse facilities as percent of BAT/AWT WWTP cost.
[3]Reuse not considered feasible at 4,000 gpd plant size.

3.8 Wastewater Collection Alternatives

Wastewater collection alternatives were analyzed for their suitability in each study area. The collection system technologies that were evaluated included conventional gravity sewers, "simplified" gravity sewers, small diameter gravity sewers, low pressure sewer grinder pump systems, septic tank effluent pump systems, and vacuum sewer systems. Of these six collection system types, three were determined to be best suited for the Keys and were evaluated in detail:

- Vacuum Sewers
- Centrifugal Grinder Pump Systems
- Progressive Cavity Grinder Pump Systems

Conceptual designs for each of these collection alternatives were prepared for those study areas or portions of study areas where development densities appeared high enough to warrant a central wastewater collection system. During this process, a total of 47 separate service areas were identified. The following guidelines or assumptions were used in the development of conceptual layouts and construction cost estimates:

EXHIBIT 3-36
Summary of Reuse Project Costs for Full Reuse within Marathon Primary Service Area

Item	Wastewater Collection and Treatment Costs[1]	Additional Costs for Reuse[1]
Collection & Transmission	$51,300,000	--
Reuse Transmission & Distribution	–	$10,200,000
Treatment & Disposal	$15,300,000	--
Reuse Facilities at WWTP	–	$1,200,000
Total Capital Costs	**$66,600,000**	**$11,400,000**
Annual Collection & Treatment O&M	$1,540,000/year	--
Annual O&M for Reuse	–	$112,000/year
Annual Debt Service on Capital Costs	$5,810,000/year	$994,000/year
Total Annual Cost	**$7,350,000/year**	**$1,106,000/year**

[1]From *Wastewater Facilities Plan with Phased Implementation for Marathon Area of the Florida Keys,* June 1998, Table 11-11. An allowance was added to bring costs to a 1998 basis and to include engineering, administration, legal, and financing costs; reuse treatment costs were also adjusted for consistency with costs presented in Exhibit 3-35.

- Systems were sized for peak flows generated by current (1998) development, plus a 20-percent additional flow.
- Each single-family residence was assumed to be served by a separate grinder pump station.
- Vacuum valves were assumed to be shared by single-family residences. On the average, one vacuum valve was required for every 2.5 single-family residences.
- Full-width jack and boring was added where pipelines crossed major highways.
- Unit prices were developed from equipment manufacturer's prices and available data for utility construction projects in the Keys.
- O&M costs were taken from information provided by manufacturers for existing systems and scaled appropriately for the Keys.
- Standard percentages were added for overhead, profit, mobilization, bonds, and insurance, as well as a 20-percent contingency.

3.8.1 Collection System Construction Cost Estimates

Total annual collection system costs per EDU within the study areas ranged from $154 on Windley Key (Study Area 18) to $1,595 for Ocean Reef Club (Study Area 27), where houses are relatively far apart. Densely populated areas typically cost less per EDU to sewer than less densely populated areas, but costs were highly site-specific. As shown in Exhibits 3-37 and 3-38, vacuum collection was typically the most cost-effective collection alternative when the number of EDUs being collected was more than about 350. In 22 of the 27 study areas, vacuum collection was the lowest cost alternative for serving the entire study area. Technical Memorandum No. 6 in Volume 4, *Supporting Documents*, of this Master Plan, provides a detailed discussion, evaluation, and cost estimates for the collection system alternatives.

Besides being the most cost-effective collection system alternative, vacuum sewer systems offer the following additional benefits:

- No electrical power is required at each home or vacuum valve
- Wastewater collection service is maintained during short-term or long-term utility power outages. A

standby generator that will automatically generate power if there is a loss of utility power will be provided at each vacuum station.

- Air drawn into the vacuum system with the sewage will help to keep the sewage fresh, and thus will help to eliminate odors.

3.8.2 Utilization of Existing Wastewater Collection Systems

Most of the wastewater collection systems serving existing WWTPs are small systems that serve individual developments, such as trailer parks, campgrounds, resorts, restaurants, motels, or shopping centers. Exceptions are the larger gravity collection systems operated by local utilities that serve Ocean Reef Club, Key Haven, KW Resort Utilities, and U.S. Naval Air Station Boca Chica. The smaller and more numerous collection systems are typically constructed on private property, and utilize gravity sewers and one to three lift stations.

Many of these systems are 20 years old or more, and were generally not constructed to current industry or utility standards. The cost of upgrading these systems to meet acceptable utility standards would be high in most cases. Therefore, it is recommended that the existing small collection systems continue to be privately owned and maintained if a regional utility is formed.

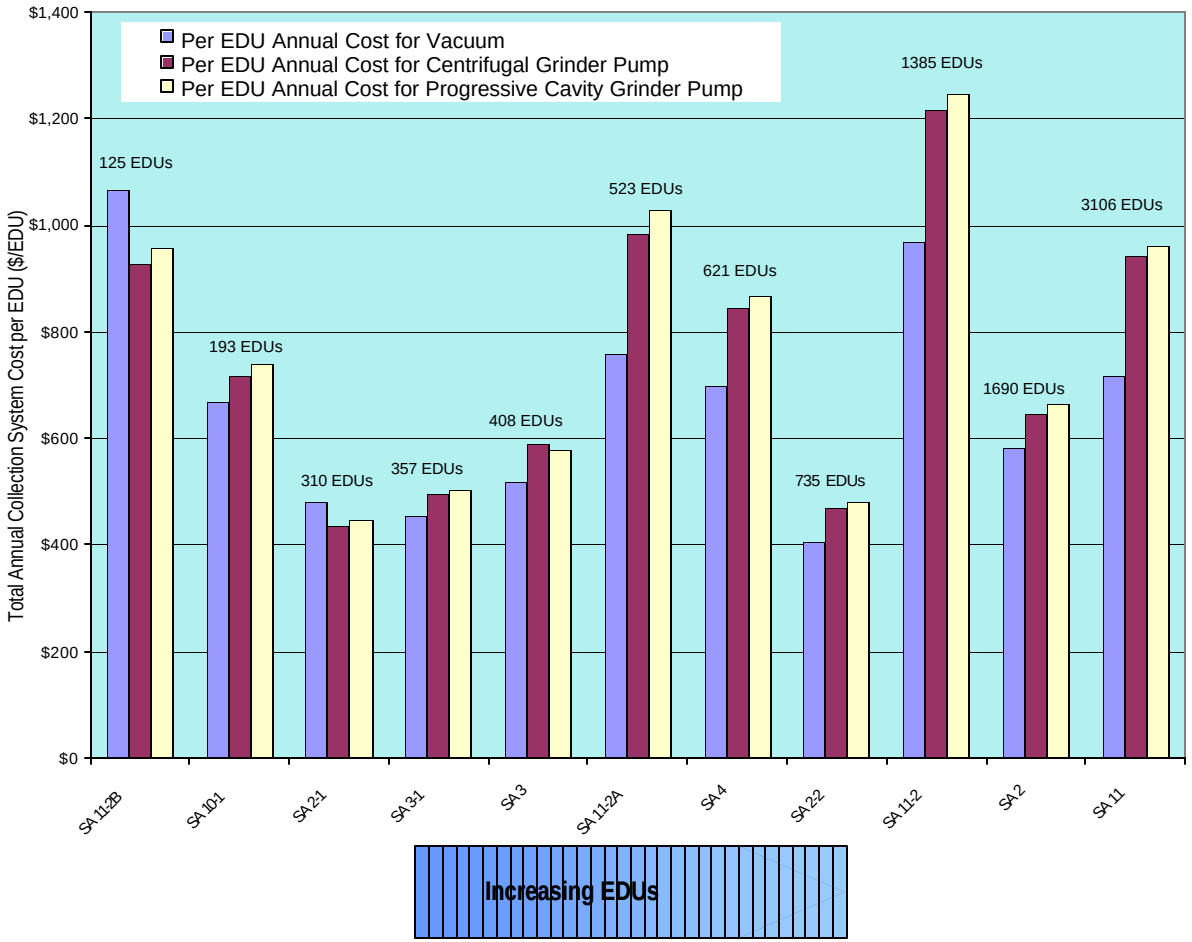


EXHIBIT 3-37
Vacuum sewers were the most cost-effective collection system alternative when more than 350 EDUs were collected in sewered areas in the Lower and Middle Keys.

For various reasons, such as age and weather, older sewer systems are never completely watertight. Ground and surface waters can enter the sewer system, and create operating challenges for a wastewater treatment system. Inflow is the term used to describe water that enters a sewer system from above ground or storm drains. Infiltration is the term used to describe water that enters the sewer system from below ground. The amount of infiltration and inflow (I/I) depends on

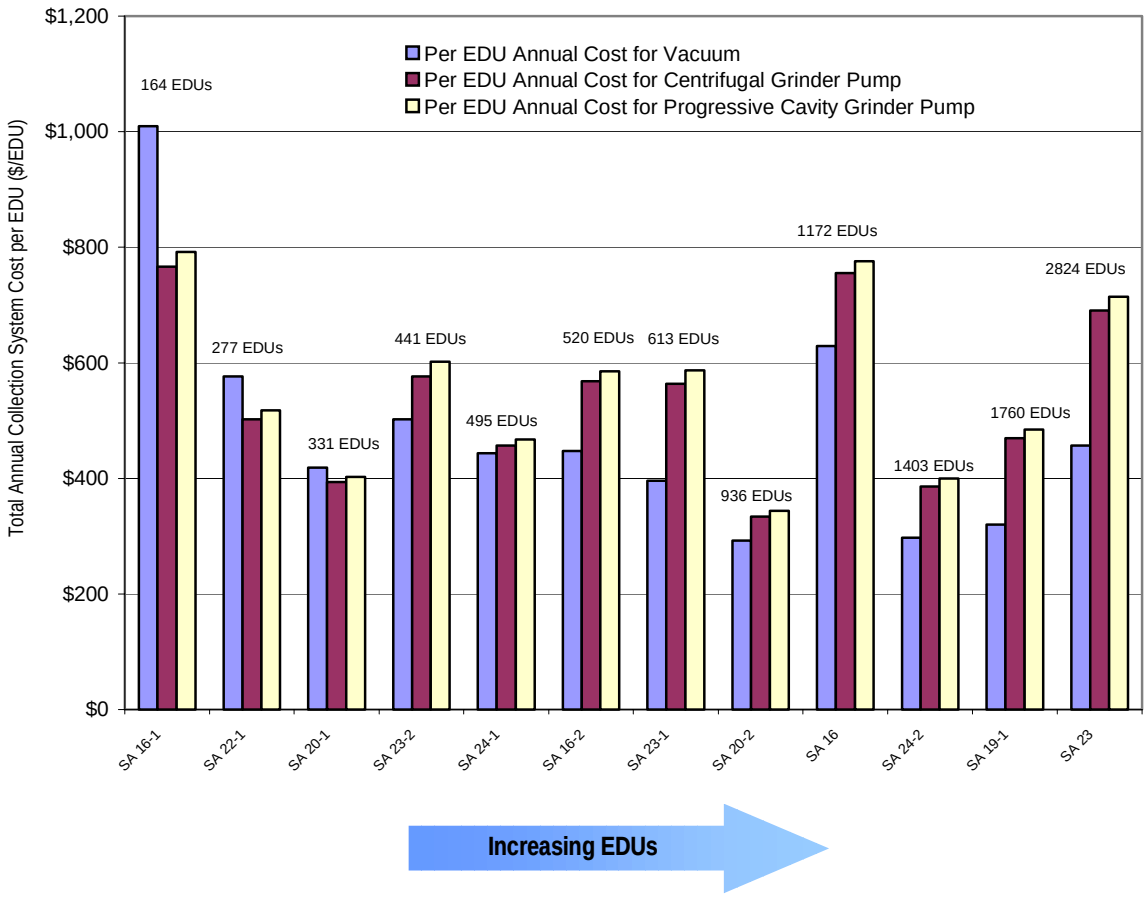


EXHIBIT 3-38
Vacuum sewers were the most cost-effective collection system alternative when more than 350 EDUs were collected in sewered areas in the Upper Keys.

the amount of rain and the number and size of cracks, holes, and leaky joints in the piping system. When it rains, large volumes of I/I can enter the sewer system and can disrupt normal plant operations, and lower operating treatment efficiency. Treating the extra water is expensive, because more capacity is needed at the plant to handle the additional flows to the plant. Exhibit 3-39 illustrates the I/I phenomenon.

Rehabilitation of gravity collection systems to reduce I/I and rehabilitation of master lift stations would need to be considered for those collection systems connecting to a regional utility. All facilities with significant collection system I/I should be required to reduce I/I to levels acceptable to the regional utility prior to connecting to the regional system. Master lift stations that would pump into the regional utility force main should be upgraded to meet regional utility standards. If these master lift stations are upgraded, the regional wastewater utility should accept them for O&M. This would be desirable, particularly for the larger lift stations, so that the utility could exercise adequate control over operation of the regional collection system.

3.9 GIS Database and Data Collection

The scope of work for this Master Plan called for developing a master wastewater database in a GIS format, which are electronic maps of the Keys, onto which land features, such as vegetation, land use, flood zones, etc. are overlayed. The GIS format facilitates detailed analyses of data by specific geographic regions, including the 27 study areas of the Master Plan. This ability to analyze data by geographic region, coupled with the ability of the GIS software (ARC/INFO) to electronically sort and manage the data, provided the team with a powerful platform to perform the extensive data analyses and evaluations of wastewater management alternatives required in the development of this Master Plan.

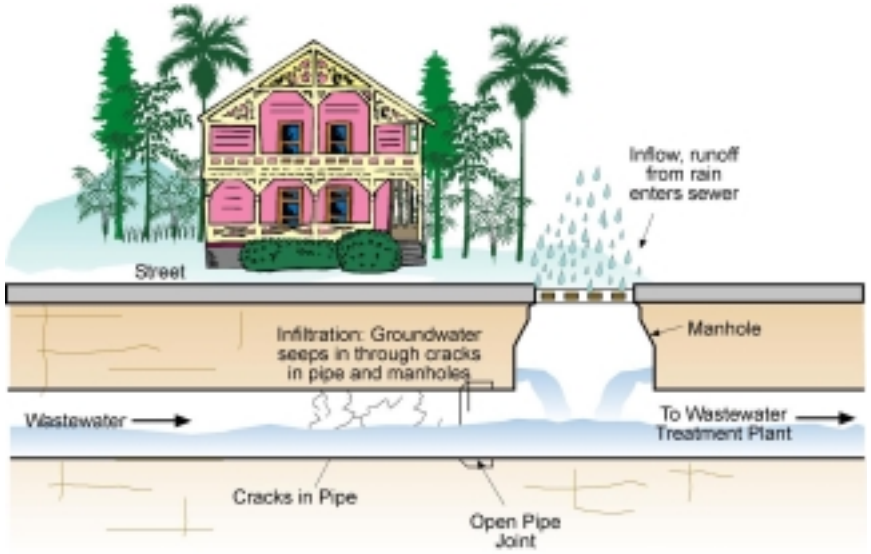


EXHIBIT 3-39
Common Sources of Infiltration and Inflow

3.9.1 Sources of Data

Multiple existing databases were evaluated for their usefulness in developing background data and future projections of wastewater flows, population, nutrient loadings, and other data relevant to the wastewater Master Plan. A secondary task was to assess their potential usefulness in other future environmental studies, such as the *Stormwater Master Plan*, the Monroe County *Carrying Capacity Study*, and the *Total Maximum Daily Load (TMDL) Study*. Existing databases or portions of database information that were not used in the development of this Master Plan, but were deemed to be useful in these other studies, were compiled and stored for future reference or use. Detailed descriptions of the databases are provided in Technical Memorandum No. 1, located in Volume 3, *Supporting Documents*. The existing databases that were evaluated include:

- The FKAA's GIS and tabular databases
- Monroe County Property Appraiser's tabular and GIS databases
- Monroe County Building Permit database
- Monroe County Well and Cistern database
- Monroe County Department of Health (MCDOH) database for onsite wastewater system permits
- MCDOH cesspool database
- FDEP wastewater facilities databases
- Florida Marine Research Institute (FMRI) GIS database
- South Florida Water Management District (SFWMD) GIS database
- U.S. Army Corps of Engineers (USACOE) databases
- Federal Emergency Management Administration (FEMA)
- U.S. Environmental Protection Agency "Storage/Retrieval" (STORET) database

3.9.2 GIS Database Development

Following the preliminary assessment of existing databases, an extensive effort was undertaken to consolidate all databases into the master GIS database. A summary of these activities follows in the subsequent paragraphs. More detailed descriptions of these tasks and their work products are provided in Technical Memorandum No. 2, in Volume 3, *Supporting Documents*.

3.9.2.1 Linkage and Consolidation of Databases

Consolidation of individual GIS and tabular databases into a master GIS database was typically accomplished through one of the following three processes:

- Linking a common field within two databases, typically the Real Estate (RE) number
- Attaching data to the new GIS map by determining the location of the data and finding the corresponding parcel on the map
- Overlaying GIS coverages onto the GIS parcel map

The fact that these databases were created independently by a variety of agencies with no focus on eventually merging them into a common database created some challenges in the development of the GIS database including:

- The only databases sharing a common field (RE number) were those developed and maintained by Monroe County (Property Appraiser's and Building Department databases).
- RE number fields in the FKAA customer account database and the MCDOH databases for onsite systems were incomplete, with RE numbers entered in only 10 percent (FKAA) to 30 percent (MCDOH) of database records.
- GIS coverages developed by different agencies did not match up with each other precisely; misalignment of data layers varied from several feet to several hundred feet.
- Geographic coverage of the various GIS databases varied and many did not provide complete coverage of Monroe County.

The Master Plan scope of work originally called for assigning RE numbers from the Monroe County Property Appraiser's database to records in the FKAA database, to the extent allowed by the database limitations. Directly linking these two databases would enable the placement of historical FKAA water use on individual parcels of the County's GIS parcel map. However, inaccuracies and omissions in both databases precluded this approach from proceeding. Instead, a GIS map was developed that assigns geographic locations to FKAA water customers, allowing distribution of the accounts among the 27 Master Plan study areas. This alternate method was judged to be adequate to estimate wastewater flows and other relevant project data at the master planning level. A procedure for accomplishing the original objective of directly linking the FKAA and Property Appraiser's databases through the RE number field, once the present deficiencies in the databases are corrected, is described in Technical Memorandum No. 2 (Volume 3, *Supporting Documents*).

3.9.2.2 Master Wastewater Database

All components of the Master Wastewater Database were provided to Monroe County on a compact disk, and includes the following items:

- GIS base map (described in the previous section) with a coverage that identifies each parcel with an RE number
- A tabular database for each parcel, primarily developed from the Monroe County Property Appraiser and Building Department databases; this database is linked to each parcel on the GIS base map through the common RE number field
- Various GIS coverages obtained from SFWMD, FEMA, FMRI, USACOE and EPA that were overlayed onto the GIS parcel map (see Technical Memorandum No. 2 in Volume 3, *Supporting Documents*, of this Master Plan)
- FDEP Facility Spreadsheet of 246 WWTPs located in the planning area, linked to the GIS base map by locating each WWTP on the map and assigning to appropriate parcels
- MCDOH Permitted Systems Spreadsheet, partially linked to GIS map through RE number (for 60 percent of the 2,808 records)
- MCDOH Unknown Systems Spreadsheet, partially linked to GIS map through RE number (for 93 percent of the 7,819 records)
- Population Projections Spreadsheet
- Well and Cistern Information Spreadsheet

The tabular database for parcels contains 66,350 records (parcels), with 53 separate data fields for each. These fields included parcel owner and address

information, existing and future land use, zoning, parcel area, number of existing units on developed parcels, number of potential future units on vacant parcels, information on the type of wastewater system serving the parcel, and the estimated wastewater flow for residential parcels. Descriptions of these database fields, the number and percentage of records completed for each field and notes on the source for each field are provided in Technical Memorandum No. 2, in Volume 3, *Supporting Documents*, of this Master Plan.

All GIS coverages were overlayed on the GIS base map with reasonable accuracy, but there was some overlay error near parcel boundaries. This did not adversely affect regional analyses at the level required for master planning.

★★★★★★

Chapter 4
Wastewater Facilities Siting

"Not in my backyard!" This statement is a recurring phrase echoed by residents in many public meetings when discussing locations for wastewater facilities. Recognizing the strong public opinion on this subject, throughout the development of this Master Plan, the Sanitary Wastewater Master Plan team held multiple meetings with members of the community and key stakeholders to solicit public input and address their principal concerns. As discussed in Chapter 2, the team also developed an objective, structured decision model to aid in selecting facility sites. This model aided in identifying and prioritizing competing objectives, and was useful in recommending acceptable sites that would generate the least amount of public opposition.

The decision model for selecting site locations was described in detail in Chapter 2, and focused on four objectives—Maximizing Public Acceptance, Minimizing Cost, Maximizing Beneficial Land Use Characteristics, and Minimizing Environmental Impacts. A rigorous process was employed where stakeholders and Sanitary Wastewater Master Plan Technical Advisory Committee (SWMP TAC) members developed measures to evaluate and weight these criteria. As shown in Exhibit 4-1, Maximizing Public Acceptance is considered the most important objective and uses four criteria to measure this:

- Avoid sites with adjacent residential land use
- Avoid non-residential, sensitive land use sites, such as commercial areas with shops, resorts, or restaurants; focus facilities in industrial land use areas
- Avoid future residential lands
- Consider sites that promote the potential for wastewater reuse

EXHIBIT 4-1
Ranking Objectives and Evaluation Criteria

Objective	Evaluation Criteria	Objective Percentage	Rank
1. Land Use Characteristics	Gross Buildable Area (WWTP size-dependent)	13	4
2. Public Acceptance	Adjacent Residential Land Use Non-residential, Sensitive Land Use Future Residential Land Use Potential for Wastewater Reuse	57	1 3 6 7
3. Environmental Impact	Endangered Species Buffer	9	5
4. Cost	Net Present Value (NPV); Cost, Based on Assessed Value	21	2
Total		**100**	

In accordance with these ranked objectives, a screening process was used to eliminate unacceptable or infeasible sites from further consideration for potential facility locations. These areas included residential areas, CARL[12]/COBRA lands[13], FEMA Zone V areas[14], and land inhabited by endangered species.

Using this Siting Decision Model to assess the remaining parcels, 42 sites were identified in areas throughout the Keys as having the potential to accommodate community and regional wastewater treatment plants (WWTPs) of various sizes. Exhibit 4-2 presents these results. The potential sites are grouped into classifications of Lower Keys and Middle and Upper Keys (excluding Marathon). The potential sites are also grouped into four treatment plant flow size ranges.

The most promising sites where community or regional WWTPs are to be located are presented in Appendix D in Volume 2 of this Master Plan. Model output scores for these sites are also provided in Appendix D. Locations with the highest scores suggest the most promising sites.

Smaller sites are required for vacuum stations and for interim WWTPs than for those central sewer systems that will be phased into a regional system. The vacuum stations can be sited on a vacant lot of approximately 50 feet by 100 feet.

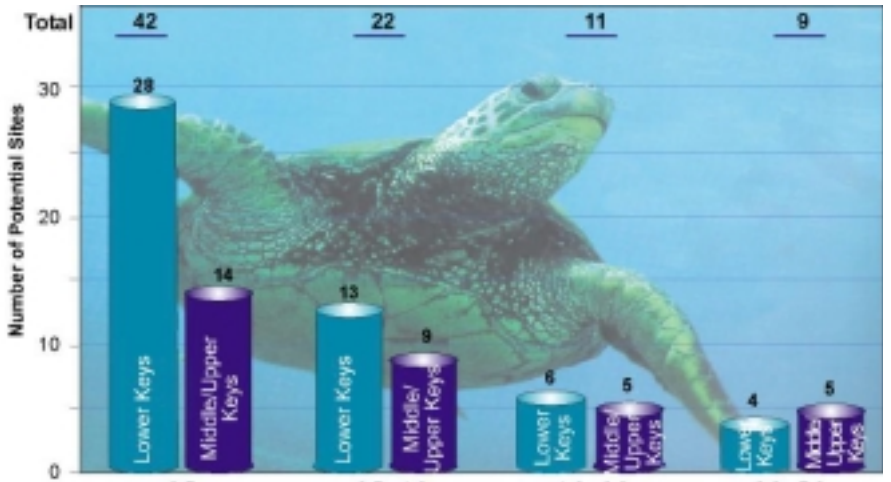


EXHIBIT 4-2
Potential Facility Sites that Meet Evaluation Criteria

[12]CARL is defined as the Conservation and Recreation Lands Program, established by the Florida Legislature in 1979.
[13]COBRA is defined as the Coastal Barrier Resources System, which precludes use of any federal funds (including State Revolving Fund or federal grants) for development of the site.
[14]FEMA Zone V areas are defined as coastal flood areas with velocity hazard.

The interim WWTPs will require a combination of several contiguous vacant lots of sufficient size to accommodate the WWTPs and, by necessity, must be located within, or immediately adjacent to, the central sewer system that it serves. There are more than 10,000 of these vacant smaller sites available throughout the Keys. Maps contained in Appendix D identify these potential smaller sites.

A program should be initiated immediately to purchase sites for future wastewater facilities through the Land Authority. Exhibit 4-3 summarizes WWTP sites that should be considered for purchase in the different community and regional wastewater service areas. When more than one site is located in a given service area, the suggested order of consideration and pursuit is also presented. Exhibit 4-4 provides additional detail for each of these sites and also summarizes the total number of sites of adequate size that were identified for each of the proposed service areas. The smaller vacuum station sites and interim WWTP sites should also be included in this program.

As noted previously, sites identified here do not include sites on the CARL list. However, because of limited sites in some service areas, pursuit of a site on the CARL list that has not yet been purchased by the State may have to be considered. Otherwise, consideration may have to be given to purchasing a site that is currently developed and then converting its use to a WWTP site.

EXHIBIT 4-3
Suggested Community and Regional Wastewater Treatment Plant Sites to Consider for Purchase[1]

Wastewater Service Area	Wastewater Sites to Consider	Remarks
Big Coppitt	Site A or B Other Sites in General Area	
Bay Point	Site C	If purchase is not an option, perhaps long-term lease could be negotiated
	Site B	Or other adjacent property
Lower Sugarloaf	Site C	
Summerland/Cudjoe/ Upper Sugarloaf Regional	Cudjoe - Site B Summerland - Site B	Cudjoe Site B is preferred because it is more centrally located
Big Pine Regional	Big Pine - Site F Big Pine - Site D Big Pine - Site C	
Conch Key	--	Investigate area adjacent to highway
Long Key/City of Layton	--	Investigate long-term lease on Monroe County solid waste transfer station property
Lower Matecumbe	Site B Site C	
Islamorada Regional	Windley Key - Site C	
Tavernier/Key Largo Regional	PAED 17 - Site D Tavernier - Site A	Tavernier Site A is not central to regional system

[1]Refer to exhibits in Appendix D in Volume 2 for details.

In the interim, until a purchased site is used for a wastewater facility, the site could be used for passive recreational facilities, such as hiking trails. Depending on site size, location, and other characteristics, an active WWTP site also may accommodate certain recreational facilities on the same site.

★★★★★★

EXHIBIT 4-4
Site Characteristics of the Most Promising Regional and Community WWTP Sites

Wastewater Service Area	Total No. of Potential Sites of Adequate Size for Service Area	Study Area	Site Letter Designation	Total Size of Site (Acres)	Mangroves (Scaled Acres)	Hardwood Hammock (Scaled Acres)	Disturbed/Open (Scaled Acres)	Remarks
Big Coppitt	2	Boca Chica						Other adjacent areas on Rockland Key may also be available.
			A	5.08	0.9	0	4.2	Zoned industrial.
			B	5.85	1.3	0	4.5	Zoned Industrial.
Bay Point	2	Bay Point						
			C	1.45	0.6	0	0.8	Zoned Recreational Vehicle. If purchase is not an option, perhaps long-term lease would be negotiated.
			B	1.07	0	0	1.07	Zoned Suburban Commercial.
Lower Sugarloaf	3	Lower Sugarloaf						Potential sites in area north of U.S.1 may also be investigated.
			C	8.10	4.5	0.5	3.1	Zoned Improved Subdivision.
Summerland/ Cudjoe/Upper Sugarloaf Regional	4							
		Cudjoe	B	60.62	52.7	0	7.9	Active quarry area zoned Industrial; surrounding area zoned Native Area.
		Summerland	B	4.0	0.9	0	3.1	Zoned Suburban Residential.
Big Pine Regional	6							
		Big Pine	F	16.87	11.8	0	5.1	Zoned Suburban Commercial.
		Big Pine	D	7.90	0	0	7.90	Zoned Suburban Commercial.
		Big Pine	C	8.36	0	0	8.36	Zoned Industrial. Contamination assessment of site should be performed.

EXHIBIT 4-4
Site Characteristics of the Most Promising Regional and Community WWTP Sites

Wastewater Service Area	Total No. of Potential Sites of Adequate Size for Service Area	Study Area	Site Letter Designation	Total Size of Site (Acres)	Mangroves (Scaled Acres)	Hardwood Hammock (Scaled Acres)	Disturbed/Open (Scaled Acres)	Remarks
Conch Key	1	Marathon Secondary						Zoned Commercial Fishing Special District. Due to the fully developed nature of the island, plant site can only be on vacant land adjacent to U.S.1.
Long Key/City of Layton	0	Long Key						No sites are available. Thus, recommendation to pursue lease on Monroe County Solid Waste Transfer Station property.
Lower Matecumbe	3							
		Lower Matecumbe	B	1.36	0	0	1.36	Zoned Commercial Fishing Special District.
		Lower Matecumbe	C	1.13	0	0.5	0.6	Zoned Suburban Commercial.
Islamorada Regional	3	Windley Key	C	17.26[1]	14.12[1]	0	3.1	Zoned Suburban Commercial.
Tavernier/Key Largo Regional	2	PAED 17	D	9.98	1.5	0	8.5	Zoned Recreational Vehicle.
		Tavernier PAED 15	A	19.41	5.9	1.0	12.5	Zoned Suburban Commercial.

[1]Large portion of parcel is submerged land. Only about 4.3 acres are actual land area.

Chapter 5 Wastewater Management Alternatives and Service Area Analyses

The varied character of the islands that comprise the Keys presents a series of challenges that must be addressed in this Master Plan. Comprised of both small and large islands, population distribution ranges from dense to sparse, and vegetative cover, where it exists, varies from tropical hardwoods to wetlands. Therefore, in order for this plan to be effective, it must consider a wide range of options to meet the unique needs of the Keys. No single solution will work. Accordingly, comprehensive and detailed comparisons were conducted of various wastewater management alternatives, including combinations of wastewater management alternatives, that would work in different areas of the Florida Keys. The alternatives evaluated ranged from simply replacing illegal cesspools to regional centralization. (See Exhibit 5-1).

To facilitate the analysis, the Keys were divided into 27 study areas (see Exhibits 1-2, 1-3, and 1-4 in Chapter 1). Assessments were then made of each identified alternative to determine its potential for accomplishing established objectives in each of the study areas, including its ability to:

- Reduce Nutrient Loads
- Minimize Projected Overall Costs
- Minimize Operations and Maintenance Costs

EXHIBIT 5-1
The varied character and land uses of the Keys is a challenge to developing a wastewater management plan.

- Meet Regulatory Standards
- Gain Public Acceptance

The wastewater management alternatives evaluation and service area analyses were performed in a structured, step-by-step process, which featured a three-level approach. In the first step, seven of the 27 study areas were chosen as being representative of the Keys' character and features. Then, up to 43 wastewater management alternatives were identified, and a preliminary screening process was conducted to test each of these alternatives in the seven representative study areas.

In the next step, the wastewater management alternatives that had favorable results in the preliminary screening of the seven study areas were evaluated in each of the 27 study areas. Lastly, study areas were combined, and the most promising wastewater management alternatives were evaluated in combined study areas where community collection and treatment seemed to be feasible. This last step enabled the team to assess the feasibility and practicality of establishing regional or sub-regional systems. Exhibit 5-2 illustrates the screening process used to evaluate study areas. Wastewater flow, types and numbers of existing sanitary sewage disposal systems and treatment facilities, standard and customized costs of implementation, and nutrient removal effectiveness of each of the existing and proposed wastewater management alternatives were evaluated.

In addition, a wastewater management alternatives analysis decision model was developed to assist in the evaluation of the multitude of alternatives and analyses (See Chapter 2). This decision model was used throughout the preliminary screening, final screening, and evaluation of combined study areas. Technical Memorandum No. 12, Volume 5, *Supporting Documents*, provides a detailed discussion of the methodology used to identify and evaluate feasible wastewater management alternatives and service areas.

The following sections provide a more detailed description of the screening process.

5.1 Preliminary Screening of Wastewater Management Alternatives

The seven study areas described above that were selected for the preliminary screening are illustrated in Exhibit 5-3, and include:

Study Area No. 2: Boca Chica, Rockland, Big Coppitt, and Geiger

Study Area No. 3: Bay Point

Study Area No. 4: Lower Sugarloaf

Study Area No. 8: Big & Middle Torch

Study Area No. 11: Big Pine (Sub Area 2 Only)

Study Area No. 16: Lower Matecumbe

Study Area No. 23: Key Largo/PAED 18

These selected areas were representative of a wide range of development and population densities, ranging from very sparse areas, such as Big and Middle Torch Key, which averages 0.02 equivalent dwelling units (EDUs)/acre, to very heavily developed areas, such as Key Largo PAED 18, which averages 2.5 EDUs/acre. These areas also varied in the number of EDUs, from as little as 56 on Big and Middle Torch Key, to as many as 2,824 on PAED 18. The size of each study area varied as well, from as small as 990 acres on Bay Point to 2,560 acres (4 square miles) in Sub-area 2 of Big Pine Key.

The 43 alternatives were tested in these study areas in various combinations, such as:

- Replace illegal cesspools with various onsite treatment technologies
- Replace illegal cesspools and upgrade substandard septic systems with

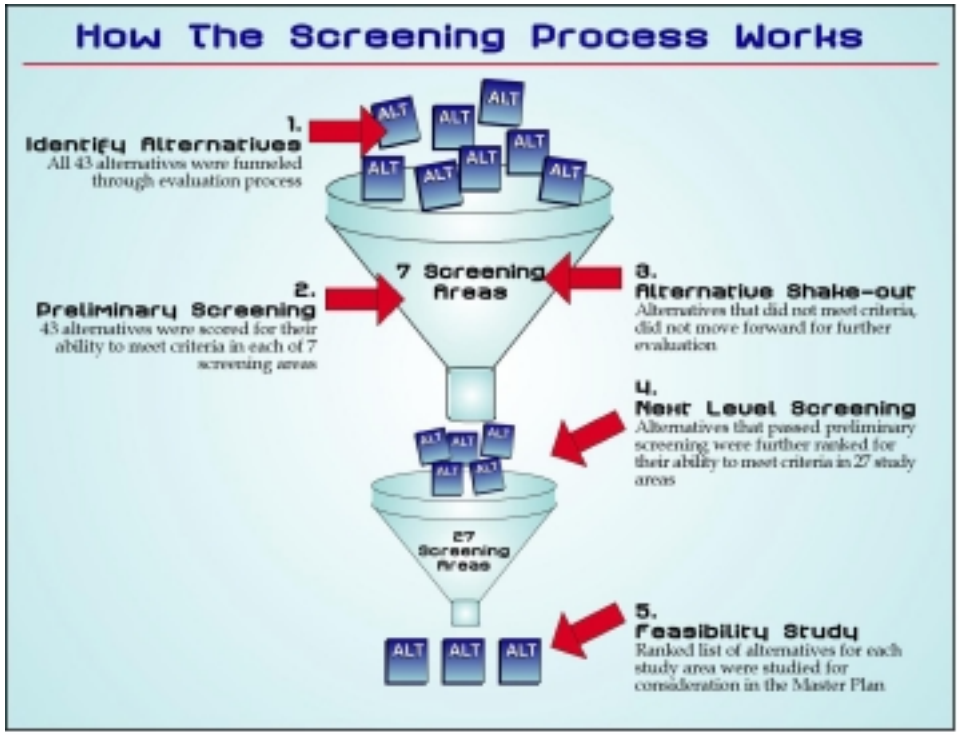


EXHIBIT 5-2
Wastewater Management Alternatives Screening Process

various onsite treatment technologies, and upgrade all existing package wastewater treatment plants (WWTPs) to Best Available Technology (BAT) or Advanced Wastewater Treatment (AWT), whichever is applicable.

- Replace illegal cesspools and upgrade substandard and permitted onsite systems with various onsite treatment technologies. Also, upgrade or replace existing package treatment plants to BAT or AWT, whichever is applicable.
- Provide the recommended sewage collection system and a secondary WWTP with Class V injection wells or other effluent disposal alternative. Evaluate wastewater reuse based on existing reuse practices and reuse demand.
- Provide the recommended sewage collection system and a BAT or AWT WWTP, whichever is applicable, with Class V injection wells or other effluent disposal alternatives. Evaluate wastewater reuse based on existing reuse practices and reuse demand.
- Evaluate secondary treatment with phosphorus removal only, instead of a BAT/AWT WWTP.

Onsite systems initially evaluated were:

- Septic tank with drainfield
- Aerobic treatment unit (ATU) with drainfield
- Performance-based (PB) systems with borehole
- Septic tank with phosphorus adsorbing media and subsurface drip irrigation (SDI)
- ATU with phosphorus adsorbing media and SDI
- Onsite wastewater nutrient reduction systems (OWNRS)

5.2 Final Screening of Wastewater Management Alternatives

Through the preliminary screening process, eight wastewater management alternatives consistently showed promise and were evaluated in the final screening process. Two cluster system alternatives were also evaluated, resulting in a total of ten wastewater management alternatives that were evaluated in the final screening process. The ten final alternatives included:

1. Replace or upgrade all onsite systems to septic tanks with phosphorus adsorbing media and SDI, and upgrade all existing WWTPs to phosphorus removal.
2. Replace or upgrade all onsite systems to septic tanks with phosphorus adsorbing media and SDI, and upgrade all existing WWTPs to BAT or AWT standards, as appropriate.
3. Replace or upgrade all onsite systems to ATU with phosphorus adsorbing media and SDI,

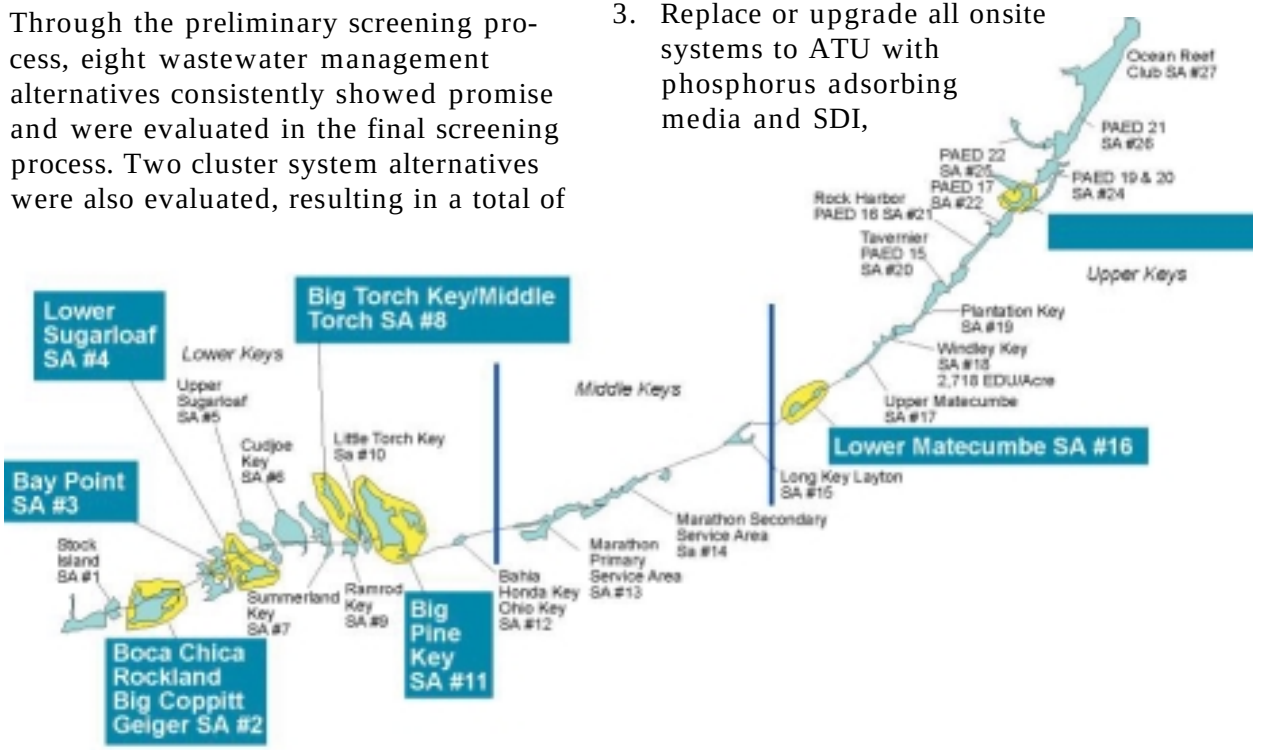


EXHIBIT 5-3
Seven Study Areas Selected for Preliminary Screening of up to 43 Wastewater Management Alternatives

and upgrade all existing WWTPs to phosphorus removal.

4. Replace or upgrade all onsite systems to ATU with phosphorus adsorbing media and SDI, and upgrade all existing WWTPs to BAT or AWT standards, as appropriate.
5. Replace or upgrade all onsite systems to OWNRS and upgrade all existing WWTPs to phosphorus removal.
6. Replace or upgrade all onsite systems to OWNRS and upgrade all existing WWTPs to BAT or AWT standards, as appropriate.
7. Replace or upgrade all onsite systems to 2-home shared cluster OWNRS and upgrade all existing WWTPs to provide phosphorus removal.
8. Replace or upgrade all onsite systems to 2-home shared cluster OWNRS and upgrade all existing WWTPs to BAT or AWT standards, as appropriate.
9. Provide central collection by vacuum and treatment at a central phosphorus removal WWTP.
10. Provide central collection by vacuum and treatment at a central BAT/AWT WWTP, as appropriate.

In evaluating the cluster system alternatives with other wastewater management alternatives presented in Chapter 5, the two-home shared cluster system was considered to be the "average" size cluster system that would be representative of all individual and cluster systems within a given study area. The costs for all two-home cluster systems is equivalent to the costs of equal numbers of individual onsite systems, two-home shared cluster systems, and four-home shared cluster systems, and was judged to represent the likely distribution of onsite systems within a given study area.

The final screening process yielded three alternatives that performed best when tested against the evaluation criteria and met the new effluent standards:

1) Regional collection and treatment to BAT/AWT
2) OWNRS
3) Two-home shared cluster OWNRS

Exhibit E-1 in Appendix E, Volume 2, presents the top three final screening wastewater management alternatives that meet current effluent standards for each of the 27 study areas.

5.3 Combining Study Areas to Evaluate Regional Wastewater Collection and Treatment

For those study areas where collection and treatment was the preferred wastewater management alternative, study areas were combined in different combinations to evaluate the feasibility and practicality of establishing regional or sub-regional systems, rather than having separate smaller service areas for each study area.

In many cases, combining study areas increases the design flow from a service area to the point where the feasibility and practicality of a deep injection well system should be evaluated. Although deep injection wells are expensive to construct and operate, the environmental benefit is greater than for shallow injection wells because 100 percent of the nutrients are removed from the environment. As noted in Chapter 3, Florida statutes require deep injection wells as the means of effluent disposal for design flows greater than 1.0 mgd.

A total of 47 combinations were evaluated during the development of this Master Plan. This chapter summarizes those that were proven to be significant in formulating the overall recommended wastewater Master Plan. See Technical Memorandum No. 12 in Volume 5, *Supporting Documents*, for details on the entire range of combinations studied.

Costs for significant Combinations of Study Areas are presented in Exhibit E-2 in Appendix E, Volume 2. In instances where the combination cost per EDU is within 10 percent of the weighted average cost per EDU, costs are considered the same, and factors other than cost alone should be considered in selecting the final alternative.

5.4 Basis of Cost

Installation, operation, maintenance, and replacement costs for onsite alterna-

tives were adapted from Technical Memorandum 7 (see Volume 4, *Supporting Documents*). Community-based collection and treatment alternatives were sized and priced based on data developed in Technical Memoranda 6, 8, 8S, 9, and 10 (Volume 4, *Supporting Documents*) for installation, operation, maintenance, and replacement costs, and include decommissioning existing onsite systems, construction of sewer service laterals from the building to the collection system in the street, upgrades of existing pumping stations that were assumed to remain in service, land purchase for vacuum station and wastewater treatment plant property, and engineering and administrative costs.

★★★★★★

Chapter 6
Water Quality Hot Spots

Significantly decreasing the high level of nutrients that is discharged into the surrounding waters of the Florida Keys is recognized as being the key to improving the water quality of the waters surrounding the Keys. This is evidenced in the 1999 Florida legislation that mandates the reduction of nutrients in effluent from both onsite systems and wastewater treatment plants. As referenced in Chapters 1 and 3, this legislation also requires that by July 1, 2010, all existing onsite wastewater facilities, which currently include 23,000 systems, must either cease discharging or upgrade to meet the new nutrient reduction standards:

- For onsite systems and community collection and treatment systems with design flows of less than or equal to 100,000 gallons per day (gpd), best available technology (BAT) standards of 10/10/10/1 apply
- For design flows greater than 100,000 gpd, advanced wastewater treatment (AWT) standards of 5/5/3/1 apply

The subject of this Master Plan has been to determine the most efficient, economical, and technically effective means of meeting this mandate and the water quality goals for the surrounding waters of the Keys. Another consideration in preparing this Master Plan is the local ordinance passed by Monroe County in 1999 to revive the Cesspool Identification and Elimination Program[15]. Actually, a goal of this Master Plan is to coordinate the Cesspool Identification and Elimination Program with the master planning efforts. This ordinance calls for the establishment of Water Quality "Hot Spots," defining "Hot Spots" as areas that are anticipated to be served by central community wastewater systems within the next 10 years or by the year 2010.

[15]Monroe County Ordinance No. 031-1999, Cesspool Identification and Elimination Ordinance

The analyses of wastewater management alternatives described in Chapter 5, *Wastewater Management Alternatives and Service Area Analyses*, as well as Technical Memorandum No. 12, which is included in Volume 5, *Supporting Documents*, of this Master Plan, demonstrate that it is much more cost effective and environmentally sound to provide community wastewater collection and treatment in most areas of the Keys (25 out of the 27 study areas), than to upgrade or replace all existing onsite systems with shared cluster onsite wastewater nutrient reduction systems (OWNRS), and to upgrade all existing wastewater treatment plants to a BAT or AWT nutrient reduction system.

There is no doubt, as the year 2010 approaches, property owners with existing onsite systems will opt for the least expensive alternative for them and the surrounding area, which would entail hooking up to a central collection and treatment system. The monthly costs for the community collection and treatment system alternatives for the different study areas are projected to range from $80 to $140 per equivalent dwelling unit (EDU); these costs do not include any grant funding or subsidies. These costs are much less expensive than the projected cost of the second best alternative, which is the shared cluster OWNRS system that ranges from $94 to $166 per EDU for the different study areas; or the third best alternative, which is the individual OWNRS that ranges from $125 to $232 per EDU for the different study areas. Both of these alternative OWNRS costs also do not include any grant funding or subsidies.

Thus, central wastewater collection and treatment systems would be implemented in those areas where the wastewater management alternatives analyses determined that sufficient density existed to make central sewers cost effective, in order to comply with the upgrade schedule set by the 1999 Florida statutes. As all these areas would be served by centralized community wastewater systems by 2010, they are “Hot Spots” as defined by the Cesspool Identification and Elimination ordinance.

Exhibits 6-1 through 6-3 list the ranked “Hot Spots”, and include “Hot Spots” for the entire Master Plan study area, including Islamorada, Village of Islands and the recently incorporated City of Marathon. The rankings are shown for the entire Keys, (with a ranking of 1 assigned to the “Hot Spot” areas that should be addressed first), as well as for each region of the Keys (Lower, Middle, Upper Keys), regardless of political boundaries. Generally, “Hot Spot” areas encompass two or more subdivisions and adjacent areas. The process used for delineating and ranking “Hot Spots” is described in Technical Memorandum No. 13, *Service Area Implementation Plan*, in Volume 8, *Supporting Documents* of this Master Plan. These “Hot Spot” areas are also shown on Exhibits F-1 in Appendix F in Volume 2. A detailed copy of these maps can be reviewed at the Monroe County Marine Resources Department in Marathon.

★★★★★★

EXHIBIT 6-1

Hot Spot Areas and Rankings - Lower Keys

Study Area No.	Name	Wastewater Service Area	Hot Spot Area Name	Area Rank by Region	Rank for Entire Keys
1	Stock Island	KW Resort Utility	Unsewered K.W. Resort Utility Resort Area	1	3
2	Boca Chica	Big Coppitt	Coppitt/Johnsonville/Gulfview Porpoise Point/Gulfrest Park and adjacent area along U.S. 1	2	5
3	Bay Point	Bay Point	Bay Point Subdivision and Saddlebunch Shores	3	6
11	Big Pine	Big Pine Regional	Whispering Pines (S)/ Sands/Grieser/ Ross Haven/Pat&Mary/Big Pine Cove, and adjacent area along U.S. 1	4	8
11	Big Pine	Big Pine Regional	Doctor's Arm/Lambert/Tropical Bay, Palma Villa, Whispering Pines (N)	5	11
10	Little Torch	Big Pine Regional	Coral Shores, Windward Beach Estates, Mate's Beach, Jolly Roger Estates, and area east of Mate's Beach south to Jolly Roger Estates	6	16
7	Summerland	Summerland/ Cudgoe/Upper Sugarloaf Regional	Summerland Key Cove/Summerland Cove Isle	7	23
11	Big Pine	Big Pine Regional	Eden Pines Colony	8	25
11	Big Pine	Big Pine Regional	Big Pine Key, Inc., Tropical Key Colony, Pine Channel Estates, Cahill Pines & Palms, and adjacent area along U.S. 1	9	26
6	Cudjoe	Summerland/Cudjoe/Upper Sugarload Regional	Cutthroat Harbor Estates, Cudjoe Ocean Shores	10	28
5	Upper Sugarloaf	Summerland/Cudjoe/Upper Sugarload Regional	Indian Mound Estates, Gulf Shores, Vacation Harbour	11	31
6	Cudjoe	Summerland/Cudjoe/Upper Sugarload Regional	Cudjoe Gardens	12	36
9	Ramrod	Big Pine Regional	Breezeswept Beach Estates, Ramrod Shores, and area along U.S. 1	13	39
2	Boca Chica	Big Coppitt	Rockland Key	14	41
11	Big Pine	Big Pine Regional	Port Pine Heights	15	42
2	Boca Chica	Big Coppitt	Boca Chica Ocean Shores, Tamarac Park	16	43
4	Lower Sugarloaf	Lower Sugar Loaf	Sugarloaf Shores, Orchid Park, adjacent area along U.S. 1	17	44

EXHIBIT 6-2

Hot Spot Areas and Rankings - Middle Keys

Study Area No.	Name	Wastewater Service Area	Hot Spot Area Name	Area Rank by Region	Rank for Entire Keys
13	Marathon Primary	Marathon	Little Venice (Phase I)	1	1
14	Marathon Secondary	Conch Key	Conch Key	2	10
13	Marathon Primary	Marathon	Phased Regional System (Phase II)	3	13
13	Marathon Primary	Marathon	Remainder of Regional System (Phase III)	4	34
14	Marathon Secondary	Marathon	Grassy Key	5	35
14	Marathon Secondary	Hawk's Cay	Duck Key	6	40
15	Long Key/Layton	Long Key/Layton	Long Key Estates, City of Layton, area adjacent to U.S. 1	7	45

EXHIBIT 6-3

Hot Spot Areas and Rankings - Upper Keys

Study Area No.	Name	Wastewater Service Area	Hot Spot Area Name	Area Rank by Region	Rank for Entire Keys
24	PAED 19/20	Tavernier/Key Largo Regional	Lake Surprise/Sexton Cove, Ocean Isle Estates, and adjacent area on U.S. 1	1	2
23	PAED18	Tavernier/Key Largo Regional	Key Largo Trailer Village, Largo Gardens, Hibiscus Park, and area adjacent to U.S. 1	2	4
23	PAED 18	Tavernier/Key Largo Regional	Cross Key Waterway Estates & Largo Sound Park/Anglers Park Shores/South Creek Village and area along U.S. 1	3	7
21	PAED 16	Tavernier/Key Largo Regional	Area A, Wynken, Blyken & Nod	4	9
20	PAED 15	Tavernier/Key Largo Regional	Harris Ocean Park, Palma Sola, Sherrill Park, Hammer Point Park, and along U.S. 1	5	12
19	Plantation Key	Islamorada Regional	Area A - Eastern end of Plantation Key including Plantation Key Colony/Kahiki Harbor/ Edernaire/ Tavernaero/ Tropical Atlantic Shores	6	14
24	PAED 19/20	Tavernier/Key Largo Regional	Remainder of PAED 19/20 - Stillwright Point/Paradise Point Cove, Riviera Village, Key Largo Mobile Home Sites, Largo City	7	15
22	PAED 17	Tavernier/Key Largo Regional	Port Largo, Key Largo Beach, Key Largo Ocean Shores, Silver Lake Park, Holiday Homesites, Buttonwood Shores, Buttonwood Cove, Lazy Lagoon, Point Pleasant Sunset Cove	8	17
16	Lower Matecumbe	Lower Matecumbe	Safety Harbor, Toll Gate Shore, Port Antigua, White Marlin Beach, Matecumbe Sandy Beach, Lower Matecumbe Beach	9	18
23	PAED 18	Tavernier/Key Largo Regional	Bahia Mar Estates/Pamela Villa/Winston Waterways	10	19
22	PAED 17	Tavernier/Key Largo Regional	Pirate's Cove, Rock Harbor Estates, Marion Park, Rock Harbor Manor, Harbor Shores, El Dorado	11	20
21	PAED 16	Tavernier/Key Largo Regional	Bay Haven, Lime Grove Estates, Sunrise Point, Abode Casa Court, Seven Acres, Sunset Gardens, Dove Creek	12	21
17	Upper Matecumbe	Islamorada Regional	Entire Study Area	13	22
20	PAED 15	Tavernier/Key Largo Regional	Old Tavernier	14	24
22	PAED 17	Tavernier/Key Largo Regional	Sunset Waterways, Key Largo Park	15	27
23	PAED 18	Tavernier/Key Largo Regional	Bermuda Shores, Twin Lakes	16	29
19	Plantation Key	Islamorada Regional	Venetian Shores	17	30
18	Windley Key	Islamorada Regional	Entire Study Area	18	32
19	Plantation Key	Islamorada Regional	Treasure Harbor, Plantation Ridge Coral Shores	19	33
19	Plantation Key	Islamorada Regional	Indian Waterways, Indian Harbor, Plantation Key, Lysiloma, Key Heights, Vacation Village, Aergood Heights, Pearl City	20	37
19	Plantation Key	Islamorada Regional	Remainder of Plantation Key	21	38

Chapter 7
The Recommended Sanitary Wastewater Master Plan

The recommended plan to improve wastewater management practices throughout the Keys is illustrated in Exhibit 7-1, and includes four principal components:

1. Upgrade or replace existing onsite systems with onsite wastewater nutrient reduction systems (OWNRS) in "Cold Spot" Areas, which are located in lower density areas of the Keys. ("Hot Spot" areas are defined in Chapter 6 and are depicted in Exhibit F-1 in Appendix F. Areas not designated as "Hot Spots" are "Cold Spot" areas.)
2. Implement central community wastewater collection and treatment system service areas in the more densely developed and highest ranked "Hot Spot" areas where service area analyses indicate central sewer systems are more cost effective and environmentally sound (see discussions in Chapter 5 of this Master Plan and Technical Memorandum No. 12 in Volume 5, *Supporting Documents*).
3. When the number of community treatment systems and the number of customers in selected areas of the Upper and Middle Keys (i.e., Marathon, Islamorada, Tavernier, and Key Largo) increase to the point where it is no longer economical to operate community treatment systems, consolidate them into larger regional treatment systems.
4. Phase implementation of smaller regional systems in the Lower Keys and construct the treatment plants at the proposed regional sites, so that interim community treatment systems are not necessary.

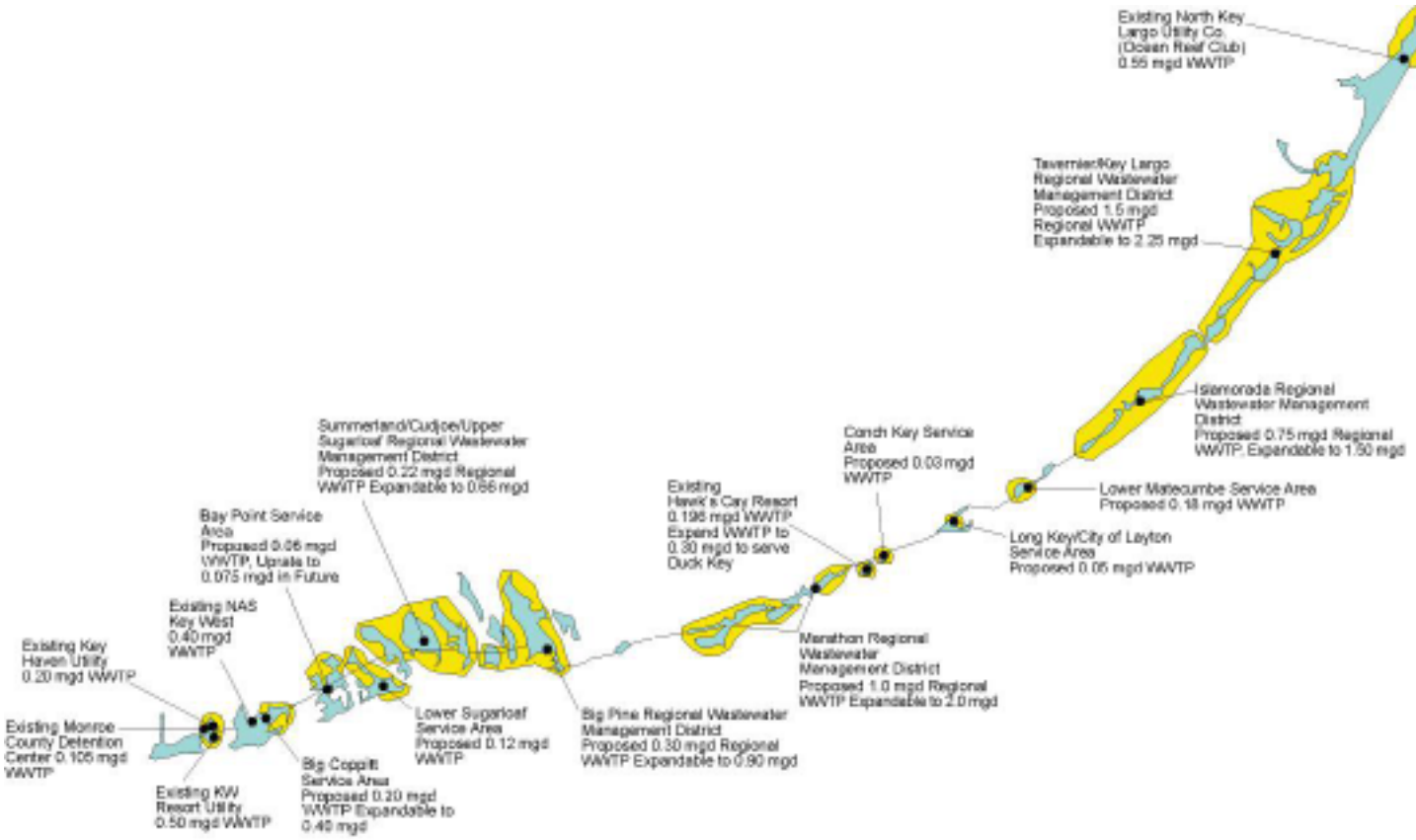


EXHIBIT 7-1
Recommended Wastewater Master Plan Service Areas and Wastewater Treatment Plants

Not all areas are conducive to being consolidated into a regional system because of the distance that would be required between study areas, and consequently, the higher costs associated with implementation of this option. This is particularly true in the Lower Keys.

Therefore, many areas will remain central community wastewater collection and treatment system service areas, and will continue serving one or several "Hot Spot" areas because it is not cost effective to do otherwise. Details of this plan are illustrated in Exhibit F-1 in Appendix F.

7.1 Onsite Systems for "Cold Spots"

Properties within "Cold Spot" areas where onsite systems will continue to operate fall into two categories:

- Those properties with unknown systems that must replace or upgrade their system immediately with a nutrient reduction OWNRS. All these systems must be replaced or upgraded by July 12, 2003.
- Those properties that currently have permits for their onsite systems and will not be required to upgrade or replace them until 2010, when all onsite systems must be upgraded or replaced with nutrient reduction OWNRS to meet the statutory effluent limits of 10/10/10/1.

Capital costs required to implement the onsite systems improvements in "Cold Spots" are summarized in Exhibit 7-2.

EXHIBIT 7-2
Estimated Capital Costs Required to Replace or Upgrade Onsite Systems with Nutrient Reduction OWNRS in "Cold Spot" Areas

Onsite System Type	No. of Systems	Project Capital Cost[1]
Unknown System - Requires immediate replacement or upgrading by July 12, 2003	235	$3,525,000
System with permits - must be replaced or upgraded by July 1, 2010	850	$12,750,000
Total	**1,085**	**$16,275,000**

[1]At $15,000/system.

7.2 Central/Community and Regional Wastewater Systems

As shown in Exhibit 7-1, the recommended plan includes twelve community wastewater collection and treatment systems and five regional systems. Five of the twelve community wastewater collection systems feature interim wastewater treatment plants (WWTPs) that over time will be phased into larger regional systems.

Like any major public works capital program, total funding for implementing this proposed system is a challenge, and a goal of Monroe County officials is to phase this program and seek grant monies to help offset the implementation costs. This would also keep the service rates that would be charged to residents at an affordable level. (Details on funding options are provided in Chapter 8 of this Master Plan.)

Exhibits 7-3 through 7-5 illustrate the recommended wastewater management implementation plan for the Lower, Middle, and Upper Keys, respectively, and also include "Hot Spot" areas by priority ranking. (Exhibit F-2 in Appendix F [Volume 2] presents more detailed information on the proposed wastewater management implementation plan.)

This implementation plan assumes that all existing WWTPs will remain operational until all "Hot Spot" areas are sewered, or until 2010 (when all WWTPs are required to upgrade to the Best Available Technology [BAT] or Advanced Wastewater Treatment [AWT] standard), whichever occurs first. At that time, all existing WWTPs will connect to either a community or regional system, except those existing plants that have been identified in this Master Plan to continue to serve specific areas. The following sections describe the implementation plan by region.

7.2.1 Lower Keys

In the Lower Keys, four new community wastewater systems and two new regional wastewater systems are recommended. The proposed systems are shown in Exhibit 7-3 along with estimated costs of implementation. For the Boca Chica community system and the two regional systems, Exhibits F-3, F-4, and F-5 in Appendix F provide further details on how each "Hot Spot" area is recommended to be phased into these community and regional systems over time and the costs associated with each phase.

Key West Resort Utility Community Service Area [2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
1	Stock Island	Unsewered KW Resort Utility	$3,082,000	Extend wastewater service to unsewered areas of KW Resort Utility franchise area.

Boca Chica Community Service Area [1, 2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
2	Boca Chica	Coppitt/Johnsonville/ Gulfview Porpoise Point/Gulfrest Park and adjacent area along U.S. 1	$11,600,000	Provide wastewater collection service to Hot Spot area. Construct 0.2 mgd WWTP expandable to 0.40 mgd. Other options include negotiate with NAS Key West for capacity or expansion of their WWTP, or negotiate with KW Resort Utilities for capacity or expansion of their WWTP.
14	Boca Chica	Rockland Key	$4,570,000	Provide wastewater collection service to Hot Spot area. Expand WWTP to 0.40 mgd.
16	Boca Chica	Boca Chica Ocean Shores, Tamarac Park	$4,100,000	Provide wastewater collection service to Hot Spot area.
—	—	—	$200,000	Connect package plants to system.

Bay Point Community Service Area [1]

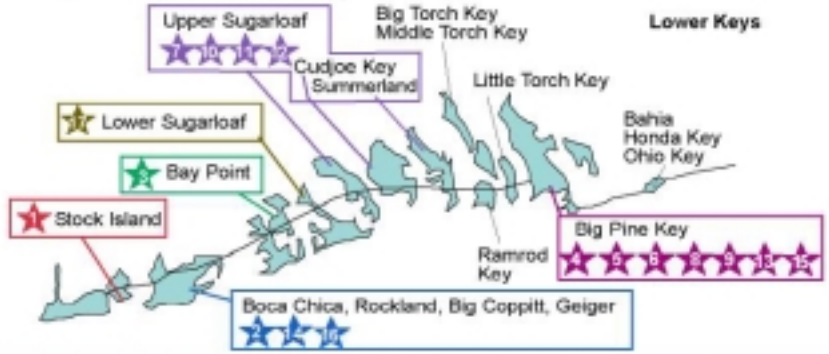
Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
3	Bay Point	Bay Point Subdivision and Saddlebunch Shores	$4,000,000	Provide wastewater collection service to Hot Spot area. Provide 0.06 mgd WWTP, capable of uprating to 0.075 mgd, for this service area.
—	—	—	—	Connect package plant to system; uprate WWTP to 0.075 mgd

Summerland/Cudjoe/Upper Sugarloaf Regional Service Area [1]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
7	Summerland	Summerland Key Cove/ Summerland Cove Isle	$12,860,000	Provide wastewater collection service to Hot Spot area. Provide initial 0.22 mgd WWTP expandable to 0.66 mgd for this regional service area.
10	Cudjoe	Cutthroat Habor Estates, Cudjoe Ocean Shores	$10,420,000	Provide wastewater collection service to Hot Spot area. Expand regional WWTP to 0.44 mgd.
11	Upper Sugarloaf	Indian Mound Estates, Gulf Shores	$3,125,000	Provide wastewater collection service to Hot Spot area.
12	Cudjoe	Cudjoe Gardens	$3,925,000	Provide wastewater collection service to Hot Spot area.
—	—	—	$4,000,000	Expand regional WWTP to 0.66 mgd; connect package plants to system.

Lower Sugarloaf Community Service Area [1, 2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
17	Lower Sugarloaf	Sugarloaf Shores, Orchid Park, adjacent area along U.S. 1	$9,349,000	Provide wastewater collection service to Hot Spot area. Provide 0.12 mgd WWTP for this service area.



Big Pine Regional Service Area [1, 2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
4	Big Pine	Whispering Pines/ Sands/Griesen/Ross Haven/Pat & Mary/Big Pine Cove, adjacent area along U.S. 1.	$11,000,000	Provide wastewater collection service to Hot Spot area. Provide initial 0.30 mgd WWTP, expandable to 0.90 mgd for this regional service area.
5	Big Pine	Doctor's Arm/Lambert/ Tropical Bay, Palma Villa, Whispering Pines	$6,500,000	Provide wastewater collection service to Hot Spot area.
6	Little Torch	Coral Shores, Windward Beach Estates, Mate's Beach, Jolly Roger Estates, and area east of Mate's Beach south to Jolly Roger Estates.	$13,240,000	Provide wastewater collection service to Hot Spot area. Expand regional WWTP to 0.60 mgd.
8	Big Pine	Eden Pines Colony	$5,000,000	Provide wastewater collection service to Hot Spot area. Expand regional WWTP to 0.90 mgd.
9	Big Pine	Big Pine Key, Inc., Tropical Key Colony, Pine Channel Estates, Cahill Pines & Palms, and adjacent area along U.S. 1	$8,300,000	Provide wastewater collection service to Hot Spot area.
13	Ramrod	Breezeswept Beach Estates, Ramrod Shores, Ramrod Shores Marina, and area along U.S. 1	$6,690,000	Provide wastewater collection service to Hot Spot area.
15	Big Pine	Port Pines Heights	$4,750,000	Provide wastewater collection service to Hot Spot area.
—	—	—	$400,000	Connect package plants to system.

[1] The plan recommends phasing out all package plants, and connecting sewers to community or regional systems when all Hot Spots are served.

[2] The plan recommends that some existing facilities continue to operate and upgrade their treatment process to BAT/AWT. For clarity, these facilities are not shown in this exhibit; refer to Exhibit 7-6 for these existing facilities.

[3] Numbers within stars indicate priority rankings of Hot Spot areas, and are further defined in Chapter 6, and in Exhibits 6-1, 6-2, and 6-3.

EXHIBIT 7-3

Recommended Wastewater Management Implementation Plan for the Lower Keys

Conch Key Community Service Area

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
2	Marathon Secondary	Conch Key	$1,750,000	Provide wastewater collection service to Hot Spot area. Provide 0.03 mgd WWTP for this service area.

Hawk's Cay Community Service Area[2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
6	Marathon Secondary	Duck Key	$5,500,000	Provide wastewater collection service to Duck Key. Expand Hawk's Cay WWTP to 0.30 mgd.

Long Key/Layton Community Service Area[2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
7	Long Key/Layton	Long Key Estates, City of Layton, area adjacent to U.S. 1.	$3,540,000	Provide wastewater collection service to Hot Spot area. Provide 0.05 mgd WWTP for this service area.

Marathon Regional Service Area[1]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
1	Marathon Primary	Little Venice (Phase I)	$6,600,000	Provide community wastewater collection system with interim 0.14 mgd WWTP.
3	Marathon Primary	Phased Regional System (Phase II)	$35,480,000	Provide wastewater collection service to Hot Spot area. Provide initial 1.0 mgd WWTP, expandable to 2.0 mgd, for this regional service area. Deactivate Little Venice WWTP and connect into regional system
4	Marathon Primary	Remainder of Regional System (Phase III)	$30,200,000	Provide wastewater collection service to Hot Spot area. Connect all package plants to regional system. Expand regional WWTP to 2.0 mgd.
5	Marathon Secondary	Grassy Key	$5,200,000	Provide wastewater collection service to Grassy Key. Treatment at Marathon Regional WWTP.

[1] The plan recommends phasing out all package plants, and connecting sewers to community or regional systems when all Hot Spots are served.
[2] The plan recommends that some existing facilities continue to operate and upgrade their treatment process to BAT/AWT. For clarity, these facilities are not shown in this exhibit; refer to Exhibit 7-7 for these existing facilities.
[3] Numbers within stars indicate priority rankings of Hot Spot areas, and are further defined in Chapter 6, and in Exhibits 6-1, 6-2, and 6-3.

EXHIBIT 7-4
Recommended Wastewater Management Implementation Plan for the Middle Keys

The two proposed regional systems in the Lower Keys are relatively small, in terms of both volume of flow and area, thus the first phase of these WWTPs can be constructed at the actual regional WWTP site, so there is no need to build an interim WWTP that would eventually be phased out and relocated elsewhere. The plan recommends expansion of the regional plant as more "Hot Spot" areas are connected.

In addition to the new systems or extension of existing systems that were presented in Exhibit 7-3, it is recommended that seven existing facilities in the Lower Keys continue to operate and upgrade their treatment processes to meet the BAT/AWT standard by July 1, 2010. These systems include:

- KW Resort Utility
- Key Haven Utility
- Monroe County Detention Center
- Naval Air Station Key West
- Bahia Honda (three facilities)

KW Resort Utility and the Monroe County Detention Center facility are included because the 1999 Florida Legislation requires wastewater reuse facilities (KW Resort Utility effluent is applied to the Key West Golf Course and Monroe County Detention Center effluent is used for toilet flushing) to treat to AWT standards any effluent that is not applied as reuse water before it is discharged to the backup

Lower Matecumbe Community Service Area[1]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
9	Lower Matecumbe	Safety Harbor, Toll Gate Shore, Port Antigua, White Marlin Beach, Matecumbe Sandy Beach, Lower Matecumbe Beach	$8,900,000	Provide wastewater collection service to Hot Spot area. Provide 0.18 mgd WWTP for this service area.

Islamorada Regional Service Area[1]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
6	Plantation Key	Area A - Eastern end of Plantation Key including Plantation Key Colony/Kahiki Harbor/Edemaire/ Tavernaero/Tropical Atlantic Shores	$12,280,000	Provide wastewater collection service to Hot Spot area. Provide initial 0.75 mgd WWTP, expandable to 1.50 mgd, for this regional service area.
14	Upper Matecumbe	Entire Study Area	$16,310,000	Provide wastewater collection service to Hot Spot area. Connect all package plants in this Hot Spot area to regional system.
17	Plantation Key	Venetian Shores	$5,050,000	Provide wastewater collection service to Hot Spot area.
18	Windley Key	Entire Study Area	$4,400,000	Provide wastewater collection service to Hot Spot area. Connect all package plants in this Hot Spot area to regional system.
20	Plantation Key	Treasure Harbor, Plantation Ridge Coral Shores	$2,600,000	Provide wastewater collection service to Hot Spot area.
21	Plantation Key	Indian Waterways, Indian Harbor, Plantation Key, Lysiloma, Key Heights, Vacation Village, Aergood Heights, Pearl City	$9,340,000	Provide wastewater collection service to Hot Spot area.
23	Plantation Key	Remainder of Planation Key	$16,030,000	Provide wastewater collection service to Hot Spot area.
——	——	——	$760,000	Connect package plants on Plantation Key to system.

EXHIBIT 7-5
Recommended Wastewater Management Implementation Plan for the Upper Keys

Tavernier/Key Largo Regional Service Area[1, 2]

Priority[3]	Study Area	Hot Spot Area Served	Project Cost	Master Plan Recommendation
1	PAED 19/20	Lake Surprise/Sexton Cove, Ocean Isle Estates, and adjacent area on U.S. 1	$11,000,000	Provide community wastewater collection system with interim 0.165 mgd WWTP.
2	PAED 18	Key Largo Trailer Village, Largo Gardens, Hibiscus Park and area adjacent to U.S. 1	$10,270,000	Provide community wastewater collection system with interim 0.165 mgd WWTP.
3	PAED 18	Cross Key Waterway Estates & Largo Sound Park/Anglers Park Shores/South Creek Village and area along U.S. 1	$9,700,000	Provide community wastewater collection system with interim 0.140 mgd WWTP.
4	PAED 16	Area A, Wynken, Blyken & Nod	$1,670,000	Provide wastewater collection service to Hot Spot area. Connect to one of two adjacent existing WWTPs, each of which appears to have adequate excess capacity to serve this Hot Spot.
5	PAED 15	Harris Ocean Park, Palma Sola, Sherrill Park, Hammer Point Park, and along U.S. 1	$8,600,000	Provide community wastewater collection system with interim 0.12 mgd WWTP.
7	PAED 19/20	Remainder of PAED 19/20-Stillwright Point/Paradise Point Cove, Riviera Village, Key Largo Mobile Home Sites, Largo City	$26,640,000	Provide wastewater collection service to Hot Spot area. Initiate regional AWT WWTP. Construct 1.50 mgd facility expandable to 2.25 mgd. Deactivate Hot Spot Priority Areas 1, 2, and 3 WWTPs and connect to regional WWTP.
8	PAED 17	Port Largo, Key Largo Beach, Key Largo Ocean Shores, Silver Lake Park, Holiday Homesites, Buttonwood Shores, Buttonwood Cove, Lazy Lagoon, Point Pleasant Sunset Cove	$11,100,000	Provide wastewater collection service to Hot Spot area.
10	PAED 18	Bahia Mar Estates/Pamela Villa/Winston Waterways	$3,500,000	Provide wastewater collection service to Hot Spot area.
11	PAED 17	Pirate's Cove, Rock Harbor Estates, Marion Park, Rock Harbor Manor, Harbor Shores, El Dorado	$6,440,000	Provide wastewater collection service to Hot Spot area.
12	PAED 16	Bay Haven, Lime Grove Estates, Sunrise Point, Abode Casa Court, Seven Acres, Sunset Gardens, Dove Creek	$7,290,000	Provide wastewater collection service to Hot Spot area.
13	PAED 15	Old Tavernier	$11,950,000	Provide wastewater collection service to Hot Spot area. Deactivate Hot Spot Priority Area 5 WWTP and connect to regional WWTP. Expand regional WWTP to 2.25 mgd.
15	PAED 17	Sunset Waterways, Key Largo Park	$6,400,000	Provide wastewater collection service to Hot Spot area.
16	PAED 18	Bermuda Shores, Twin Lakes	$2,500,000	Provide wastewater collection service to Hot Spot area.
——	——	——	$2,300,000	Connect package plants to system.

[1] The plan recommends phasing out all package plants, and connecting sewers to community or regional systems when all Hot Spots are served.
[2] The plan recommends that some existing facilities continue to operate and upgrade their treatment process to BAT/AWT. For clarity, these facilities are not shown in this exhibit; refer to Exhibit 7-8 for these existing facilities.
[3] Numbers within stars indicate priority rankings of Hot Spot areas, and are further defined in Chapter 6, and in Exhibits 6-1, 6-2, and 6-3.

shallow injection wells. As all the effluent cannot be applied to the golf course during periods of extended rain or used for toilet flushing, these facilities must be upgraded to meet the AWT effluent standard for the wastewater that is disposed to the shallow injection well systems.

Although the Monroe County Detention Center facility is within the City of Key West, it has been included in this Master Plan because it is owned and maintained by Monroe County. These existing systems and the estimated costs of the upgrades are summarized in Exhibit 7-6.

7.2.2 Middle Keys

In the Middle Keys, two new community wastewater systems and one new regional system are recommended. The proposed Middle Keys service areas are shown in Exhibit 7-4. Other than Duck Key, Conch Key, and Long Key/Layton, all study areas of the Middle Keys are within the City of Marathon.

In addition to the new systems described above, it is recommended that six existing facilities in the Middle Keys continue to operate and upgrade their treatment process to meet the BAT/AWT standard by July 1, 2010. These systems include:

- Hawk's Cay (Hawk's Cay portion of AWT upgrade)
- West End Long Key (three facilities)
- East End Long Key (two facilities)

These existing systems and the estimated costs of the upgrades are summarized in Exhibit 7-7.

7.2.3 Upper Keys

In the Upper Keys, one new community wastewater system is recommended in Lower Matecumbe, and two new regional systems are recommended: the 1.5-million gallon per day (mgd) system to serve Islamorada Regional Wastewater Management District; and a 2.25-mgd system to serve the Tavernier/Key Largo Regional Wastewater Management District.

7.2.3.1 Islamorada, Village of Islands

The Village of Islamorada must decide whether it ultimately will participate with Monroe County in creating a regional wastewater system for the entire Upper Keys, or whether it will develop its own wastewater service areas. In the service area analyses (see Chapter 5 and Technical Memorandum No. 12 in Volume 5, *Supporting Documents*), costs developed for these different alternatives indicate that costs to the Village are only slightly more (7 percent) if the Village develops its own wastewater service areas rather than joins with Monroe County. Therefore, it is assumed that the Village will develop its own wastewater service areas. The

EXHIBIT 7-6
Estimated Costs to Upgrade Existing Treatment Facilities Recommended for Continued Operation in the Lower Keys

Study Area	WWTP	Capacity (mgd)	Upgrade to BAT/ AWT Standard	Capital Cost	Increased Annual O&M Cost
Stock Island	KW Resort Utility	0.50	AWT	**$760,000**	**$3,000**
Stock Island	Key Haven Utility	0.20	AWT	**$500,000**	**$40,000**
Stock Island	Monroe County[1] Detention Center	0.105	AWT	**$250,000**	**$2,000**
Boca Chica	NAS Key West	0.40	AWT	**$670,000**	**$80,000**
Bahia Honda	Bahia Honda State Park	0.0083	BAT	$98,000	$16,000
	Bahia Honda State Park	0.010	BAT	$102,000	$16,000
	Sunshine Key Campground	0.060	BAT	$187,000	$23,000
	Total For Bahia Honda Service Area			**$387,000**	**$55,000**

[1]Though located in the City of Key West, and beyond the boundaries of this master plan, the detention center is owned and operated by Monroe County, and therefore has been included in the master plan study.

EXHIBIT 7-7
Estimated Costs to Upgrade Existing Treatment Facilities Recommended for Continued Operation in the Middle Keys

Study Area	WWTP	Capacity (mgd)	Upgrade to BAT/AWT Standard	Capital Cost	Increased Annual O&M Cost
Marathon Secondary[1]	Hawk's Cay[1]	0.196	AWT	**$1,600,000**	**$40,000**
West End Long Key	Ocean Bay Condominium	0.006	BAT	$93,000	$15,000
	Long Key State Park	0.010	BAT	$99,000	$16,000
	Outdoor Resorts	0.060	BAT	$192,000	$23,000
	Total for West End Long Key			**$384,000**	**$54,000**
East End Long Key	Oceanside Isle Apartments	0.0070	BAT	$94,000	$15,000
	Fiesta Key Campground	0.060	BAT	$192,000	$23,000
	Total for East End Long Key			**$286,000**	**$38,000**

[1]Upgrade of Hawk's Cay portion of treatment capacity only.

likely Islamorada wastewater service areas would include:

- A community system serving the "Hot Spot" area that includes Safety Harbor, Toll Gate Shores, Port Antigua, White Marlin Beach, Matecumbe Sandy Beach, and Lower Matecumbe Beach.
- The remaining eastern portion of Lower Matecumbe Key would continue with onsite systems.
- Ultimately, a regional system serving Upper Matecumbe, Windley, and Plantation Keys is recommended. Initially, however, community systems to serve the highest ranked "Hot Spot" areas are recommended. Likely service areas and the order of implementation of "Hot Spot" community systems are shown in Exhibit 7-5 and Appendix F-2, in Volume 2.

7.2.3.2 Remainder of Upper Keys

In the Upper Keys from Tavernier (Tavernier Creek at Mile Marker 91) to Key Largo (at Mile Marker 106), interim community systems for "Hot Spot" areas serving approximately 700 to 900 equivalent dwelling units (EDUs) are recommended initially, until the number of community systems increases to the point where a regional system is more affordable. This system size takes advantage of economies of scale to the greatest extent possible, while keeping project costs to implement these systems in the $10,000,000 to $12,000,000 range. At this cost range, it is more likely that grants will be received, thus making wastewater rates affordable, as opposed to a larger project where much larger grant amounts would be required to make wastewater rates affordable, but are less likely to be awarded.

In the future, when the number of small community systems and the number of customers increase, it will become more economical to consolidate the smaller community treatment systems into a larger regional treatment facility. Exhibit 7-5 presents the community wastewater collection and treatment systems, and the corresponding "Hot Spot" areas they will serve. This exhibit also defines the point where the regional system would be implemented. Details of the phasing for the Tavernier/Key Largo regional wastewater system are presented in Appendix F, in Exhibit F-6 (Volume 2), which

presents the interim central community wastewater systems and the subsequent regional system.

In addition to the new systems summarized in Exhibit 7-5, four other treatment facilities in the Upper Keys are recommended to continue to operate and upgrade their treatment processes to meet the BAT/AWT standard by July 1, 2010. These systems include:

- Ocean Reef Club (North Key Largo Utility Company)
- Area at Jewfish Creek (in PAED 22, Study Area 25-2, two facilities)
- Area at County Line (in PAED 22, Study Area 25-1)

These existing facilities and the estimated costs of the recommended upgrades are summarized in Exhibit 7-8.

EXHIBIT 7-8
Estimated Costs to Upgrade Existing Treatment Facilities Recommended for Continued Operation in the Upper Keys

Study Area	WWTP	Capacity (mgd)	Upgrade to BAT/AWT Standard	Capital Cost	Increased Annual O&M Cost
Ocean Reef Club (Study Area 27)	No. Key Largo Utility Company	0.55	AWT	$1,500,000	$143,000
	Extend sewer service to unsewered area.			$4,160,000	$36,000
	Total for Ocean Reef Club			**$5,660,000**	**$179,000**
PAED 22 at Jewfish Creek (Study Area 25-2)	Gilbert's	0.010	BAT	$100,000	$16,000
	Anchorage	0.010	BAT	$100,000	$16,000
	Total for Gilbert/Anchorage			**$200,000**	**$32,000**
PAED 22 at County Line (Study Area 25-1)	Barefoot Cay Treatment Plant	0.045	BAT	$164,000	$22,000
	Barefoot Cay Sewer Extension[1]			$300,000[1]	$3,000
	Total for Barefoot Cay			**$464,000**	**$25,000**

[1]Low pressure sewer grinder pump system to serve unsewered adjacent area.

7.2.4 Interim Treatment Plants

Because the Tavernier/Key Largo regional system, as well as the Islamorada and Marathon regional systems, are larger than the regional systems proposed in the Lower Keys, both in terms of flow and area, it is not cost effective to locate the initial WWTP at the proposed regional facility site. Instead, central community wastewater collection systems with interim WWTPs to serve the "Hot Spot" areas are a more cost-effective solution. When the regional WWTPs become operational, the interim WWTPs would be decommissioned and relocated elsewhere, and the wastewater would be transmitted to the regional facilities.

7.3 Wastewater Solids Management

7.3.1 Regionalization Options

Given the recommended wastewater management facilities, an evaluation to determine the best solids management plan for all 28 existing and proposed wastewater facilities was performed. Three options were evaluated:

- **Option 1 – Minimum Regionalization**: Operate solids handling facilities at all 14 WWTPs of 100,000 gallons per day (gpd) capacity or greater.
- **Option 2 – Maximum Regionalization:** Operate solids handling facilities only at the largest WWTP in the Lower,

EXHIBIT 7-9
Cost Comparison of Solids Handling Location Options

Location Option	Estimated Total Annual Cost[1]
1. Minimum Regionalization	$2,700,000/year
2. Maximum regionalization	$3,100,000/year
3. Intermediate Regionalization	$2,600,000/year

[1]Includes capital and O&M costs, with aerobic digestion, dewatering, and agricultural land application assumed for regional facilities. Capital costs amortized over 20 years at 6 percent interest; O&M costs based on operation of facility at 80 percent of design ADF.

Middle, and Upper Keys, with solids from all other WWTPs trucked to the nearest of these facilities. The Big Pine, Marathon, and Tavernier/Key Largo WWTPs were assumed to serve as the three regional facilities.

- **Option 3 – Intermediate Regionalization:** Operate solids handling facilities at the nine WWTPs of 400,000 gpd capacity or more, with solids from the remaining plants trucked to the nearest of these facilities. These nine plants would include three existing plants (KW Resort, U.S. Naval Air Station, and Ocean Reef Club) and six of the new plants.

Cost comparisons for the three options, which are summarized in Exhibit 7-9, suggest that a high degree of regionalization of solids management facilities will not be cost effective. Instead, except for WWTPs with capacities less than 100,000 gpd, the evaluation indicates that WWTPs should treat and dewater their own solids and transport the dewatered solids to mainland Florida.

Solids handling at each treatment facility was included when developing cost estimates for the wastewater facilities recommended in this Master Plan. Hence, the cost estimates for wastewater treatment facilities reflect accurately the solids management plan recommended, and do not need to be adjusted for a different solids management scheme.

7.3.2 Recommended Solids Management Plan

The following summarizes the recommended solids management plan. A detailed discussion of the solids management plan evaluation process is provided in Technical Memorandum, *Wastewater Solids Management Plan for Monroe County*, Volume 4, *Supporting Documents*.

7.3.2.1 WWTPs with Less than 100,000 gpd Capacity

Of the 28 WWTPs proposed to serve the planning area, eleven existing plants and three proposed new plants will have ultimate capacities of less than 100,000 gpd. These small plants cannot cost-effectively treat solids onsite and are recommended to provide temporary aerated storage only. Unstabilized or partially stabilized solids should be periodically transported to one of the existing or proposed regional or larger community WWTPs in the Lower, Middle, and Upper Keys. In the interim period before a regional solids handling facility is available, the solids from these smaller WWTPs should continue to be transported to one of the three Monroe County Solid Waste Transfer Stations.

7.3.2.2 WWTPs with Capacity of 100,000 gpd or Greater

The Master Plan recommends that 14 WWTPs with a capacity of 100,000 gpd or greater ultimately serve the planning area. These include five new regional WWTPs, three new community WWTPs, and six existing WWTPs. The five new regional and three new community WWTPs will generally be the largest plants in operation in the planning area. Generally, these WWTPs are recommended to treat and dewater their own solids. However, depending on the timing of construction of the new community plants and the different phases of the regional plants, hauling of unstabilized solids for treatment and dewatering, or hauling of stabilized solids for just dewatering to already operating facilities should also be evaluated as an interim or preferred alternative.

The six existing community WWTPs that will continue to operate each have independent solids handling facilities centered around the aerobic digestion process. Most likely, it will be cost effective to maintain these existing solids handling facilities currently in operation. However, a detailed evaluation of each facility will be necessary to determine if the existing facilities are adequate. If expansion or major improvements are necessary, particularly at the four smallest facilities having capacities of 0.2 mgd or less, then transporting solids to a nearby regional facility for stabilization and/or dewatering may be a more cost-effective option.

7.3.2.3 Interim WWTPs

Solids management facilities should not be constructed at interim WWTPs because of their limited lifespan. Solids from these facilities should be transported to one of the Monroe County Solid Waste Transfer Stations for ultimate disposal at Miami-Dade.

7.3.2.4 Solids Treatment and Disposal

Class B aerobic digestion followed by dewatering and truck transport of cake to a remote land application site in mainland Florida is the recommended solids management system for all residual solids from the wastewater treatment facilities.

7.3.2.5 OWNRS

Waste sludge from the 1,085 OWNRS is recommended to be contract-hauled to the existing Monroe County Solid Waste Transfer Stations and then to Miami-Dade, as is the current practice for septage. If issues arise with this method, a sludge receiving facility and expanded solids treatment capacity could be installed at one or several of the regional WWTPs, most likely the Big Pine, Marathon, or Tavernier/Key Largo Regional WWTPs.

7.3.2.6 Grease Management

Continuation of the current practice of transporting waste grease to the Monroe County Solid Waste Transfer Stations for ultimate disposal at Miami-Dade is recommended. Disposal of waste grease at the community or regional WWTPs should be avoided because of the potential for odors.

7.4 Capital Costs Required to Implement the Master Plan

As shown in Exhibit 7-10, the capital costs required to improve wastewater management practices, as recommended by this Master Plan, are approximately $438,000,000. These costs assume that, other than those existing WWTPs that will continue to serve given isolated areas or existing functioning private wastewater utilities, all existing WWTPs will connect into the central community wastewater systems or regional systems once all the "Hot Spot" areas are served, or by 2010, whichever occurs first.

The seven largest systems, in terms of capital cost, (one of which is all the "Cold Spot" areas that will have to upgrade onsite systems to nutrient reduction OWNRS) represent 89 percent of the $438,000,000 total cost. (See Exhibit 7-11.)

7.5 Wastewater Reuse

Although there are advantages associated with wastewater reuse, the high cost associated with additional facilities and the limited availability of suitable areas to irrigate make this option more difficult to implement in the Florida Keys than in other areas. As noted in Section 3.7.3, the cost required to provide reuse water for irrigation is expected to be considerably higher than the current cost to provide potable water (an estimated $12.52/1,000 gallons for reuse water vs. $4.93/1,000 gallons for potable water). Consequently, initiating wastewater reuse does not provide a cost-savings incentive to wastewater customers in the Keys. Therefore, a policy mandating wastewater reuse would have to be initiated by local, state, or federal regulatory agencies before full-scale wastewater reuse could be implemented in the Keys. However, mandating a reuse policy should be carefully considered because it may be more economically sound to produce more potable water from seawater and distribute it to the existing potable water distribution system than to produce and distribute reclaimed water through a separate reuse distribution system.

An immediate initial step in determining the practicality and economics of wastewater reuse in the Keys should be to conduct reuse feasibility studies

EXHIBIT 7-10
Estimated Capital Cost Required to Implement the Master Plan

Wastewater System Service Areas	Estimated Capital Cost[1]
KW Resort Utility	$3,080,000
Big Coppitt Service Area	$20,500,000
Bay Point Service Area	$4,000,000
Lower Sugarloaf Service Area	$9,350,000
Summerland/Cudjoe/Upper Sugarloaf Regional	$34,300,000
Big Pine Regional	$55,900,000
KW Resort Utility (AWT for non reuse)	$760,000
Key Haven Utility	$500,000
Monroe County Detention Center (AWT for non reuse)	$250,000
NAS Key West (Boca Chica)	$670,000
Bahia Honda	$390,000
Marathon Regional	$72,300,000
Conch Key Service Area	$1,750,000
Long Key/Layton Service Area	$3,540,000
Hawk's Cay (Hawk's Cay portion of AWT upgrade)	$1,600,000
West End Long Key	$380,000
East End Long Key	$290,000
Lower Matecumbe Service Area	$8,900,000
Islamorada Regional	$66,800,000
Tavernier/Key Largo Regional	$119,400,000
Ocean Reef Club	$5,660,000
PAED 22 at Snake Creek	$200,000
PAED 22 at County Line	$460,000
Onsite Unpgade of Unknown Systems	$3,525,000
Onsite Upgrade in 2010	$12,750,000
Total	**$437,950,000**

[1]Capital costs include a 20% contingency and include all construction costs, including the costs to decommission existing onsite systems and the costs of new building sewers on private property from the house or building to the street. Capital costs also include all engineering, construction administration and inspection, land acquisition, legal fees, and financing charges.

throughout the different service areas. These studies should establish firm amounts of reclaimed water to which reuse customers are willing to commit and pay for.

7.6 Alternatives for Implementing Wastewater Infrastructure Systems

In implementing the recommended capital improvements in this Master Plan, a variety of project delivery methods could be used, from the traditional design-bid-build approach to many different project delivery alternatives that are being employed throughout the United States. The delivery alternatives are presented in Exhibit 7-12. The following sections describe these alternatives and the pros and cons of each.

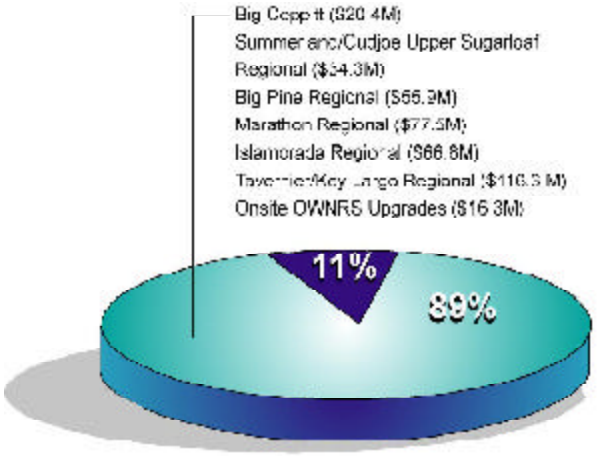


EXHIBIT 7-11
The seven largest systems represent 89% of the total $438,000,000 capital cost of the Monroe County program.

7.6.1 Traditional Project Delivery

In the traditional design-bid-build method of project delivery, the owner contracts with an engineer to design the project, develop complete contract documents, and assist the owner in bidding the project. The owner contracts separately with a general contractor, generally the low bidder in public works projects, to build the facility. Generally, the engineer assists the owner during the construction of the project. No contractual relationship exists between the engineer and contractor. In this traditional project delivery method, the owner assumes all cost and project delivery risks, but has a good degree of control of the project in terms of quality and owner preferences.

This traditional method of project delivery has been used widely throughout the United States for the last 100 years. As a result, owners, engineers, suppliers, contractors, and regulators understand how this method works, and owners and political governing bodies accept the results. From a timing perspective, the traditional method of project delivery generally is the most time-consuming alternative.

7.6.2 Construction Management

Construction management is similar to the traditional method of project delivery in that all the design documents are prepared first. However, the construction manager replaces the general contractor as the overall coordinator of construction. The construction manager receives bids from the various trade subcontractors and suppliers.

With this alternative, however, the construction manager does not assume cost or project delivery risks normally assumed by a general contractor. These project risks are retained by the owner, although the expectation of most owners is that the project will be constructed on-budget and within the time constraints associated with the project delivery. This usually results in cost savings to the owner over the fee that would have been charged by the general contractor performing a similar function.

Normally, the design engineer is either contracted directly by the owner or serves as a team member under a direct subcontract to the construction management firm.

7.6.3 Construction Management-at-Risk

The construction management-at-risk alternative is similar to the construction management alternative in terms of function, except the construction manager offers guarantees to the owner related to project price, delivery time, and/or overall process performance. In exchange for any or all of these guarantees, the construction manager normally seeks an additional fee to take on the risk, and the owner benefits knowing that the project has a construction cost upper limit, that it will be delivered on time, and that the performance requirements of the project will be met and guaranteed.

Further, in a traditionally delivered project, minimum standards for the level of quality are established by the contract documents; however, the quality of the finished project may also be influenced by cost in a low-bid environment. With either of the construction management alternatives, the owner has more control over the quality of the finished project because the owner is involved in more of the cost decisions affecting the construction process.

As with construction management, although the individual packages are bid, usually to prequalified firms, the owner is exposed to the bid results of the individual trade subcontractors and equipment suppliers and vendors. The owner, not the general contractor, in conjunction with

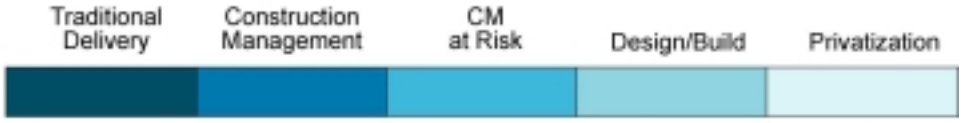


EXHIBIT 7-12
The Public-to-Private Spectrum of Project Delivery Alternatives

the construction manager, then has the flexibility to decide what equipment and material are to be furnished on the project, based on the prices received and the detailed project cost estimate prepared by the construction manager. This delivery method allows the owner to control the quality of the equipment and materials used on the project.

As a general guideline, construction management projects can usually be delivered in a somewhat shorter time period than those delivered under traditional methods.

7.6.4 Design/Build

The design/build alternative offers the owner the ability to deliver a project rapidly and cost effectively. In this case, the owner prepares a bid package. This bid package can vary in the amount of detail provided, depending on what the owner wants, the schedule desired, and the risks willing to be assumed. The ideal design/build procurement occurs when the owner retains a program management firm that prepares design criteria and a design development document for the project that is approximately 15 to 20 percent complete. At this point, the designer/builder still has an opportunity to be creative, while the owner maintains some control by developing, or participating in, the design up to the 15- to 20-percent stage.

Proposals, which include project approach, project team qualifications, and price, are solicited from qualified designer/builders, with the award usually based on the lowest project cost, although there are many other qualitative selection criteria that could be used. Once selected, the designer/builder is charged with implementing the conceptual design over the specified project delivery period.

For some owners, this concept of project delivery best meets their expectations for the following reasons:

Sole Source Responsibility. Because the contractor and engineer are operating as a team, one entity is responsible for the delivery, acceptability, and performance of the finished project.

Cost. Often, these projects are the most cost-effective for the owner for several reasons:

1. The delivery time is much shorter and administrative and construction costs, therefore, tend to be lower.
2. The design and its related costs should be completed only to the extent required by the designer/builder and permitting agencies.
3. Because 80 to 85 percent of the design details are left up to the designer/builder, the marketplace will provide the owner with the most cost-effective solution that fulfills the obligations contained in the request for proposal (RFP).

Time. The overall project implementation period is normally shortened. On most projects, this can shorten the schedule by at least 3 to 6 months.

In using this method of delivery, however, owners must recognize that they will have less control over the outcome of the project than with other methods.

7.6.5 Privatization

Privatization concepts are gaining more appeal as communities and wastewater utilities across the United States address stringent fiscal issues. Privatization includes a variety of options, ranging from outsourcing specific functions (e.g., sludge hauling, lawn maintenance), to contract operations of the facility, to full ownership and operation of facilities. At the present time, more than 500 large municipal treatment plants are operated by private contract operations firms throughout the United States and abroad. In the Keys, almost all the treatment plants are operated by private contract operations firms. Privatization options include:

Contract Operations: Where the owner contracts with a private operations firm to operate existing or newly constructed facilities.

Design/Build/Operate: Where the owner contracts with a private firm to design, build, and operate the facility for a fixed fee. Generally, the number of years of operation is defined by contract, and there

is a cost index escalation factor allowed for annual operations.

Design/Build/Finance/Operate: Where the owner contracts with a private firm not only to design, build, and operate the facility, but also to finance the facility for a fixed fee.

7.7 Recommended BOCC Implementation Actions

To accomplish the water quality objectives of the *Year 2010 Comprehensive Plan*, and to move the implementation of this Master Plan forward, the Monroe County Board of County Commissioners (BOCC) should take the following actions:

1. Continue to pursue state and federal grant money in association with the Florida Keys Aqueduct Authority (FKAA).
2. Request the FKAA to adopt service areas as recommended in the Master Plan.
3. Take legal action to establish municipal sewer service districts for the respective service areas.
4. Initiate land purchases of wastewater facility sties, as outlined in the Master Plan. This should also include the smaller vacuum station sites and the interim WWTP sites, if additional facilities are required.
5. Develop and adopt interim onsite wastewater system standards and policies for "Hot Spot" areas; this will have to be coordinated with the Florida Department of Health (FDOH).
6. Adopt a policy to address the "double charge" issue. (Paying to upgrade an onsite system to a nutrient reduction OWNRS, and then paying again to connect to the sewer system when central sewers are provided.)

★★★★★★

Chapter 8
Funding and Financing Options

This Master Plan has described the significant steps being taken by Monroe County, the State of Florida, numerous Federal agencies, other local governments, public and private organizations, and other stakeholders to improve and protect the water quality of the Florida Keys. In addition to selecting the most appropriate means to improve water quality, funding and financing must be secured for the required equipment and facilities, as well as the proposed systems' ongoing operation, maintenance, repair, and replacement. The selection of funding and financing instruments will affect who bears the responsibility of paying for the facilities and how much they will pay.

This chapter summarizes the findings of the funding analyses, and presents the following:

- Primary means by which wastewater utilities fund activities and finance needed capital improvements
- Mechanisms that have been proposed for funding or financing this wastewater management program
- Primary issues relating to the funding and financing of the proposed wastewater management program
- Results of an analysis of the fiscal impacts of using some of the primary funding and financing options to fund the proposed wastewater management program
- Recommended funding and financing strategy

8.1 Funding and Financing Options

Typically, a myriad of potential funding and financing options are available for wastewater management programs, however, many of these options are not viable for the Keys' program. There are several reasons why many options would not be suitable solutions in the Keys:

- They would not generate sufficient funds to implement this program.
- They would divert funds from other worthwhile uses.
- The cost of the program that would be recovered from specific users, property owners, or others, would be disproportionate to either the costs these users impose on the system, or the waste loads they discharge into the waters around the Keys.

The funding and financing options presented herein are in no way a complete list of the available funding and financing options, but represent some of the more commonly used methods of funding wastewater management programs, or those that have been proposed for the Keys' program.

8.1.1 Funding and Financing Evaluation Criteria

In considering the various funding and financing options or combinations thereof, the following questions should be addressed:

- Will the option(s) provide sufficient revenue to cover the costs they are intended to fund or finance?
- Is it a stable source of revenue that can be relied upon from period to period?
- Will funds be available when needed?
- How flexible is the source of revenue? Can the revenue generated from this source be adjusted to reflect changing conditions or needs?
- How easy or difficult will it be to implement and administer the option?
- How costly will it be to implement and administer the option?
- Is the option legally defensible?
- If the use of the option diverts funding from some other use, how will this other use make up the lost revenue, or what other services will need to be reduced?
- Are the costs that will be imposed on individuals or companies reasonable and affordable?
- Will the costs of the program be recovered from those who create the need for the program or who will benefit from it, and will the charges they must pay be in proportion to the costs they impose on the system or the benefits that they receive?
- Will users understand and accept the rates and fees as reasonable charges for the services they are receiving?

8.1.2 Types of Funding and Financing

In general, the various wastewater funding and financing options fall into one of the following categories:

- User Fees and Charges
- Taxes and Assessments
- Bonds and Loans
- Grants and Contributions
- Redirection of Existing Programs or Funding
- Financial Assistance for Low and Fixed Income Users
- Doing More with Less

The following describes various funding and financing options associated with each of these categories.

8.1.2.1 User Fees and Charges

User fees and charges are collected for the provision of services that provide a specific benefit to a user. Various types of user fees and charges are described below.

Wastewater Rates and Charges. For most utilities, their primary source of revenue is the rates charged to customers. Publicly-owned utilities are typically operated as "Enterprise Funds" within the local government's organization. Enterprise funds are intended to be managed like a

business, and are typically expected to be self-supporting, although many utilities do receive additional funds from the city or county's general fund. In addition to paying for ongoing operation and maintenance (O&M) costs, a portion of a utility's rate-generated revenues is used to directly fund minor capital programs, as well as to repay the debt service on any outstanding bonds or loans. Rate revenues may be dedicated to a capital reserve account and used to fund annual capital improvements, or may be accumulated until sufficient to fund larger projects. This is the most common method used for funding equipment renewal and replacement requirements. Wastewater rates may include a minimum or fixed charge that does not vary from billing period to billing period (most frequently month to month), and/or a volume charge that may be based on the user's water consumption or metered wastewater flows.

Miscellaneous Fees and Charges. Most utilities also charge customers miscellaneous fees for services that the utility may provide, or to provide incentives, such as for prompt payment of bills. These fees are typically designed to recover the utility's costs incurred to provide these specific services, or to recover the costs the utility incurs because of the customers' actions (service line clean outs, issuing reminder bills, lost interest income, etc.).

Connection Fees. Hookup, tap, or connection fees are charges collected for new connections to a community wastewater system. In many communities, connection fees are designed to recover just the cost the utility incurs to install the service connection to the sewer main. In some communities, the connection fee includes an impact fee (described below), while in others, the impact fee is a separate charge.

Impact Fees. Impact fees, like connection fees, are collected at the time a user connects to the wastewater system. Impact fees are intended to recover the costs the utility incurs to oversize its transmission, treatment, and disposal facilities to provide capacity to serve new users. The intent of these charges is to avoid charging existing customers for the costs the utility is incurring to serve future customers.

Line Extension Fees. Some utilities charge a fee for extending collection and or transmission lines to serve a new customer's property. This charge, which is generally based on the number of feet that the collection or transmission line must be extended to serve the property, may be collected in addition to the connection and impact fees.

Service Availability Fees. Community water and wastewater utilities frequently require developed properties to connect to the system once service is available (i.e., when a collection line has been constructed along their property). In some communities, where the local government has opted not to require a connection to the system, service availability fees have been implemented. The service availability fees are typically designed to recover capital costs that the utility has incurred to make service available to the user, which the user is choosing not to exercise. These types of fees are currently being challenged in Florida courts.

8.1.2.2 Taxes and Assessments

Taxes are used to fund activities that do not provide a specific benefit, but provide a more general benefit to the community; the user may not be able to avoid paying the tax. Assessments must show a benefit to the property owned by the user. The various forms of common taxes and assessments are described in the following sections.

Local Improvement District Assessments. The extension of lines to serve existing developments is frequently accomplished through the creation of a local improvement district (LID). LIDs are created for the specific purpose of financing capital improvements (e.g. roads, water lines, sewer lines, street lighting, and/or storm water improvements) to serve a specific area. Once the LID has been created, special assessment bonds can be issued, which are secured by liens on the properties located within in the LID. Debt service on the bonds issued to finance the improvements is recovered through annual assessments on the property located in the LID. For sewer line improvements, a property owner's share of the cost of the improvements is frequently based on

the front footage of the property along which the sewer line is being laid. For improvements involving more than laying of sewer lines, other bases for the assessment may be used, such as square footage of property in the LID. These annual assessments are generally collected in the user's annual property tax bill.

Sales Tax/Local Option Tax. A 1-cent (1-percent) sales tax, or local option tax, is used frequently to provide funding for a wide variety of projects and activities, from schools to highways. Monroe County is currently using revenues from a local option sales tax to fund grants for its cesspool replacement program. Residents, tourists, and businesses all pay a sales tax on purchases made in the County.

Highway Tolls. A toll is under consideration on all vehicles entering the Keys on U.S. 1, the principal highway leading into the County. To establish a toll on U.S. 1, the County would need the support of, and approval from, the State of Florida. Since this toll would significantly impact both residents and tourists, stakeholder acceptance of this option would need to be addressed.

Property Tax. Property taxes are assessments charged to real property owners based on a percentage (millage rate) of the assessed property value. These taxes generally support the majority of a county's non-enterprise fund activities. However, the revenues from property taxes can also be used for enterprise fund projects, and have been used in many communities to pay debt service on general obligation bonds issued to finance wastewater system improvements. Because communities are limited in the total level of the millage rate, use of property taxes to fund wastewater improvements could limit the County's ability to raise funds for other activities.

Municipal Services Taxing/Benefit Unit. Municipal Services Taxing Units (MSTUs) and Municipal Services Benefit Units (MSBUs) can be established through annual property taxes or assessments to generate funds for projects. Unlike LIDs, MSTUs and MSBUs can be used to fund both capital and annual O&M costs. *Ad valorem* taxes are generated from MSTUs; special assessments generate funds in MSBUs. The taxes and assessments are levied on property owners. Unlike the process required for raising the millage rate on property taxes, no referendum is required to levy taxes or assessments in an MSBU or MSTU, unless the revenues are used for leveraging bonds. The taxes associated with MSTUs are subject to the cap on the total millage rate. Therefore, use of an MSTU to generate funds would constrain the future taxing ability of the County.

Bed Tax. The bed tax generates revenues from tourists' expenditures at hotels, motels, and short-term lodging. Like a sales tax, a bed tax is usually based on a percentage of expenditures, however, the tax would be limited to expenditures at a hotel or motel for lodging, and therefore has little or no direct impact on residents. Monroe County currently collects a 4-percent bed tax, out of which 1 percent goes to the County's Land Development Authority, and the other 3 percent goes to the County's Tourist Development Council.

Local Option Gasoline Tax. Local communities can levy a maximum 1-cent per gallon tax on the purchase of gasoline. The local option gas tax could generate revenues from the purchases of gas, and affects both residents and tourists. Generally, use of gas tax revenues is limited to funding road and transit projects.

Real Estate Transfer Tax. A real estate transfer tax is collected from all sales of real estate in a county. The tax is levied at the time of the transfer of real property. These types of taxes may be based on a percentage of assessed value or may be a flat deed registration fee, or both. New property owners would be responsible for paying the real estate transfer tax.

Tax Increment Financing. In areas where publicly financed redevelopment is raising property values, tax increment financing (TIF) can be used to fund new projects. With TIF, the incremental increase in *ad valorem* tax revenues that is a consequence of rising property values (which in turn result from the planned improvements) is dedicated to repaying the debt that financed the capital projects in that area. This approach to funding projects is

applicable only in areas undergoing redevelopment.

8.1.2.3 Bonds and Loans

Bonds and loans can be used to finance capital improvements. The local government issuing the bond or loan must be able to fund the payment of the debt service on the loan or bonds.

Revenue Bonds. Revenue bonds are bonds that are secured by a pledge of the revenues of the utility. The utility issuing bonds pledges to generate sufficient revenue annually to cover the system's operating costs, plus meet the annual debt service requirements (principal and interest payment) times a factor, termed the coverage factor, which is designed to provide additional protection to the bond holders. The coverage factor generally ranges from 110 to 150 percent of the utility's annual or maximum annual debt service requirement in the current or any future year.

General Obligation Bonds. Cities, counties, and special districts generally are able to issue general obligation (GO) bonds that are secured by the full faith and credit of the entity. In this case, the local government issuing the bonds pledges to raise its property taxes or use any other sources of revenue, to generate sufficient revenues to make the debt service payments on the bonds. A general obligation pledge is a stronger pledge than a revenue pledge, and thus may carry a lower interest rate than a revenue bond. Frequently, when local governments issue GO bonds for utility improvements, the utility will make the debt service payments on the GO bonds with revenues generated through the utility's rates and charges. However, if those rate revenues are insufficient to make the debt payment, the local government is obligated to raise taxes or use other sources of revenue to make the payments.

Local Improvement District Bonds. LID bonds are secured by a lien on the property in the LID. Debt service payments on these bonds are funded through annual assessments to the property owners in the LID, as discussed previously.

State Revolving Fund Loans. The State of Florida, like most states, operates a state revolving fund (SRF) loan program, that offers to local governments below-market-rate loans for wastewater projects. The original seed money for the loan program was provided by the federal government, with a 20-percent match from the state. Loans are made for a 20-year term, with interest rates set at about 60 percent of the current market interest rate. SRF loans are generally limited to $10 million per entity per year.

State Bond Loan Program. The State of Florida Department of Environmental Protection and the Division of Bond Finance of the Department of General Services jointly administer the State Bond Loan Program. The state bond loan program generally issues bonds that are sized to provide sufficient funds to meet the capital financing needs of several communities or entities participating in the program. The state will then loan the bond proceeds to these entities at an interest rate slightly higher than the interest rate that the state is paying on the bonds. Frequently, the entities participating in the program are smaller communities or entities without the credit history or capability to enter the bond market on their own. These entities get the benefit of being able to borrow funds using the state's credit rating to gain a lower interest rate than they would be able to obtain on their own.

Commercial Loans. Banks and other financial institutions may make commercial loans to local governments to fund capital projects. For utilities, these loans are typically secured by a pledge of the utility's revenues, but may also carry a general obligation pledge.

8.1.2.4 Grants and Contributions

While the availability of grant monies is certainly reduced from prior periods, a number of federal grant programs are still available. In addition, grants may also be available from the State of Florida and local governments for specific elements of the wastewater management program. Most grant programs are only available to state or local governments, so these grant programs likely will not be available to help fund improvements for privately-owned utilities. In addition, devel-

opers often are required to transfer to the community wastewater system the facilities that they construct to provide service to their development.

Cesspool Replacement Grant Program. Monroe County has implemented a grant program to assist residents with replacing cesspools. This program provides a grant for at least 62 percent of the capital cost of an onsite wastewater nutrient reduction system (OWNRS). Residents whose homes have an assessed value of less than $100,000 receive an additional grant of $3,000 (over the 62-percent grant amount), or approximately 84 percent of the total capital cost of an OWNRS system. Those with homes assessed at between $100,000 to $200,000 receive an additional grant of $1,000 over the 62-percent grant amount, or 69 percent of the total capital cost of these systems. This program is funded through revenues generated from grants from the Florida Department of Environmental Protection and the Florida Department of Community Affairs, as well as from funds from Monroe County's infrastructure sales tax.

Florida State Revolving Fund Small Community Wastewater Facilities Grants. The Florida Department of Environmental Protection Bureau of Water Resource Management has a grant program designed to assist small communities with planning, designing, and constructing wastewater management facilities. To qualify, a community must be incorporated, have a 1990 population of less than 7,500 people, and 1990 per capita income of less than $19,107.

Water Advisory Panel Grants. The State of Florida created a water advisory panel in Fiscal Year 1999, which administers a grant program that provides funds for projects that:

- Reduce recurring violations of state water quality standards
- Resolve a public health threat
- Reduce discharges of pollutants into an impaired water body
- Reduce discharges into groundwater supplies

The project sponsor must provide for at least a 25-percent match of the total project cost for this grant.

Federal Agencies. A number of federal agencies, in association with coordinating state agencies, provide grant funding to local governments to help the federal agency achieve their objectives. Potential grant funding sources include the Environmental Protection Agency, Department of Housing and Urban Development, Department of Transportation, and Department of Agriculture. The *Monroe County Funding History Summary Report – Draft*, dated November 1999, contains descriptions of various grant programs available from these sources and a proposed strategy for obtaining these funds. This report is available in Volume 8, *Supporting Documents*, of this Master Plan.

Direct Federal Funding. For projects with national significance, Congress can appropriate federal funds for certain uses. The Florida Keys National Marine Sanctuary and Protection Act of 1990, which was enacted to protect the resources of the area, may provide a basis for which federal funds could be allocated for wastewater projects that would address water quality concerns. Reliance on direct federal funding can be risky, however, as the funding must be re-appropriated each year. The *Monroe County Funding History Summary Report* also discusses initiatives of this nature and potential strategies for obtaining this type of funding.

Developer Contributions. As a condition of being permitted to develop a site, developers are required to provide for the transmission, treatment, and disposal of the wastewater that would be generated by the proposed land use. If a community wastewater system is available and has the capacity to serve the new development, the developer will generally be required to connect to the community system, construct the service lines and laterals to serve the development, and may be required to extend transmission or collection mains or pay a fee to the utility to extend the transmission or collection mains to serve the proposed development. The developer will then contribute the

service lines, etc. to the utility as a condition of receiving service.

8.1.2.5 Redirection of Existing Programs or Funding

These sources of funds would involve changing the priorities or focus of existing County activities to help achieve the objectives of the wastewater management program. It may also involve reducing funding for other activities so that the funds can be used for the wastewater management program. Individual examples of this source of funding have not been included in this Master Plan, as the available options could include almost any existing local governmental activity or source of funding.

8.1.2.6 Financial Assistance for Low and Fixed Income Users

There are several programs that are designed to reduce the costs of providing wastewater service to users of limited means, including:

- Lifeline Rates
- Cesspool Replacement Grants
- Assessment Deferral Programs
- Discounts on Connection Fees for Users With OWNRS Onsite Systems
- Developer Funding

Lifeline Rates. Some communities provide discounts on the monthly wastewater bills to users who are below certain income levels. A more common practice is to set rates that have a low minimum charge and/or use fee for a minimum ("lifeline") level of service. Higher rates are then collected from users with higher levels of water consumption (and thereby higher estimated wastewater flows).

Cesspool Replacement Grants. The Cesspool Replacement Program described previously is available to users at 62 to 84 percent of the cost of the installation of an OWNRS onsite system, based on improved property values.

Assessment Deferral Programs. A program could be established to allow low income or fixed income users who are required to connect to a community wastewater system to defer their costs of connecting to the wastewater system and/or LID assessments until such time as their property is sold. The interest expense on the deferred assessments or connection fees could be paid through a fund established for this purpose. The deferred assessments and connection fees would constitute a lien on the property, which would need to be satisfied upon the sale of the property. External funding would be needed to establish the fund for providing the interest subsidy for these low income users.

Discounts on Connection Fees for Users with OWNRS Onsite Systems. The County may want to consider providing a discount to users who are required to connect to a community wastewater system who have already installed an OWNRS onsite treatment system. These users would have already paid a substantial cost for installing the OWNRS system and would be faced with the additional expense of paying a connection fee and/or LID cost for the community system. The amount of the discount could decline over time, say over 10 years to zero, to reflect the benefit that the user has received from the OWNRS system.

Developer Funding. A secondary market has been created by the state's requirement that a user who is currently on a cesspool be connected to a community wastewater system or upgraded to an OWNRS system before any new development can be constructed. Developers have been providing funding assistance to those users who are currently on cesspools to upgrade their onsite systems. In return, the developer is allowed to develop his or her property. The suggestion has been made that developers should contribute a comparable amount into the fund that is providing grants to low income and fixed income users who are required to upgrade their onsite systems, instead of these developers directly paying an individual to upgrade their system.

8.1.2.7 Doing More with Less

This category seeks to reduce costs of providing wastewater services by instilling competition, providing incentives to reduce the costs of the wastewater management program, or by reducing users demands on the wastewater system.

Many of the options under this category relate to public and private partnerships or privatization of certain activities.

Public and Private Partnerships. There are many forms of public and private partnerships, including private operations assistance; contract O&M; design, build, own, operate, and transfer (DBOOT); finance, design, build, own, operate and transfer (FDBOOT); and full private ownership and operation. In general, these forms of public and private partnerships are intended to provide more cost effective delivery of services by taking advantage of competitive market pressures. Public entities have advantages associated with public financing and may have a desire for local control that often tend to influence which, if any, of these options is exercised.

Cost-Savings Incentives. While many publicly-owned utilities have not privatized their operations, many have significantly reduced their operating costs. In part, this has been the result of competitive pressures from firms offering to privatize these systems. Management structures and incentives can be built into better public and private systems to help foster cost effective delivery of services.

Reducing User Demands. Cost savings could be achieved by reducing user demands on the system or by sharing facilities. For example, the high costs of installing and operating an OWNRS could become much more affordable if the OWNRS system was shared by several households. (See the discussion in Chapter 3 describing OWNRS alternatives.)

8.2 Funding and Financing Issues

There are numerous issues surrounding the funding and financing of the proposed wastewater system improvements and operations in the Keys, including:

- The relatively high cost per customer for the planned improvements
- The significant differences in costs between service areas and types of treatment
- Differences in the availability of grants for specific projects
- Overall limitations on the availability of grant funding
- A significant population of low income and fixed income residents
- Limited growth potential
- Potential double charging of users who replace failing septic tanks or cesspools prior to the installation of sewer lines to serve the area, paying once for the new onsite system and then again for connection to the sewer system
- How the Florida Keys Aqueduct Authority (FKAA) should set sewer rates and fees, on a County-wide basis, regional basis (e.g., Lower Keys, Middle Keys, and Upper Keys), or varied for each individual service area.

The following sections describe each of these issues.

8.2.1 High Cost Per Customer

One of the most significant constraints on the ability of the County to implement the wastewater management improvements needed to achieve the water quality goals in and around the Florida Keys is the high cost of the projects per resident or per connection served. The limited number of existing community wastewater facilities and infrastructure, limited customer base, physical impediments to achieving significant economies of scale, difficult construction conditions, the advanced levels of treatment required to achieve the state-mandated goals, and limited availability of land upon which to site new wastewater treatment facilities are among the factors that contribute to the high cost of this program. For the 45 projects identified, the estimated capital costs vary from $17,100 per equivalent dwelling unit (EDU) for Conch Key, which when combined with O&M costs is equivalent to a cost per EDU of $197 per month, to a capital cost of $5,200 per EDU for Windley Key, which when combined with O&M costs is equivalent to a cost per EDU of $55 per month.

The total estimated capital cost of the identified improvements to serve all of the County's wastewater service areas is $438 million. This equates to $7,800 per permanent resident, or $9,149 per EDU. When combined with O&M costs, this is

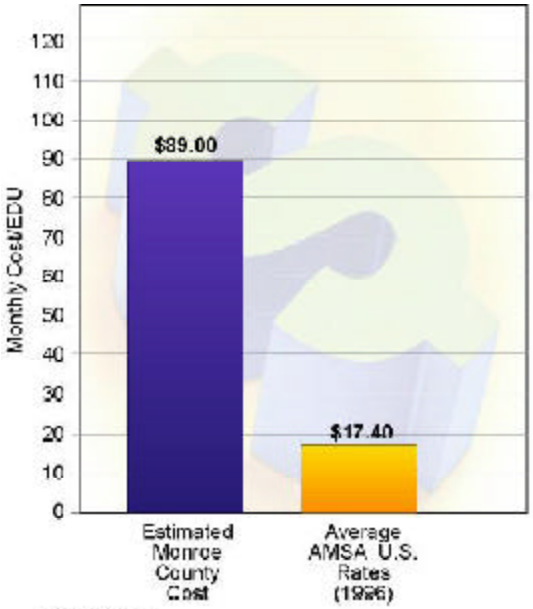


EXHIBIT 8-1
Monroe County's estimated monthly wastewater cost is well above national average wastewater rates.

equivalent to an average cost per EDU of $89 per month, or $1,068/EDU/year (assumes capital costs are amortized over 20-year term, at 6 percent interest, but does not reflect offsetting connection fees or potential grants, either of which would reduce the monthly cost to users). This cost per household represents 3.2 percent of the County's median family income of $33,906 in 1989, the most recent year for which this information is available. These costs are well in excess of what would generally be considered affordable and are much higher than is typical in the rest of Florida, and the United States. The U.S. Environmental Protection Agency has issued documents that have suggested that when a community's wastewater charges exceed 2 percent of the community's median family income, that program may be considered to impose a financial hardship on the community. For purposes of comparison, the 1996 Association of Metropolitan Sewerage Agencies (AMSA) financial survey found that the highest annual wastewater service charge of any of the 96 respondents to its survey of large wastewater utilities in the United States was $551.40 per year, or about $46/month. The average charge was $209.26/year, or about $17.40/month. (See Exhibit 8-1.)

EXHIBIT 8-2
Connection Fees and Monthly Sewer Charges for Monroe County Utilities

Monroe County	Total Wastewater Connection Fees	Average Monthly Sewer Bill
Key Haven Utilities	$1,800	$46.98
Ocean Reef Club	$1,400	$37.00
K W Resort Utilities	$2,700	$34.25
Key West	$1,340	$36.00
Key Colony Beach	$4,500	$30.00
Average	$2,348	$36.85

EXHIBIT 8-3
Monthly Water and Sewer Bill Comparison - 1999
Smallest Residential Service 5,000 Gallons

Community	Monthly Water Bill ($)	Monthly Sewer Bill ($)	1999 Combined Water and Sewer Bill ($)
North Port Utilities	23.41	42.24	65.65
St. Augustine	31.74	29.98	61.72
Hillsborough County	17.15	33.70	50.85
Okeechobee	24.35	27.44	51.79
Pahokee	20.50	25.90	46.40
Temple Terrace	13.65	25.65	39.30
Lake Alfred	12.95	40.54	53.49
Longwood	15.65	31.70	47.35
Edgewood (Service by Orange Co.)	10.52	26.64	37.16
Orange County	10.52	26.64	37.16
Average	**18.04**	**31.04**	**49.08**

The County has adopted guidelines that a connection fee of $1,600 per connection and a $35 per month user charge is affordable. This policy level is less than what is being charged by some other communities in the Keys and in Florida. Exhibit 8-2 presents the current connection fees and wastewater rates of existing utilities in Monroe County. Exhibit 8-3 presents the monthly user fees of communities in Florida with relatively high wastewater rates. Exhibit 8-4 presents impact fees for Florida communities. It should be recognized that the communities listed in Exhibits 8-2, 8-3, and 8-4 have had water and sewer systems in place for many years, and were constructed at a time when construction costs were much

EXHIBIT 8-4
Impact Fees of Florida Communities

Community	Impact Fee		
	Water ($)	Sewer ($)	Combined ($)
Boca Raton	4,141	3,322	7,463
Longwood	1,150	4,300	5,450
Venice	2,720	1,642	4,362
Orlando	1,300	3,008	4,308
South Walton County	1,500	2,500	4,000
Edgewater	1,095	2,487	3,582
Orange County	1,095	2,487	3,582
Cooper City	1,316	2,201	3,517
Royal Palm Beach	1,590	1,830	3,420
Tamarac	1,400	1,800	3,200
Average	**1,730**	**2,558**	**4,288**

less expensive. In addition, these communities are not faced with the cost of constructing and operating an entirely new wastewater system, and their systems provide a lower level of treatment than that being proposed for the Keys (except for Key West and Key Colony Beach, where rates reflect advanced wastewater treatment [AWT]). Many of these systems also received grant funding at the time they were constructed.

8.2.2 Cost Differences Between Service Areas and Types of Treatment

There is a significant variance in the cost per customer between proposed service areas in the Keys. This variance contributes to making the identification of an equitable and affordable means of funding these improvements and activities difficult. Some of the existing wastewater systems in the Keys have connection fees as low as $1,400 and monthly charges of $37 per month (Ocean Reef Club). This is in contrast to the capital cost of an OWNRS onsite treatment system, which is estimated to cost $15,000, and has an associated monthly O&M cost of $125. This equates to a monthly cost of $234 (assuming the capital cost is amortized over 20 years, at 6 percent interest).

There are a number of unknown systems and permitted septic tanks that are not located within the areas that will be receiving service from a community wastewater system under the proposed wastewater management program. There are an estimated 235 unknown systems that must be replaced and upgraded to an OWNRS system by July of 2003. In addition, there are approximately 850 permitted systems that will need to be upgraded to an OWNRS system by July of 2010. The estimated capital cost of providing an individual OWNRS system to each user would amount to over $16 million. The County's current program provides grants that will cover 62 percent or more of the capital cost of these systems. To provide 62-percent grants for all of these systems would require about $10.1 million. However, the County currently has only about $2 million available to support this grant program, leaving an $8.1-million shortfall in funding for the County to provide this level of grant funding for the Cesspool Replacement Program. (See Exhibit 8-5).

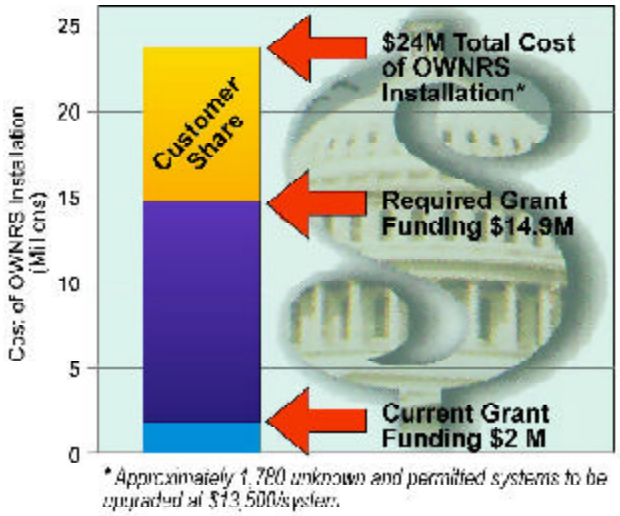


EXHIBIT 8-5
Current Funding Available for Monroe County's Cesspool Identification and Elimination Grant Program

Assuming that the property owners can obtain 20-year loans at 6 percent interest for the remaining capital cost of these systems (after a 62-percent grant), their monthly loan payment would amount to about $41/month. In addition, the monthly operating cost for these systems is estimated at $125/month, for a total monthly cost of $166/month. This monthly expense would amount to 5.9 percent of the median family income in the County, and compared to the 2-percent indicated by the U.S. Environmental Protection Agency, would be well beyond most measures of what would be considered affordable to these users.

8.2.3 Availability of Grant Funding

Prior to the 1980s, grants were one of the primary sources of financing for wastewater improvement projects. Political and economic conditions in the early 1980s caused rapid changes in the methods of financing projects. While some federal grant money is still obtainable, the financial burden for meeting wastewater needs has increasingly shifted to local communities, with much less assistance available now than in the past. In their place, a number of funding and financing options, primarily low interest loan programs, have been developed to help local governments acquire the funds necessary to construct facilities to meet environmental regulations and to meet the service needs of their customers.

Federal grants and many of the low interest loan programs are generally not available to individuals or private companies, but only to local governments. This has significant implications for future ownership of the wastewater facilities. For example, federal grants would not be available to property owners who need to install an OWNRS onsite system, but could be available if the onsite systems were operated by a utility. Grants may be available for a community wastewater system and plant, provided it is owned by a local government rather than a private company. Grants are also generally not available to offset the ongoing O&M costs of any of the facilities.

8.2.4 Low and Fixed Income Population

A significant proportion of Monroe County's population base is relatively low or fixed income. About 11.5 percent of the County's population was below the poverty level in 1993, and over 15 percent of the population was over 65 years old in 1996. Many of the standard measures of affordability are based on median family income, which do not directly reflect the capabilities of those least able to afford the capital cost of installing a new OWNRS or paying for the cost of connecting to a new public sewer system, or the associated monthly sewer bills. Many of these customers are located in communities that are more densely developed, and many have cesspools. The County's 62- to 84-percent reimbursement program will help these customers pay for and finance the costs of installing an OWNRS. The remaining 16 to 38 percent of the cost of the replacement would need to be financed by the homeowner.

8.2.5 Limited Growth Potential

New development in the Keys is limited through the rate of growth ordinance (ROGO), which restricts the number of new housing starts annually. With this limited growth, the system costs will not decrease significantly because these costs can not be shared with significant numbers of additional users in the future.

8.2.6 Potential Double Charging

Some users with cesspools or septic tanks may be required to replace their systems before a public sewer system is available in their area. These users will be required to install nutrient reduction OWNRS onsite systems. Once a public sewer system is available in their area, the user will then be required to connect to this system, and thus a user would have to pay for both an OWNRS and for connection to the sewer system. The County, through its current Cesspool Identification and Elimination Ordinance, has greatly reduced the "double charge" potential by not requiring cesspool replacement in "Hot Spot" areas. However, because some cesspools had been replaced before the current ordinance was enacted, and because some properties (new homes) in "Hot Spot" areas will have to install OWNRS before central sewers are available, the

County should develop a policy to address the "double charge" issue.

8.2.7 Countywide, Regional, or Service Area Rates and Fees

As wastewater service is extended to various service areas, the County, the FKAA, and incorporated areas will need to decide how they intend to set rates and fees for wastewater service. Among the choices available are 1) setting uniform wastewater rates and fees throughout Monroe County; 2) setting uniform wastewater rates for specific regions of the County (e.g., the Lower Keys or incorporated areas); or 3) setting different rates and fees for each wastewater service area served. These decisions will have significant implications regarding user equity, revenue stability, and the ability of the system to extend service into many areas.

Providing affordable uniform wastewater rates to all Monroe County residents is an important issue, and has been further complicated by the recent incorporation efforts. Setting uniform wastewater rates and fees throughout all the unsewered areas of the County is the most equitable rate-setting approach and the recommendation of this Master Plan. To do otherwise poses the danger that more developed areas, where implementation costs tend to be lower, would be implemented first, and would charge lower rates. The smaller or more remote service areas where implementation costs will be higher would then be forced to set higher rates and fees. This has the potential to compromise affordability, and therefore jeopardize implementation of this program in these areas.

8.3 Fiscal Impact Analysis

As the costs of the wastewater management program are well beyond the financial capability of the residents of the County to afford without outside assistance, the fiscal impact analysis presented herein evaluates the level of grant or external funding that would be needed to make the program financially feasible under specific assumptions regarding wastewater rates and connection fees. It was assumed for this analysis that funding and financing for the wastewater management program would come from four main sources: revenues from rates, connection fees (including impact fees), revenue bonds, and grants. While this analysis only considers the use of these four sources of funding and financing, this should not be interpreted as a recommendation to only use these sources of funding and financing for the County's wastewater program. We believe these tools will likely be used as part of the County's wastewater program's funding and financing, but many other mechanisms may also be used.

8.4 Approach for Analysis of Funding Options

To examine the feasibility of the projects, four scenarios were developed. The first scenario (Scenario 1) assumes ratepayers would be charged a monthly fee of $35 per EDU and would pay a one-time assessment, or connection/impact fee, of $1,600. The assessment would be used to defray the capital costs for the project. The monthly fee would support O&M costs, including repair and replacement costs. Any portion of this fee not used for O&M and repair and replacement costs would be available to repay the debt service on the local portion of the capital costs.

Scenario 2 analyzes the impacts of a monthly fee of $40 per EDU, with a $2,500 connection fee. Scenario 3 analyzes a $50 monthly fee and a $2,500 connection fee. Finally, Scenario 4 examines a monthly fee of $50 per EDU, with a connection fee of $3,500. It was assumed for each of these scenarios that revenue bonds would be issued to finance the local portion of the capital costs, with a 20-year term and an interest rate of 6.0 percent. Exhibit 8-6 summarizes these scenarios.

8.4.1 Regional Analysis

For the three regional areas in the Keys (Lower, Middle, and Upper), the total amount of grant monies needed for the recommended projects is presented for each scenario. Because the amount of grant money that will be available for any individual project cannot be predicted, financial feasibility is best evaluated countywide or for the three regional areas. A project-level analysis, however, is provided in Technical Memorandum 15 in

EXHIBIT 8-6
Funding Scenarios
Monroe County, Florida

Scenario	Monthly Fee	Cost per Year	Connection Fee
Scenario 1	$35	$420	$1,600
Scenario 2	$40	$480	$2,500
Scenario 3	$50	$600	$2,500
Scenario 4	$50	$600	$3,500

Volume 8, *Supporting Documents*, of this Master Plan.

8.4.1.1 Lower Keys

A total of $129,700,000 in capital costs, representing eleven wastewater management projects, have been identified in the Lower Keys. These projects will support an estimated 13,309 EDUs, with the average capital cost per EDU being approximately $9,745. These projects consist of two regional systems, three community systems, and six upgrades of existing privately-owned systems. Monthly O&M costs for the regional and community projects vary from $18 to $32 per EDU. The additional O&M costs to provide AWT- or BAT-level treatment at the existing small, privately-owned systems vary significantly from system to system. Assuming that these systems remain privately-owned, these systems will not be subject to the same impact fee and rate schedules as the publicly-owned systems. While grant monies can help Monroe County address the high capital costs associated with these projects, grants cannot be used to reduce the monthly O&M costs. The monthly O&M costs for the combined Lower Keys projects are estimated to be $23 per EDU.

For the majority of the projects, the monthly fees of between $35 (Scenario 1) and $50 (Scenarios 3 and 4) per month would generate funds beyond that which is required to support O&M and repair and replacement costs. The difference between total annual revenues (the monthly fee times 12, multiplied by the number of EDUs) and total O&M costs is the annual debt service that the project could support under each scenario. The amount of additional funds that could be allocated to debt service varies with the monthly fee and each project's estimated O&M costs. Connection fees are used to offset some of the capital expenditures associated with each project. The connection fees evaluated range from $1,600 (Scenario 1) to $3,500 (Scenario 4). Exhibit 8-7 presents the grant money that would be required for the projects in the Lower Keys to be feasible under each of the four scenarios.

Under Scenario 1, grants totaling approximately $90.0 million, or 69 percent of the projects' combined capital costs, would be necessary for the projects to be undertaken. When the monthly charge increases to $40 per EDU and the connection fee to $2,500, the amount of grant monies needed falls to $70 million, or 54 percent of the capital cost of these planned improvements. The percentage of capital costs needed in grants is roughly 32 percent ($41.8 million) under Scenario 4. The use of SRF loans, which carry a lower interest rate, can be expected to slightly reduce the amount of grant funding that is needed.

8.4.1.2 Middle Keys

Eight wastewater management projects, estimated to cost a total of $90.6 million, have been identified in the Middle Keys. These projects will support an estimated 10,595 EDUs, with the average capital

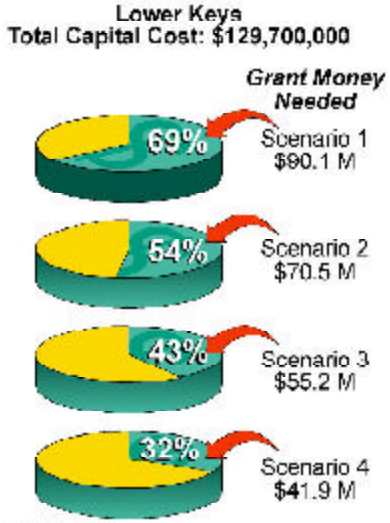


EXHIBIT 8-7
Total Grant Money Needed in the Lower Keys to Fund Wastewater Management Improvements

cost per EDU being approximately $8,550. Monthly O&M costs per EDU for the one regional project and three community projects vary from a low of $23 for the Marathon Regional System to a high of $72 at Conch Key. None of the monthly fees under the four scenarios would generate sufficient revenue to fully support the required O&M cost for Conch Key. The monthly O&M costs for the combined projects in the Middle Keys is estimated to be $25 per EDU, which allows some of the monthly fee to fund a portion of the capital cost for wastewater improvements. The grant money required to implement the projects in the Middle Keys is presented in Exhibit 8-8 for each of the four scenarios.

The projects for the Middle Keys would require a proportionately smaller amount of grant assistance than those in the Lower Keys. Grants totaling approximately $60.9 million, or 67 percent of the projects' combined costs, would be necessary to fund the projects with the monthly charge and connection fee under Scenario 1. When the monthly charge increases to $50 per EDU and the connection fee to $3,500 (Scenario 4), the total grant amount needed falls to $22.5 million, or 25 percent.

8.4.1.3 Upper Keys

Six wastewater management projects have been identified in the Upper Keys, costing a total of $198.0 million. These projects will support an estimated 22,762 EDUs, with an average capital cost per EDU of approximately $8,849. O&M costs per EDU at the two regional systems and one community system vary from a low of $11 at the Tavernier/Key Largo Regional System to a high of $25 at the Lower Matecumbe Service Area. The monthly O&M costs for the combined projects in the Upper Keys is estimated to be $15 per EDU. For each of the four scenarios, the grant money required to implement the Upper Keys' projects is presented in Exhibit 8-9.

The projects for the Upper Keys would require a greater amount of grant assistance (from $30.2 to $112.6 million) to be feasible under the four scenarios evaluated. Grants totaling approximately $112.6 million, or 56 percent of the projects' combined costs, would be necessary for the projects to be funded under Scenario 1. With a monthly charge of $50 per EDU and a connection fee of $3,500 (Scenario 4), the grants needed fall to $30.2 million, or 15 percent.

8.4.1.4 Entire Keys

For the entire Keys, 45 wastewater management projects costing a total of $421,700,000 have been identified. When the costs of the proposed onsite improvements in "Cold Spot" areas are added, the total cost increases to $437,950,000. These projects are estimated to support 47,871

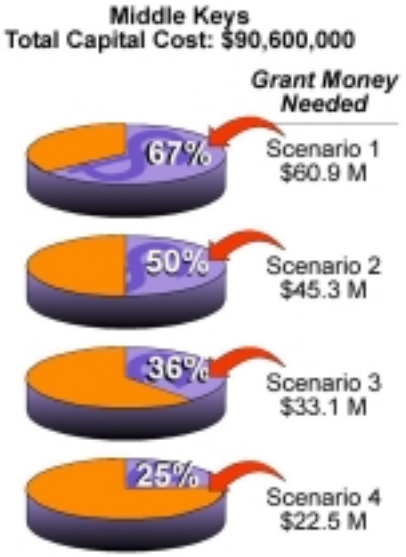


EXHIBIT 8-8
Total Grant Money Needed in the Middle Keys to Fund Wastewater Management Improvements

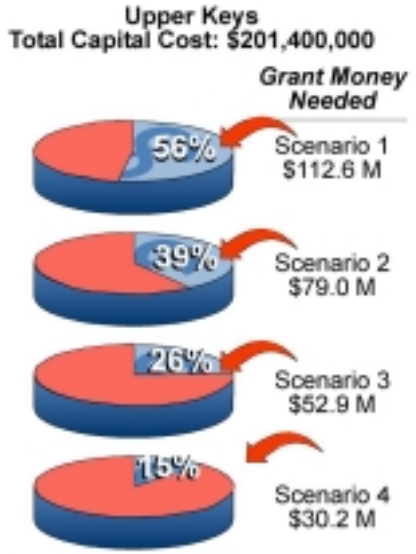


EXHIBIT 8-9
Total Grant Money Needed in the Upper Keys to Fund Wastewater Management Improvements

EDUs, with an average cost per EDU of $9,149. Monthly O&M costs are estimated to be $22 per EDU. The total amount of grant monies necessary, when all projects are analyzed together, is presented in Exhibit 8-10 for each of the four scenarios.

For the projects in the Keys to be implemented, even under the heavy rate payer burden of Scenario 4 ($50 per month and $3,500 connection fee), a considerable amount of grant monies would still be needed. The projects are estimated to require between $117.1 million to $290.4 million to be feasible under the four scenarios evaluated. Grants totaling approximately 66 percent of the projects' combined costs would be necessary for the projects to be feasible under Scenario 1 ($35 per month and $1,600 connection fee). With an increase in the monthly charge to $40 per EDU and the connection fee to $2,500 (Scenario 2), the amount of grant funding needed falls by $70.0 million to $219.9 million, or 50 percent of the total cost. A $10 per month increase (Scenario 3) further decreases the needed grant funding to $165.0 million (38 percent). Finally, under Scenario 4, more than $117.1 million, or 27 percent of the total capital costs, would need to be raised through grants to support the recommended wastewater improvement projects in the Keys.

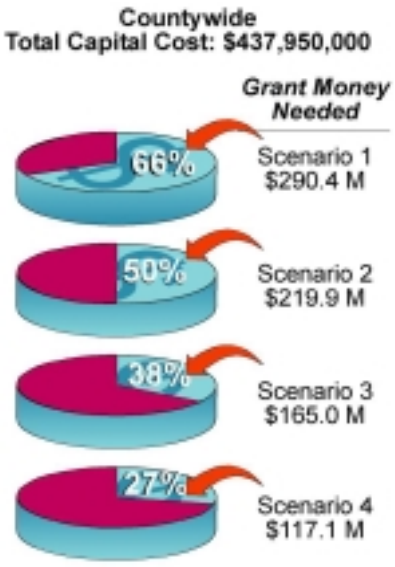


EXHIBIT 8-10
Total Grant Money Needed in the Entire Keys to Fund Wastewater Management Improvements

8.5 Funding Recommendations for Monroe County

Any strategy to fund and finance a wastewater management program that addresses the issues inherent in Monroe County should give due consideration to the funding and financing evaluation criteria described earlier in this section. Additionally, any potential funding or financing solution should be evaluated in light of the total system needs, rather than focusing on any one individual project or issue. The selected funding and financing program should provide sufficient funding to meet the entire program costs when needed, and the costs that will be borne by the users of the system need to be reasonable, affordable, and equitable.

It is clear from the analysis of the relevant financial issues that the users of the wastewater systems in the Keys cannot afford the costs of this program without significant external financial assistance. Even with federal and/or state grants to offset large portions of the capital costs of the needed improvements, the O&M costs of some of the systems serving specific areas would be cost prohibitive if those systems needed to be self-supporting.

For these reasons, the County and the FKAA will need to aggressively pursue grant funding for virtually all of the projects included in this wastewater management program. Projects that involve improvements to privately-owned utilities are not typically grant eligible. *The Monroe County Funding History Summary Report* (included in Volume 8, *Supporting Documents*) discusses strategies for pursing grant funding for this wastewater management program.

Recognizing that it may not be possible to accomplish initially, it is recommended that the FKAA and the incorporated areas not under the jurisdiction of the FKAA implement a uniform countywide rate and connection/impact fee structure as soon as possible to offset the higher cost of implementation presented by some of the service areas. For example, the high overall implementation costs in the Lower Keys could make it difficult to implement the needed improvements in that region. While there may seem to be some

financial incentives to form multiple service districts with varying rates, it will be important for the success of this wastewater program that this does not occur. The success of this program is dependent, in part, on the economies and sharing of costs associated with a single system, rather than numerous individually-funded smaller systems.

The "go it alone" funding and rate and fee setting approach currently being pursued in certain areas is in conflict with the goal of uniform rates throughout all unsewered areas and could undermine the viability of this program. It is recommended that an oversight entity, such as the Water Quality Steering Committee, be charged with the responsibility to oversee the goal of implementing countywide rates and fees to assure all areas equitable and affordable wastewater rates.

In order to ensure the financial feasibility of these projects and success of the wastewater management program, the County has in place requirements for users to connect to the community wastewater systems when service becomes available.

Because the County has a significant population of low income and fixed income residents, many of these customers will need financial assistance to afford the cost of connecting to a community wastewater system or to purchase an OWNRS onsite system. The current funding for the County's grant program for replacing and upgrading onsite systems is insufficient to meet the anticipated grant funding needed over the next 10 years. Additional funding for this grant program needs to be identified if this program is to be of financial help to those in need of this assistance. For connections to community sewer systems, the County may want to consider an alternative program that would allow low income users to defer making their connection payments until such time as their property is sold. This program could prove to be more affordable to the County's low-income residents.

Despite the financial assistance for the capital cost of an OWNRS onsite system, the projected monthly cost of these systems is substantial for Keys' residents, and falls considerably above the average U.S. rate. The County or FKAA should provide technical assistance to help users who need to install and operate these systems arrange to share the use and cost of these systems with others who are similarly situated. The administration and management plan proposed in Chapter 9 should help to accomplish this goal. Ultimately, some form of discount on the provision of these O&M services ultimately may be needed to render this program affordable. The high cost associated with these systems will provide a strong cost incentive to find a more cost-effective community-based solution for these users.

The County should continue to examine and pursue alternative funding and financing arrangements, management structures, public and private partnerships, and alternative service arrangements that will help reduce the costs of this program to the County, the FKAA, and wastewater customers. The SRF loan program, with its below-market interest rates, will generally be the preferred source of financing for the local share of the capital costs of most projects. However, as there are limits on the total annual amount of funding that can be obtained from this source (generally $10 million / year), revenue bonds may be needed to finance the local share of the capital costs of some projects.

★★★★★★

Chapter 9 Recommended Wastewater System Administration, Management, and Operation and Maintenance Plan

Considering the wide range of types and sizes of wastewater management facilities that will be implemented in the Keys, a viable and effective wastewater administration and management structure must be in place to ensure that all facilities are properly operated and maintained to meet the expected effluent quality. This chapter presents a recommended conceptual wastewater management structure that reflects the unique and diverse wastewater management systems that currently exist in the County and will develop as the Master Plan is implemented.

9.1 Existing Wastewater Management Structure

The Florida Keys Aqueduct Authority's (FKAA) enabling legislation authorizes the FKAA to supply both potable water and wastewater services in Monroe County, including acquiring, financing, operating and maintaining wastewater collection, transmission, treatment, and disposal systems. A Memorandum of Understanding (MOU) between the Monroe County Board of County Commissioners (BOCC) and the FKAA establishes the FKAA as the wastewater authority for all of Monroe County, except for the Cities of Key West and Key Colony Beach and Islamorada, Village of Islands. As such, FKAA will own, operate, and maintain all publicly-

owned wastewater collection and treatment systems in these areas of Monroe County.

Although the FKAA has the authority through their enabling legislation and the MOUs with the County to manage all wastewater facilities, including onsite systems and privately-owned package plants, a policy has yet to establish who will administer and manage the private package plants and onsite systems.

9.1.1 Existing OWTS Administration and Management

Chapter 381 of the Florida Statutes delegates the responsibility for regulation of onsite wastewater treatment systems (OWTS) in Florida to the Florida Department of Health (FDOH). These responsibilities are administered locally by the Monroe County Public Health Unit (MCPHU). FDOH has promulgated administrative rules in Chapter 64E-6, of the Florida Administrative Code (FAC), that describe how the OWTS will be permitted and constructed. Because of the unique and sensitive environment in the Florida Keys, the rule contains additional requirements that are Keys-specific, such as 1) system location, design, and maintenance criteria; 2) cesspit replacement and undocumented system upgrades; and 3) coordinated permitting.

Currently, there are no mandated management requirements for onsite systems in the Keys except for aerobic treatment units (ATUs) and recently required onsite wastewater nutrient reduction systems (OWNRS), which require an operating permit with the MCPHU and must include a maintenance agreement between the property owner and an approved maintenance entity. The maintenance agreement requires two inspections per year for residential ATUs and four inspections per year for ATUs serving commercial establishments. Inspection reports must be provided by the maintenance entity to the MCPHU. The MCPHU evaluates a representative number of ATUs each year to monitor maintenance and performance of the ATUs in the Keys. The property owner or permit holder provides the administration and management of the ATUs or OWNRS. The owner typically contracts with a certified operator who assumes responsibility for making operation and maintenance repairs and submitting required reports to the regulatory agency.

9.1.2 Existing Package Plant Administration and Management

A few wastewater treatment plant (WWTP) owners employ staff who are certified to operate and maintain their wastewater facilities, however, most of the plants are operated and maintained by certified operators under contract with the owner. The owner of the package plant must have a wastewater permit in effect with the Florida Department of Environmental Protection (FDEP). This permit contains the construction and operating requirements for the WWTPs and associated reuse or disposal systems.

Certified operators oversee the operation of the plant and file reports to permittees or owners of the facilities and FDEP, describing treatment plant operation, sampling, and laboratory analyses. In addition, they maintain an operational log documenting specific maintenance activities performed, and perform preventive maintenance and repairs approved by the facility owner. The responsible party (facility owner) is required to submit monthly facility monitoring reports to FDEP.

9.2 Wastewater Management Objectives

Important objectives to a successful wastewater system administration and management plan for the Keys are:

- Ensure all systems are properly managed
- Ensure all systems meet water quality standards
- Reflect recent County/FKAA agreements
- Achieve cost-effective operation and maintenance wastewater systems
- Develop a management structure that is flexible and adaptable (able to meet changes as the Keys-wide wastewater management technologies are phased in over time)

9.3 Administration and Management Options

This section focuses on potential management and institutional structures that might be utilized to manage and administer both onsite wastewater systems and private package WWTPs within the planning area. As the recommendations in this Master Plan are implemented, many of the existing small package plants will be decommissioned and more economical and environmentally sound wastewater treatment will be provided by the recommended community or regional wastewater systems. Ultimately, only a few of the small privately-owned package plants will remain. Likewise, many of the existing onsite systems will be served by the recommended community and regional wastewater systems. However, approximately 1,100 onsite systems are projected to be remaining when the recommendations of this Master Plan are fully implemented. Thus, the larger questions relative to the future management framework focus on the management of the onsite systems, which will be the nutrient reduction OWNRS systems.

9.3.1 Onsite Wastewater Treatment Systems

Organizational structures for managing onsite wastewater treatment systems do not exist in most communities, although a management structure is required almost universally for centralized wastewater facilities and for other utility services such as electric, telephone, cable TV, and water. In the case of OWTS, state regulations generally prescribe the design and construction standards for onsite systems and enforcement of these regulations falls to local agencies, generally the health departments, which often have limited authority, little wastewater engineering expertise, and insufficient staff resources. Inconsistent laws and policies in the U.S. have resulted in effective management structures for the larger, urban and centralized wastewater systems, while small, rural, decentralized wastewater systems such as OWTS frequently remain unmanaged.

Experience has shown, however, that OWTS must be managed from site evaluation and design through the life of the system to maintain proper function and to protect ground and surface water quality.[16,17] Inadequate operation and maintenance of OWTS by homeowners have led to system failures and the resulting perception that decentralized wastewater systems are less reliable than centralized facilities.

9.3.1.1 Management Functions of an OWTS

The objective of developing a management program for OWTS in Monroe County is to ensure that: 1) performance requirements are established for restoring and protecting the surrounding and nearshore waters; 2) the performance of the onsite wastewater treatment systems are consistent with those requirements; and 3) qualified service providers are available to perform necessary design, construction, operation, maintenance, and monitoring of the systems such that they perform satisfactorily over their service lives. An effective wastewater management program for onsite systems should address the following functions:[18,19]

- Planning and Administration
- Site Evaluation
- System Design
- System Installation
- Residuals Disposal
- Financing
- Operation and Maintenance (O&M)
- Monitoring
- Public Information and Education

[16]U.S. Environmental Protection Agency. 1997. Response to Congress on the Use of Decentralized Wastewater Treatment Systems. EPA 832-R-97-001b. Office of Water, Washington, D.C.
[17]Ciotoli, P.A. and K.C. Wiswall. 1982. *Management of Onsite and Small Community Wastewater Systems*. Report to the U.S. Environmental Protection Agency, Municipal Environmental Research Laboratory, Cincinnati, Ohio.
[18]U.S. Environmental Protection Agency. 1997. Response to Congress on the Use of Decentralized Wastewater Treatment Systems. EPA 832-R-97-001b. Office of Water, Washington, D.C.
[19]Ciotoli, P.A. and K.C. Wiswall. 1982. *Management of Onsite and Small Community Wastewater Systems*. Report to the U.S. Environmental Protection Agency, Municipal Environmental Research Laboratory, Cincinnati, Ohio.

EXHIBIT 9-1
Functions and Responsibilities of an Effective Wastewater Management Structure

Planning and Administration	Plan preparation Plan review coordination Research and development Office and staff management	**Operation and Maintenance**	Procedures and regulations Operator/inspector certification Routine inspections Emergency inspections System repair/replacement Repair supervision Performance certification System ownership
Site Evaluation	Guidelines and criteria Evaluation certification Site suitability analysis	**Residuals Disposal**	Disposal regulations Hauler certification Record keeping Equipment inspections Facility inspections Facility operation
System Design	Standards and criteria Designer certification System design Design review Permit issuance	**Financing**	Secure funding Arrange financing options Set rates/charges Collect charges
System Installation	Construction supervision Installer certification Recordkeeping Permit assistance	**Public Information and Education**	Develop methods Disseminate information Respond to complaints
Monitoring	Sampling and monitoring program Reporting and tracking system		

Exhibit 9-1 provides a list of the activities covered by each of these functions.

9.3.1.2 OWTS Management Planning

The onsite wastewater management planning process is a critical first step and involves coordination of a variety of technical and institutional factors, including engineering, environmental, legislative, public education, socio-economic, and administrative considerations. The interaction of these factors is illustrated in Exhibit 9-2.

One of the most important aspects of the planning process is to determine who will be responsible for the onsite wastewater management program and the functions listed above. The responsibility for these functions can be distributed among the following parties:

1. Homeowners/property owners of onsite systems
2. OWTS service providers, such as engineers, installers, inspectors, soil scientists, septage haulers, and regulatory agency officials
3. A program management entity, which at a minimum, administers the program.

The structure of the management program depends on the functions to be performed and the resources of the community. The program structure should include mechanisms for proposing and enforcing regulations, performing system inspections and maintenance, and monitoring program performance. The success or failure of an onsite wastewater management program depends significantly on the choice of the management entity. Once a community defines the specific functions needed to support the program operation, it must then determine whether existing organizations have the statutory authority and resources to carry out these functions. If existing institutions lack certain legal powers, legislative modifications may be necessary.

Several types of onsite wastewater management structures are possible, and may involve existing local agencies, private organizations, or a combination of agencies and organizations. Different types of entities can provide management services,

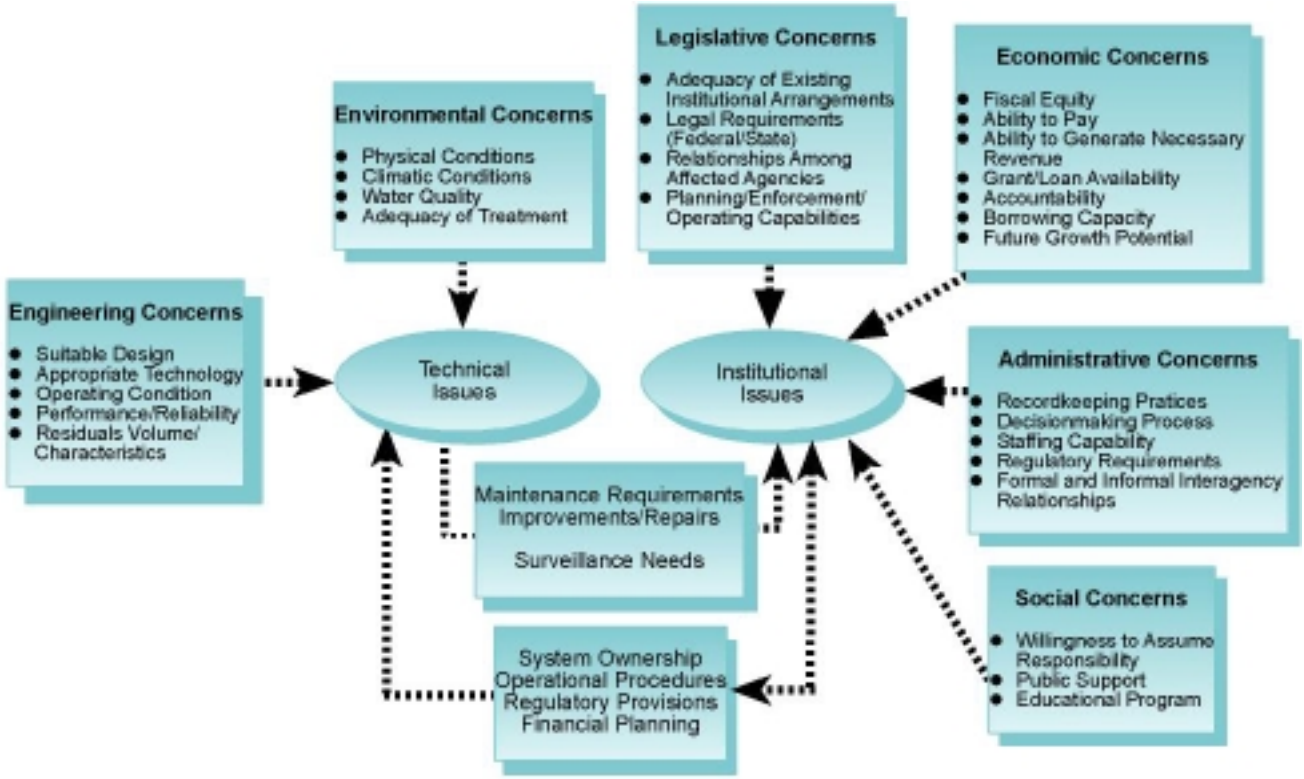


EXHIBIT 9-2
Technical and Institutional Factors in Onsite Wastewater Systems Management Planning[22]

including local government, private industry, special districts, and public authorities. Recently, OWTS management by rural electric cooperatives has been considered.[20] Exhibit 9-3 summarizes the various management structures available for OWTS and provides descriptions, characteristics, and the advantages and disadvantages of each.[21]

Case studies of OWTS management system implementation in other locations in North America are provided at the end of this chapter. These examples provide the experience of other municipalities in setting up onsite wastewater management programs, and can be used to assist in the development of a management program for Monroe County.

9.3.2 Wastewater Treatment Plants

An example of a management structure for the remaining small private WWTPs in the study area is provided by Indian River County, Florida.

Indian River County established a countywide (with the exception of the City of Vero Beach) wastewater operation

[20]U.S. Environmental Protection Agency. 1997. Response to Congress on the Use of Decentralized Wastewater Treatment Systems. EPA 832-R-97-001b. Office of Water, Washington, D.C.
[21]Ciotoli, P.A. and K.C. Wiswall. 1982. *Management of Onsite and Small Community Wastewater Systems*. Report to the U.S. Environmental Protection Agency, Municipal Environmental Research Laboratory, Cincinnati, Ohio.
[22]U.S. Environmental Protection Agency. 1997. Response to Congress on the Use of Decentralized Wastewater Treatment Systems. EPA 832-R-97-001b. Office of Water, Washington, D.C.

EXHIBIT 9-3
Types of Management Structures for Onsite Wastewater Treatment Systems[23]

Management Entity	State Agency	County	Municipality	Special District	Improvement District	Public Authority	Public Nonprofit Corp.	Private Nonprofit Corp.	Private for Profit Corp.
Description	Environmental protection agencies, health depart-ments, and public utilities.	Most basic political subdivision in a state. Comprised of incorporated and unicorporated areas.	Cities, towns, and townships.	Performs functions prescribed by state-enablihg legislation. Provides single or multiple services.	Device used by counties/munic to provide services to local gov. jurisdictions.	Authorized to administer a revenue-producing public enterprise. Similar to a special district.	Provides water or wastewater services on behalf of local governments.	Established by the users of a facility to assist in facility financing and operation.	Designs, operates, or maintains facilities.
Service Area	Program enforcement can be handled on a regional basis.	Provides service throughout its juris. and to defined areas via improvement districts.	Provides service throughout its juris, and to defined areas, via improvement districts.	Flexible.	One or more as part of a single jurisdiction.	Flexible.	Flexible (single community, group of communities, or statewide).	Can include subdivisions, small communities, and rural areas.	Flexible (single homeowner to small community).
Governing Body	Agencies report to the governor, legislature, or to a board of directors.	Includes elected (princ. legislative branch) county board commission, council-administrat-or, council-elected executive.	Mayor-council, commission, and council-manager.	Board of directors (elected, appointed, or existing agency members).	Governing body of the creating unit of government.	Board of directors (elected or members of local government).	Usually municipal or state officials.	Board of directors elected by stockholders or a property owners association.	Private utility has stock-holders or investors. Public utility commission (PUC) has jurisdiction.
Responsibilities	Code enforcement of wastewater design, installation, and operation standards, and technical and financial assistance.	Coordinates munic. in its jurisdiction; provides special services on contract basis; serves as a fiscal agent for other local units of government.	Provides a wide range of services.	All wastewater management functions, similar to local government. State defines function and scope.	State statutes define extent of authority. Usually applied to finance public service improvements.	Used primarily for financing capabilities.	Serves financing mechanism. Can provide technical assistance to small communities.	Provides financing and operational functions.	Active and flexible role for managing small systems.

EXHIBIT 9-3
Types of Management Structures for Onsite Wastewater Treatment Systems[23]

Management Entity	State Agency	County	Municipality	Special District	Improvement District	Public Authority	Public Nonprofit Corp.	Private Nonprofit Corp.	Private for Profit Corp.
Financing Capabilities	Provides financial support through federal grants and state revenues.	Charges for sewerage sources and finance construction through taxation, general funds, special assessments, bonds, and permit fees.	Has a broad range of fiscal powers (similar to counties).	Local taxation, service charges, special assessments, grants, loans, bonds, and permit fees.	Can apply special property assessments, user charges, other fees. Can seel bonds.	Can use revenue bonds, user charges, and connection fees.	User charges and service fees and sales of stocks and tax-exempt bonds. Can accept some federal grants and loans.	Eligible for federal grants and loans.	User charges. The PUC can influence the service rates charged.
Advantages	Regulatory and financial advantages over local government. State enforcement can insulate from local political pressure. Can administer training/cert. programs.	Can interact with states and local governments on many issues. Often seen as administrative arms of the state. Provide efficient resource base for providing public service.	Can better react to local perception and attitude.	Flexible. Renders equitable services (only those receiving services pay for them). Simple independent forms of government.	Can extend public services without major expenditures. People in the benefitted area usually favor the improvement.	Good when local governments are not able to provide public service because of financial, administrative, or political problems. Has a certain degree of autonomy.	Offers flexibility in establishing management facilities and financing facilities by state and local governments. Financing method does not affect local debt limitations.	Provides public services where local governments are unwilling or unable.	Frees the local public sector from providing these services. Competition between firms will help maintain quality while keeping costs down.
Disadvantages	Program organizations differ. Difficult to implement methods from one state to another. Can become distanced from local governments.	Sometimes not willing to provide specialized public services to a defined service area. Community debt limits could be restrictive.	Might lack admin. capabilities, staff, or willingness to design, install, operate, and/or regulate a facility. Financial capabilities might be limited.	Can promote proliferation of local government and duplication and fragmentation of public services. Fiscal problem could result from overuse.	Contributes to fragmentation of local government services. Can result in administrative delays.	Financing ability is limited to revenue bonds. Thus, local government must support the debt incurred by the public authority.	Local governments might be reluctant to apply this concept.	Services could be of poor quality or could be terminated.	Threat that the company could go out of business. Private corporations are usually not qualified for federal and state grant and loan programs.

[23]Ciotoli, P.A. and K.C. Wiswall. 1982. *Management of Onsite and Small Community Wastewater Systems.* Report to the U.S. Environmental Protection Agency, Municipal Environmental Research Laboratory, Cincinnati, Ohio.

through its Department of Utility Services (DUS) in 1986, which maintains its own administrative and O&M staff. The County built their wastewater infrastructure by purchasing private, investor-owned systems, and to date, has purchased seven systems.

The DUS maintains two O&M divisions, one for water and the other for wastewater. The wastewater division is further divided into two units, one is responsible for operating and maintaining the wastewater plants, while a second division maintains the collection and distribution system.

There are only two privately-owned wastewater systems remaining in operation. Both are operated under franchise agreements with the County. Each franchisee is required to supply the County with copies of monthly FDEP operating reports, and a copy of the annual report. In addition, the franchise agreement requires that the franchisee establish a renewal and replacement account for the purposes of renewal and/or replacement of capital assets. County oversight basically involves a DUS inspection of each facility once a year.

9.4 Management Scenarios

The treatment and disposal of wastewater within the planning area has traditionally been accomplished utilizing either OWTS or small and intermediate-sized, privately-owned wastewater treatment package plants. Historically, the only institutional entities involved in wastewater management in the Keys have been the MCPHU or FDEP. The MCPHU is responsible for all matters related to permitting, inspections, and enforcement of OSTDSs and package plants under 10,000 gpd, unless it requests the FDEP assume permitting responsibility (FDEP/MCPHU Interlocal Agreement). Permitting, monitoring, compliance and enforcement of all the package plants greater than 10,000 gpd and Class V injection are FDEP's responsibility. To a large extent, the wastewater users, especially those on WWTPs and ATUs, have depended upon the expertise of the private certified operators that their systems are being properly managed in accordance with the conditions of their operating permit. Under present staffing conditions, the MCPHU and FDEP are more or less limited to conducting one inspection per facility per year. Where violations have been identified, their staffs make additional visits until compliance is achieved.

During the implementation of the Monroe County Sanitary Wastewater Master Plan, decisionmakers will be considering a number of wastewater treatment options that will have the ability of significantly reducing nutrient levels in wastewater effluent. Regardless of the type of upgraded wastewater system, OWNRS or advanced WWTP, the new technology is more complex than the traditional systems.

9.4.1 Recommended Administration and Management Plan

In Technical Memorandum No. 14 (located in Volume 8, *Supporting Documents*), three different scenarios were evaluated:

- SCENARIO I – FKAA manages all wastewater systems
- SCENARIO II - FKAA manages publicly-owned wastewater systems & Monroe County manages the investor-owned wastewater plants and OSTDS/OWNRS
- SCENARIO III – Involves maintaining the existing administrative and management structure. FKAA continues to manage only publicly-owned systems; privately-owned systems continue to be managed by the facility owner and contract utility companies with regulatory oversight by FDEP; and OWNRS continue to be managed by the property owner and certified operators, with MCPHU providing regulatory oversight.

Scenario I is the recommended option and is briefly summarized in the following sections. For a more detailed discussion refer to Technical Memorandum 14 in Volume 8, *Supporting Documents*.

9.4.2 Implementation Mechanisms

Chapter 75-441 of the Florida Statutes authorizes the FKAA to supply potable water and provide wastewater services in Monroe County. Further, on October 15,

1997, the BOCC adopted Resolution No. 393-1997 providing that the BOCC recognizes the FKAA as the sole governmental provider of wastewater services in unincorporated Monroe County. It includes both central collection systems served by WWTPs and OWTS. In the Resolution, the BOCC requested that the FKAA exercise its authority to acquire, finance, operate, and maintain wastewater collection, transmission, treatment, and disposal systems, in effect becoming the wastewater authority for the entire unincorporated area of the Florida Keys.

Although the City of Key West, the City of Key Colony Beach, the City of Layton, and Islamorada, Village of Islands are outside the jurisdiction of the FKAA, all of the municipalities may choose to be included in the FKAA system.

	Degree of Support				
	Minimal				Maximum
Master Plan Objectives	1	2	3	4	5
Ensure all systems are properly managed					✓
Ensure all systems meet state water quality standards					✓
Reflect recent County/FKAA Agreements					✓
Achieve cost effective O&M wastewater facilities					✓
Develop a management structure that is flexible and adaptable					✓

EXHIBIT 9-4
Scenario 1 supports all of the Master Plan objectives.

9.4.3 Specific Implementation Requirements

As described above, the FKAA presently has the legal authority to comprehensively manage all wastewater in the Keys and is therefore the logical entity to manage all wastewater. This option provides the most efficient management structure by keeping the number of entities having wastewater management responsibilities to a minimum.

Under this scenario, the FKAA would administer and manage all wastewater facilities (publicly-owned WWTPs, privately-owned WWTPs, and OWNRS) throughout the study area. The FKAA would own all publicly-owned WWTPs and would administer, manage, operate, and maintain all such facilities. In addition, the FKAA would administer and manage, but generally would not own, all onsite systems and private package plants, but would represent all operating permit holders, and coordinate with MCPHU and FDEP on permitting issues and renewal of operating permits. The MCPHU and FDEP would continue to be responsible for compliance and enforcement as is the current practice. Exhibit 9-4 indicates how the FKAA management scenario supports each of the wastewater management objectives presented in Section 9.2.

Under this recommended scenario, the property owner or facility owner of an individual OWTS or private WWTP would continue to own their system, and would hold the operating permit. Before the FKAA could manage either OWTS or WWTPs, the Authority would need to enter into management agreements with each property owner or WWTP facility owner. Those agreements would result in transferring all wastewater management responsibilities to the FKAA, thereby allowing FDEP and MCPHU, the compliance and enforcement agencies for WWTPs and onsite sewage treatment and disposal systems, respectively, to work through one entity responsible for wastewater management, rather than thousands of operating permit holders. By consolidating wastewater management responsibilities under the FKAA, economies of scale can be achieved

in terms of capital facility and labor costs. Exhibit 9-5 summarizes the specific implementation requirements of the recommended management plan for onsite wastewater systems and private treatment plants.

9.4.4 General Implementation Requirements

Besides the implementing mechanism described above, there are manpower and equipment needs that must be considered; i.e., the FKAA would need to augment its existing resources. The number and expertise of the staff required by the FKAA would depend on whether the FKAA would contract for operation and maintenance services for both OWTS and treatment plants from one or several of the private, state-certified operators (as permitted under Chapter 153, Part III, Florida Statutes) or would develop in-house capability to undertake O&M. The FKAA could consider establishing franchise areas and contract with private, wastewater contract operations firms with state-certified operators to operate and maintain all facilities within the defined franchise area. Franchises would be awarded upon a competitive selection process and separate franchises would be established for OWTS and for package plants.

EXHIBIT 9-5
Recommended Management Plan Implementation Requirements, Onsite Wastewater Systems, and Private Treatment Plants

Facility Ownership:	Generally, FKAA would not own OWTS or package plants, facility ownership would remain with the property owner or facility owner. An exception may be for shared cluster systems or sewered cluster systems, where FKAA may choose to own these systems.
Permittee:	The permittee would continue to be the property owner or facility owner; the FKAA would carry out the operating permit requirements for the permittee and would assist the permittee in permit renewals.
Fees and Charges:	The permittee would continue to be responsible for all annual or periodic renewal fees although the permittee likely will be billed by FKAA for the fee.
Design and Permitting:	Design and permitting of both OWTS and private treatment plants should be the choice of FKAA; it could either perform both, one, or none. If by others FKAA should exercise review and approval authority. The FKAA should also establish minimum design standards.
System Installation:	Like design and permitting, system installation should be the choice of FKAA. If installation is by others qualified and certified to install OWTS or package plants, FKAA should oversee the installation and start up of all systems.
Operation, Maintenance, and Monitoring	
Onsite Systems:	FKAA would operate and maintain and perform all required monitoring, either through its own staff or through contract operators retained by FKAA. FKAA would in turn bill the system owners.
Private Wastewater Treatment Plants:	FKAA either could be responsible for the operation, maintenance, and monitoring, similar to onsite systems, or it could merely provide oversight to the operation, maintenance, and monitoring, and allow the owner to contract directly with a contract operator. Oversight could consist of review of monthly operating reports and an annual site inspection, similar to that described for Indian River County in Section 9.3.2.
Perpetual Easements:	FKAA and any management entities retained by FKAA must have authorizations to enter property for inspections or repairs. This perhaps could be a condition of the operating permit or franchise agreement, or some other legal mechanism to allow entry.
Repairs:	FKAA, through a legal mechanism, must be able to effect repairs on its own and put a lien on the property until repaid.

9.5 Case Studies of OWTS Management Structures

9.5.1 Georgetown, California[24,25]

The Georgetown Divide Public Utility District created perhaps the oldest comprehensive onsite management program in the United States. The program was formed in 1971 around a subdivision called Lake Auburn Trails. While the subdivision would ultimately contain more than 1,000 homes, it began with only a few hundred units. Thus, a treatment plant designed for buildout would initially have insufficient flow to function properly. The sub-divider proposed onsite systems as an interim measure. However, the District was concerned about ultimate housing density; the thin, poor soils; and steep topography. They decided that unmanaged onsite systems would not be acceptable. An onsite public management concept was thus proposed to the Georgetown Divide District, which was prepared to accept the responsibility for monitoring and maintaining the onsite systems, and sought and received authorization in law from state and county governments.

"Cradle to grave" management of individual onsite systems at Lake Auburn Trails has evolved into a highly successful program with minimal environmental or financial impacts. The District does not "own" the systems, but it has all necessary access to them, and full decisionmaking authority regarding their acceptability in siting and performance. The District also does not install the onsite systems, although it closely supervises installation by private contractors. It assumes virtually all other management responsibilities. The District maintains the system and bills the homeowner. The granting of an onsite permit is conditioned with authorization by the owner for the District to monitor and maintain the system. Systems are designed by District staff, using computer-aided drafting and mapping tools. Both conventional and alternative designs may be employed. Each unit is tailored to soil and slope conditions at the site. Inspection devices are built into the units; the site plan also incorporates landscaping and grading provisions to control erosion. Onsite environmental monitoring includes sampling, testing, and flow measurements of the drainfield or disposal areas. In cooperation with the U.S. Geological Survey (USGS), watershed monitoring is also performed.

A part time staff of four who use a computer system to schedule maintenance and septic tank pump-outs, oversee more than 800 systems. An initial design and permit fee of about $550, and annual fees of about $170 on dwellings and $80 on vacant lots, are sufficient to fully cover the cost of the program, whose success is attributed to "intimate" public agency involvement and in-house expertise.

9.5.2 Stinson Beach, California[26,27]

Stinson Beach is a small town in Marin County, located about 20 miles north of San Francisco. Part of the beach is a park that can draw 10,000 visitors on a weekend. The town generally falls under the jurisdiction of Marin County government. There are approximately 700 onsite systems in Stinson Beach. It is another early participant in the onsite management concept.

In 1961 a county survey concluded that surface and groundwaters were being polluted by many of the town's existing onsite wastewater systems. In response, the County created the Stinson Beach County Water District, whose task was to solve the problem. The Water District is governed by a five-member, elected Board of Directors who make policy and perform

[24]Prince, R. N. and M.E. David. 1988. "Onsite Wastewater Management and Groundwater Protection". *Proceedings of the National Environmental Health Association*, Third Annual Midyear Conference, Mobile, Alabama. Georgetown Divide Public Utility District, Georgetown, California (also available from NSFC), 15 pp.

[25]Shephard, F. 1996. *Managing Wastewater: Prospects in Massachusetts for a Decentralized Approach*. Ad Hoc Task Force for Decentralized Wastewater Management. Waquoit Bay National Estuarine Research Reserve. Massachusetts Department of Environmental Management, 103 pp.

[26]Shephard, F. 1996. *Managing Wastewater: Prospects in Massachusetts for a Decentralized Approach*. Ad Hoc Task Force for Decentralized Wastewater Management. Waquoit Bay National Estuarine Research Reserve. Massachusetts Department of Environmental Management, 103 pp.

[27]Richardson, M.S. 1989. "Public Management, Operation and Maintenance of Onsite Sewage Systems." In: *Proceedings of the Sixth Northwest Onsite Wastewater Treatment Course*, R.W. Seabloom (ed), pp 368-384.

water quality planning. Between 1961 and 1973, nine separate studies and proposals for central wastewater collection and treatment were rejected by voters. In 1973 the San Francisco Regional Water Quality Control Board (SFRWQCB) intervened, putting Stinson Beach on notice. All onsite systems were to be eliminated by 1977, and a building moratorium would go into effect forthwith. Even so, a tenth central sewerage and treatment proposal was rejected. Voters were not only alarmed by the estimated costs, but were unconvinced that alternatives had been sufficiently considered. An eleventh study, specifically undertaken to examine alternatives, concluded that onsite wastewater systems remediation was both the most cost-effective and environmentally benign alternative.

Concurrence was sought from both the regional board and the state legislature, which enacted special legislation (consistent with California Water Code provisions) in 1978 empowering the Stinson Beach County Water District to establish the Stinson Beach Onsite Wastewater Management Program. The program would be managed directly by the SFRWQCB, rather than to Marin County, and would govern the permitting, construction, inspection, repair, and maintenance of old and, later, new systems. Rules and regulations were approved by the regional board on a trial basis, and were later made permanent. Rules and regulations (and ordinances) have evolved as problems were encountered, there being few precedents to go on.

Ownership of the systems, and ultimately the responsibility for repairing or upgrading them, rest with the building owner. But operating permits are required, and program staff perform inspections and can issue citations that list violations and provide a timetable for remediation. Upon program initiation, a house-to-house survey was used to identify the most critical failures or substandard systems from which came interim permits to operate. As in the case of Georgetown, the permit to operate is conditional on authorizing the district to enter property for purposes of inspection and, if need be, repair. Conventional systems are inspected every two years, alternative systems (now stipulated for some areas) every quarter. The operating permit may carry conditions, or varying periods of validity. The regulations provide penalties for noncompliance of up to a $500 fine or 60 days imprisonment, each day considered another count. The District also has the power to effect its own repairs and put a lien on the property until repaid, has access to low-interest state loan funds for low-income households. However, it has rarely had to take strong measures because the District is also empowered to cut off the water supply of a non-complier, something, it has had to do occasionally. During the initial period, about half the existing systems were found to require repair or replacement.

Five staffers approve plans, and inspect and handle compliance. The budget is met partly out of tax revenues and partly by $53 per household semiannual fee. Fees are charged for special or compliance inspections.

Problems encountered at Stinson Beach mostly had to do with delays as bugs were worked out and sudden demands were put on staff as well as private engineers and installers. In 1992, the SFRWQCB imposed a moratorium on new systems pending reevaluation of the program. This resulted in revised technical requirements, approval and tracking procedures, and the development of a more adequate staffing and fee structure. New ordinances were passed in 1994, and the program is back on track. Not without some growth pains, this 17-year-old program is regarded as both successful and adaptable to other locales.

9.5.3 Westboro, Wisconsin[28,29]

Westboro, Wisconsin, was one of the first communities to participate in the Small Scale Waste Management Project run by the University of Wisconsin. In 1974, the

[28]Otis, R.J. 1978. *An Alternative Public Wastewater Facility for a Small Rural Community*. Report of the Small Scale Waste Management Project, University of Wisconsin-Madison, College of Engineering, Madison, Wisconsin.

[29]Otis, R.J. and K. Sirotiak. 1987. "Sewer-septic Tank Hybrid Promises Savings." *Civil Engineering*, August 1987. American Society of Civil Engineers, New York.

69 occupied buildings of the town were served by individual septic tank systems, 80 percent of which were thought to be failing, either by discharging above ground or leaking into a drain system leading directly to a creek. The state's Department of Natural Resources issued a consent order for Westboro to correct the problem. The community formed "Sanitary District No. 1 of the Town of Westboro," and hired an engineering firm to draw up a facilities plan for a central treatment plant. The estimated cost of the centralized facility was $5,500 per building. Furthermore, the town was ranked 372 out of 395 applicants on the priority list for EPA construction grant funding. The Small Scale Waste Management Project stepped in with its own proposal. For most of the town, repaired individual septic tanks combined with small diameter gravity sewers would transport the effluent to one of two alternating community drainfields. Houses not connected would be provided with the new individual septic systems, but they would be owned and operated by the Sanitary District. The revised estimated costs were $3,900 per building, a savings of 30 percent. The Westboro system has now been in operation for approximately two decades.

Wisconsin also has a statewide grant program, called the Wisconsin Fund, for failed system upgrades. Depending on a homeowner's income eligibility and other qualifications, it will pay for up to 60 percent of the cost of onsite wastewater system upgrading or replacement.

9.5.4 Cass County, Minnesota[30]

Cass County is typical of the counties in the "Northern Lake Ecoregion" of Minnesota, which have evolved from an economy based on agriculture and timber to an economy where the lakes and associated tourism have become very important. Because much of the development and growth around the lake regions took place in earlier years, little consideration was given to lot sizes, soil types, or water quality impacts from onsite systems. Cass County is now faced with a growing number of non-conforming onsite wastewater systems around many of its rural lakes. Furthermore, the state Shorelands Management Act and Minnesota Pollution Control Agency (MPCA) regulations are setting tighter regulatory wastewater standards, which Cass County is obliged to enforce. Many residents were placed in the position of being unable to sell their homes because they could not provide a "conforming" septic system on their property. Cass County was pressed to look for answers.

In 1994, the County developed the concept of the "Environmental Subordinate Service District," whereby a township, as the local unit of government, can effectively provide, finance, and administrate governmental services for subsets of its residents. Establishment of such districts within a town is authorized under Minnesota Statute 365A. The purpose of these districts is to provide a self-sufficient, effective, and consistent long-term management tool, chiefly for neighborhood alternative collection systems and communal subsurface wastewater infiltration systems (SWIS), or cluster systems. This model is innovative because it stays at the grass roots level where the affected property owners and the township remain involved. Cass County provides technical and support assistance when required, but is not directly involved on a daily basis. The partnering between the townships and the county has allowed resource sharing, improved communication, and thus has opened up prospects for other cooperative ventures such as land-use planning, road improvements, and geographic information systems.

Once a Subordinate Service District is created by petition and vote from the residents needing the specific service, a County/Township agreement is signed. The County then determines the system design, handles construction oversight, gives final approval for the collection system, commits to yearly inspections, and assures regulatory compliance. The SWIS are located away from lakes, wells, and groundwater supplies. Cass County allows systems to lie on county-adminis-

[30]Shephard, F. 1996. *Managing Wastewater: Prospects in Massachusetts for a Decentralized Approach*. Ad Hoc Task Force for Decentralized Wastewater Management. Waquoit Bay National Estuarine Research Reserve. Massachusetts Department of Environmental Management, 103 pp.

tered land in order to defray residents' costs, or to enable optimal siting.

The township is the legal entity that secures management services needed for the district to function. Other key players are the MPCA's Brainerd Regional Office, providing regulatory and technical assistance, the Association of Cass County Lakes for lake and water quality monitoring and educational support, the Minnesota Association of Townships for their legal counsel, the Mutual Service Insurance Agency for insuring the townships and the district wastewater collection systems, the Tri-County Leech Lake Watershed (district) for engineering funding, and the Woodland Bank of Remer, which is providing low interest financing to residents.

However, another major player is the Rural Utilities Services (formerly the Rural Electrification Association). A key component missing from the districts was an operations, maintenance, and management program. Therefore, Cass County sought out the local utility, Crow Wing Power and Light (Brainerd, MN), and asked them to consider cluster system management. Crow Wing Power and Light now provides the following services as utility managers: (1) security monitoring; (2) monthly inspections (they also maintain the grounds); (3) through a subcontractor, pumping of individual septic tanks, and any other repair or maintenance required; and (4) record keeping—logs are kept of inspections and repairs/maintenance. Bills are sent to the residents every 6 months, totaling about $200 per year per household.

A management maintenance contract is negotiated for the utility's services, thus reducing the need for additional staffing by the town itself. The township remains the legal entity guaranteeing any unpaid charges through its power to levy special district taxes.

9.5.5 Paradise, California[31]

The Town of Paradise is one of the largest unsewered communities in the United States. But residents have opposed the installation of a central wastewater collection and treatment system to process the wastewater generated by both single-family residences and commercial developments within the town. Instead, in 1992, the Town of Paradise created an Onsite Wastewater Management Zone (OWMZ), by Town Council adoption of an ordinance (No. 219) which established the regulatory provisions for the installation and maintenance of onsite wastewater systems. The establishment of the OWMZ was the result of engineering studies that suggested that long-term reliance upon onsite systems as the primary method of sewage treatment and disposal would require active oversight and management.

OWMZ regulations require that permits be obtained to construct, operate, and repair onsite systems. The town will not issue an operating permit until as-built plans have been received, and, for alternative systems, operating and maintenance manuals have been submitted by the system designers. All systems must be periodically evaluated for compliance. Inspections are required whenever the system is pumped, the property is sold, or a complaint is filed. Otherwise, inspections are required at least every 7 years except in identified "areas of concern," where scheduled inspections occur more frequently. An onsite system must be operating without failure and the septic tank must be pumped regularly to permit continued use. Septic system evaluators, typically septic system installers (but also registered environmental health specialists and designers), have been trained and certified by the OWMZ to fulfill this function.

Evaluation reports submitted to the OWMZ by these licensed professionals detail the operational efficiency of the septic system. Receipt by the OWMZ of an evaluation report that documents a failing onsite system results in the property owner being notified by the OWMZ to repair the system at the owner's expense. The owner must demonstrate proof of

[31]Shephard, F. 1996. *Managing Wastewater: Prospects in Massachusetts for a Decentralized Approach*. Ad Hoc Task Force for Decentralized Wastewater Management. Waquoit Bay National Estuarine Research Reserve. Massachusetts Department of Environmental Management, 103 pp.

compliance within 30 days or the operating permit will be withdrawn, and abatement procedures implemented. Ultimately the town may abate and place a lien on the property. Owners may apply to the town for financial assistance in upgrading systems to compliance standards.

The receipt of an evaluation report that documents a functioning system results in an Operating Permit, which authorizes the continued use of the system for a specified period of time, based upon the age of the system and its observed operational history. For a household onsite wastewater system, the annual charge is $14.20, typically itemized on the water bill.

9.5.6 Nova Scotia, Canada[32,33]

A law passed in 1982 allows Nova Scotia towns and municipalities to create Wastewater management districts, which provide uniform services to building owners, regardless of the mix of technologies and regardless of who owns the systems. All property owners in the district are obliged to participate in the funding, paying an annual charge that covers capital recovery as well as operation and maintenance costs. Boundaries of the district need not coincide with the existing town boundaries, and would typically be smaller. In fact, the district may be "noncontiguous," consisting of individual properties or groups of properties that require special consideration for environmental or historical reasons.

The administrative institution is either a sewer or public works committee of the municipal council. It is vested with all the necessary authorities and duties. It can own or lease land, make contracts, and fix and collect charges, and it is held responsible for overall planning; upgrades; and design, construction, inspection, operation and maintenance of all types of systems. Finally, it can enter private property to inspect, repair, or replace malfunctioning systems.

In Port Maitland (population 360), a preliminary study estimated a per household cost of $6,000 to $10,000 to install a conventional collection system and treatment plant. The town opted instead for a mix of individual onsite systems and four cluster systems fed by gravity sewers to central septic tanks, siphon chambers, and contour subsoil wastewater infiltration trenches. Installation costs were approximately $2,400 per dwelling unit. Maintenance, repair, and septic tank pumping are provided by private contractors with the District. Annual fees per household were $65 in 1994. Recent studies have shown that despite seasonally high groundwater, the systems are functioning well.

Guysborough, with a similar population, adopted a plan that includes a small conventional treatment plant for part of the town, an aerated lagoon for another part, and individual onsite systems for a third part. All owners were assessed $2,100 initially, and were charged annual fees of $125 in 1994.

Voter approval of residents living in the district is required; it must be presented to them as a complete plan that has considered sites, boundaries, servicing options, preliminary designs, and cost estimates. However, districts have often been voted down. Only three Nova Scotia towns had adopted such districts by the spring of 1994. Of 16 others that considered it, decentralized management was actually recommended in 14 cases. But six had chosen to centralize, and five were still in nebulous discussion. Five others were actively considering Onsite Wastewater Management District programs. Equity of either service or cost has been an issue in towns considering a mixed approach. Furthermore, central sewerage is often regarded by the public as more desirable and less interfering. Aside from questions of equity, voters have not always perceived that a problem existed, or that a wastewater management district was the entity to fix it.

★★★★★★

[32]Otis, R.J. 1978. *An Alternative Public Wastewater Facility for a Small Rural Community*. Report of the Small Scale Waste Management Project, University of Wisconsin-Madison, College of Engineering, Madison, Wisconsin.

[33]Mooers, J.D. and D.H. Waller. 1994. "Wastewater Management Districts: the Nova Scotia Experience." In: E.C. Jowett, *Proceedings of Conference on Wastewater Nutrient Removal Technologies and Onsite Management Districts*. Waterloo Centre for Groundwater Research, University of Waterloo, Ontario, pp. 171.

Chapter 10 Works Cited

Ayres Associates. 1998. Florida Keys Onsite Wastewater Nutrient Reduction Systems Demonstration Project. Final Report to the Florida Department of Health.

Ayres Associates. 1993. *Onsite Sewage Disposal System Research in Florida: An Evaluation of Current OSDS Practices in Florida*. Report to the Florida Department of Health and Rehabilitative Services under Contract LP596, Tallahassee, Florida.

CH2M HILL, Lindahl, Brown Ferrari & Hellstrom, and Continental Shelf Associates. June 1998. *Wastewater Facilities Plan with Phase Implementation for the Marathon Area of the Florida Keys*.

Ciotoli, P.A. and K.C. Wiswall. 1982. *Management of Onsite and Small Community Wastewater Systems*. Report to the U.S. Environmental Protection Agency, Municipal Environmental Research Laboratory, Cincinnati, Ohio.

Governor's Executive Order 98-309. 1998. Issued by Governor Buddy MacKay; Tallahassee, Florida.

Monroe County Florida Board of County Commissioners. *Monroe County Year 2010 Comprehensive Plan*. Adopted by Monroe County Board of County Commissioners April 15, 1993. Amended January 4, 1996. Adopted by the Department of Community Affairs and the Administration Commission of the State of Florida, Part I, January 2, 1996, and Part II, July 17, 1997.

Monroe County Ordinance No. 031-1999, Cesspool Identification and Elimination Ordinance.

Mooers, J.D. and D.H. Waller. 1994. "Wastewater Management Districts: the Nova Scotia Experience." In: E.C. Jowett, *Proceedings of Conference on Wastewater Nutrient Removal Technologies and Onsite Management Districts.* Waterloo Centre for Groundwater Research, University of Waterloo, Ontario, pp. 171.

Otis, R.J. 1978. *An Alternative Public Wastewater Facility for a Small Rural Community.* Report of the Small Scale Waste Management Project. University of Wisconsin-Madison, College of Engineering, Madison, Wisconsin.

Otis, R.J. and K. Sirotiak. 1987. "Sewer-septic Tank Hybrid Promises Savings." *Civil Engineering*, August 1987. American Society of Civil Engineers, New York.

Prince, R. N. and M.E. David. 1988. "Onsite Wastewater Management and Groundwater Protection". *Proceedings of the National Environmental Health Association*, Third Annual Midyear Conference, Mobile, Alabama. Georgetown Divide Public Utility District, Georgetown, California (also available from NSFC), pp. 15.

Richardson, M.S. 1989. "Public Management, Operation and Maintenance of Onsite Sewage Systems." In: *Proceedings of the Sixth Northwest Onsite Wastewater Treatment Course*, R.W. Seabloom (ed), pp. 368-384.

Shephard, F. 1996. *Managing Wastewater: Prospects in Massachusetts for a Decentralized Approach.* Ad Hoc Task Force for Decentralized Wastewater Management. Waquoit Bay National Estuarine Research Reserve. Massachusetts Department of Environmental Management, pp. 103.

U.S. Environmental Protection Agency. 1996. *Water Quality Protection Program Document for the Florida Keys National Marine Sanctuary.* Final report submitted to the Environmental Protection Agency under Work Assignment 3-1, Contract No. 68-C8-0134. Batelle Ocean Sciences, Duxbury, Massachusettes, and Continental Shelf Associates, Inc., Jupiter, Florida.

U.S. Environmental Protection Agency. September 1999. *Water Quality Concerns in the Florida Keys: Sources, Effects, and Solutions.* Water Quality Protection Program – Florida Keys National Marine Sanctuary. By William L. Kruczynski, Program Scientist. EPA 904-R-99-005.

U.S. Environmental Protection Agency, 1997. Response to Congress on the Use of Decentralized Wastewater Treatment Systems. EPA 832-R-97-001b. Office of Water, Washington, D.C.

★★★★★★

Appendix A

APPENDIX A

List of Deliverables (Technical Memorandum and Others)

Monroe County Sanitary Wastewater Master Plan

	Deliverables	Volume
	Proceedings and Summary Report for Decision Analysis Phase A	3
	Decision Analysis, Phase B, Proceedings and Summary Report for Siting Decision Model	3
	Decision Analysis, Phase C, Proceedings and Summary Report for Wastewater Management Alternatives Decision Model	3
	Decision Analysis, Phase D, Timing and Implementation Issues	3
	Initial Public Forums Summary Report	3
	Final Public Forums Summary Report	3
	Summary Report of Initial Meetings Conducted with Civic, Business, and Environmental Groups Throughout the Keys	3
	Summary Report of Meetings Conducted with Civic, Business, and Environmental Groups Throughout the Keys During Solutions Phase of Sanitary Wastewater Master Plan	3
TM 1	Evaluation of Existing Databases	3
TM 2	Master Wastewater Database Development	3
TM 3	Wastewater Flow Analysis	3
TM 4	Analysis of Wastewater Derived Nutrients from Developed Land-Based Areas of the Keys	3
TM 5	Evaluation of Existing Wastewater Facilities	4
TM 6	Collection System Alternatives	4
TM 7	Technology Assessment of Onsite Wastewater Treatment Systems	4
	OWTS Technology Assessment No. 1: A Primer on Onsite Wastewater Treatment Systems (OWTS)	4
	OWTS Technology Assessment No. 2: Non-Water Carriage Toilets	4
TM 8	Assessment of Secondary and Advanced Wastewater Treatment Technologies	4
TM 8S	Assessment of Wastewater Treatment Costs to Provide Phosphorus Removal Only	4
TM 9	Effluent Management Technologies	4
TM 10	Solids Management Technologies	4
	Wastewater Solids Management Plan for Monroe County	4
TM 11	Wastewater Facilities Siting Analysis	5
TM 12	Wastewater Management Alternatives and Service Area Analyses	5
	Preliminary Screening Areas - Wastewater Management Alternatives Screening Process	6
	Final Screening of Wastewater Management Alternatives	7
	Combinations of Wastewater Study Areas	5
	Service Area Expansions of Existing WWTPs	5
TM 13	Service Area Implementation Plan	8
TM 14	Wastewater Management and Administration Plan	8
	Funding Evaluation Report	8
	Marathon Area Wastewater System Funding Proposal	8
	Funding History Summary Report	8
TM 15	Wastewater Treatment Financing Plan	8
TM 16	Review of Agency Statutes/Regulations	8
TM 17	Overview of Other Wastewater-Related Studies	8
Project 2	Executive Summary of *"Evaluation of Nitrogen and Phosphorus Removal Technologies for Small Wastewater Treatment Plants"* (10/28/98)	8

Appendix A

APPENDIX A

List of Deliverables (Technical Memorandum and Others)

Monroe County Sanitary Wastewater Master Plan

	Deliverables	Volume
	Proceedings and Summary Report for Decision Analysis Phase A	3
	Decision Analysis, Phase B, Proceedings and Summary Report for Siting Decision Model	3
	Decision Analysis, Phase C, Proceedings and Summary Report for Wastewater Management Alternatives Decision Model	3
	Decision Analysis, Phase D, Timing and Implementation Issues	3
	Initial Public Forums Summary Report	3
	Final Public Forums Summary Report	3
	Summary Report of Initial Meetings Conducted with Civic, Business, and Environmental Groups Throughout the Keys	3
	Summary Report of Meetings Conducted with Civic, Business, and Environmental Groups Throughout the Keys During Solutions Phase of Sanitary Wastewater Master Plan	3
TM 1	Evaluation of Existing Databases	3
TM 2	Master Wastewater Database Development	3
TM 3	Wastewater Flow Analysis	3
TM 4	Analysis of Wastewater Derived Nutrients from Developed Land-Based Areas of the Keys	3
TM 5	Evaluation of Existing Wastewater Facilities	4
TM 6	Collection System Alternatives	4
TM 7	Technology Assessment of Onsite Wastewater Treatment Systems	4
	OWTS Technology Assessment No. 1: A Primer on Onsite Wastewater Treatment Systems (OWTS)	4
	OWTS Technology Assessment No. 2: Non-Water Carriage Toilets	4
TM 8	Assessment of Secondary and Advanced Wastewater Treatment Technologies	4
TM 8S	Assessment of Wastewater Treatment Costs to Provide Phosphorus Removal Only	4
TM 9	Effluent Management Technologies	4
TM 10	Solids Management Technologies	4
	Wastewater Solids Management Plan for Monroe County	4
TM 11	Wastewater Facilities Siting Analysis	5
TM 12	Wastewater Management Alternatives and Service Area Analyses	5
	Preliminary Screening Areas - Wastewater Management Alternatives Screening Process	6
	Final Screening of Wastewater Management Alternatives	7
	Combinations of Wastewater Study Areas	5
	Service Area Expansions of Existing WWTPs	5
TM 13	Service Area Implementation Plan	8
TM 14	Wastewater Management and Administration Plan	8
	Funding Evaluation Report	8
	Marathon Area Wastewater System Funding Proposal	8
	Funding History Summary Report	8
TM 15	Wastewater Treatment Financing Plan	8
TM 16	Review of Agency Statutes/Regulations	8
TM 17	Overview of Other Wastewater-Related Studies	8
Project 2	Executive Summary of *"Evaluation of Nitrogen and Phosphorus Removal Technologies for Small Wastewater Treatment Plants"* (10/28/98)	8

Appendix B

APPENDIX B

EXHIBIT B-1

Public Forums

Attendees for the Three Public forums That Were Held January 26-28, 1998

Lower Keys Attendees:

General Public	Project Team	County Staff	Media
Alicia Putney	Ken Williams	George Garrett	Laurie
Debbie Robertson	Damann Anderson	Rich Flowers	Kamatz
Mark Robertson	Bill Theiss		Bill Becker
Donald Wilson	Wendy Nero		
Heinz Kropp			
Gordon A. West			
Joan Grander			
Nancy Hunting			
John Seney			
Jim Sommit			
Joel Rosenblatt, P.E.			
Richard Herbert			
Linda Yorde			
Marney Womack			
Mike Rees			
Terry McDaniel			
Tom Meredith			
Jeanne Somma			
David W. Tuttle			
Jim Reynolds			
J. DeMatteis			
Damann Anderson			
Bill Theiss			
Wendy Nero			
Rich Flowers			
Bill Becker			

Upper Keys Attendees:

General Public	Project Team	County Staff	Media
Charlie Brooks	Ken Williams	George Garrett	None
John Lee Caudle	Bill Theiss	Isabelle Reid	
Kathleen M. Caudle	Damann Anderson		
Denis Stedman	Wendy Nero		
Capt. George McHugh			
Coman Monroe			
Earl Becker			
Chris Schrader			

Middle Keys Attandees:

General Public	Project Team	County Staff	Media
Bob Ernst	Ken Williams	George Garrett	None
Taras Lyssenko	Bill Theiss	Isabelle Reid	
Paul Lesle	Damann Anderson		
Gene Kibbe	Wendy Nero		
Bill Smith			
Richard Grathwohl			
Jean T. Castagno			
Chris Anisko			
Susan Esliger			

APPENDIX B
EXHIBIT B-2
Civic/Business/Environmental Groups
Attendees for the Initial Civic/Business/Environmental Groups Meetings Held September 1997 through March 1998

Name	Organization
Debra Harrison	World Wildlife Fund
Richard Grathwohl	Marathon Fishing Guides Association
Karen Lee, Juanita Green	Isaak Walton League, Water Quality Joint Action Group, Wild Bird Sanctuary, Friends of the Everglades, League of Women Voters
Mark Robertson, Paul Dye	The Nature Conservancy
Dagney Johnson, Charles Brooks, Cowan Porter, Alice Allen	Upper Keys Citizens Association
Billy Causey	Florida Keys National Marine Sanctuary
David Holtz	Center for Marine Conservation
Henry	American Association of Retired People
Ray Kitchener	Marathon Chamber of Commerce
Gene Kibbe	Monroe County Condominium Association
Chris Schraeder	Septic Tank Installers, Package Plant Operators
Scott Marr	Key Largo Economic Development Council
Ginna Thomas Drake	Key Largo Chamber of Commerce
Linda Yorde	Citizens Task Force on Wastewater
Tom Tuell	Keynoter
Fran and Bill Ford, Homer Herrick	Audubon Society
David Ethridge	Solares Hill
Virginia Panico	Key West Chamber of Commerce
Gene Schinkevich, Robert Schneider	Florida Keys Citizens Coalition, Big Pine Civic Association
Kip Blevin	Key West Citizen, Advertiser
Bill Becker	US 1 Radio
John Sanchez	Monroe County Commercial Fishermen
Linda Yorde, Charles Brooks, John Larkin	Citizens Task Force on Wastewater, Outreach Subcommittee
Marika Lynch	Miami Herald
Stewart Shaw	TCI Channel 5
Arturo Espanol	Latin American Chamber of Commerce
Linda MacMinn	Tourist Development Council
Dr. Jenny Cronk	Jolly Rogers Homeowners Association
Carol Fisher	Lower Keys Chamber of Commerce
Paul Winklejohn	Ocean Reef Club, Key Largo Utilities Corporation
Bill Smith, Bob Cayce, Ron McPhall	Florida Keys Contractor's Association
Lynn Mapes	Marathon Economic Development Council

APPENDIX B

EXHIBIT B-3

Attendees for Additional Civic/Business/Environmental Groups Meetings in December 1999

Name	Organization
19 Attendees	Florida Keys National Marine Sanctuary
Jim Fryer	The Nature Conservancy
Tom Shumaker	Keynoter
Richard Grathwohl	Marine Fishing Guides
Bill Becker	US 1 Radio
Carol Fisher	Lower Keys Chamber of Commerce
Ray Kitchener	Marathon Chamber of Commerce

EXHIBIT B-4

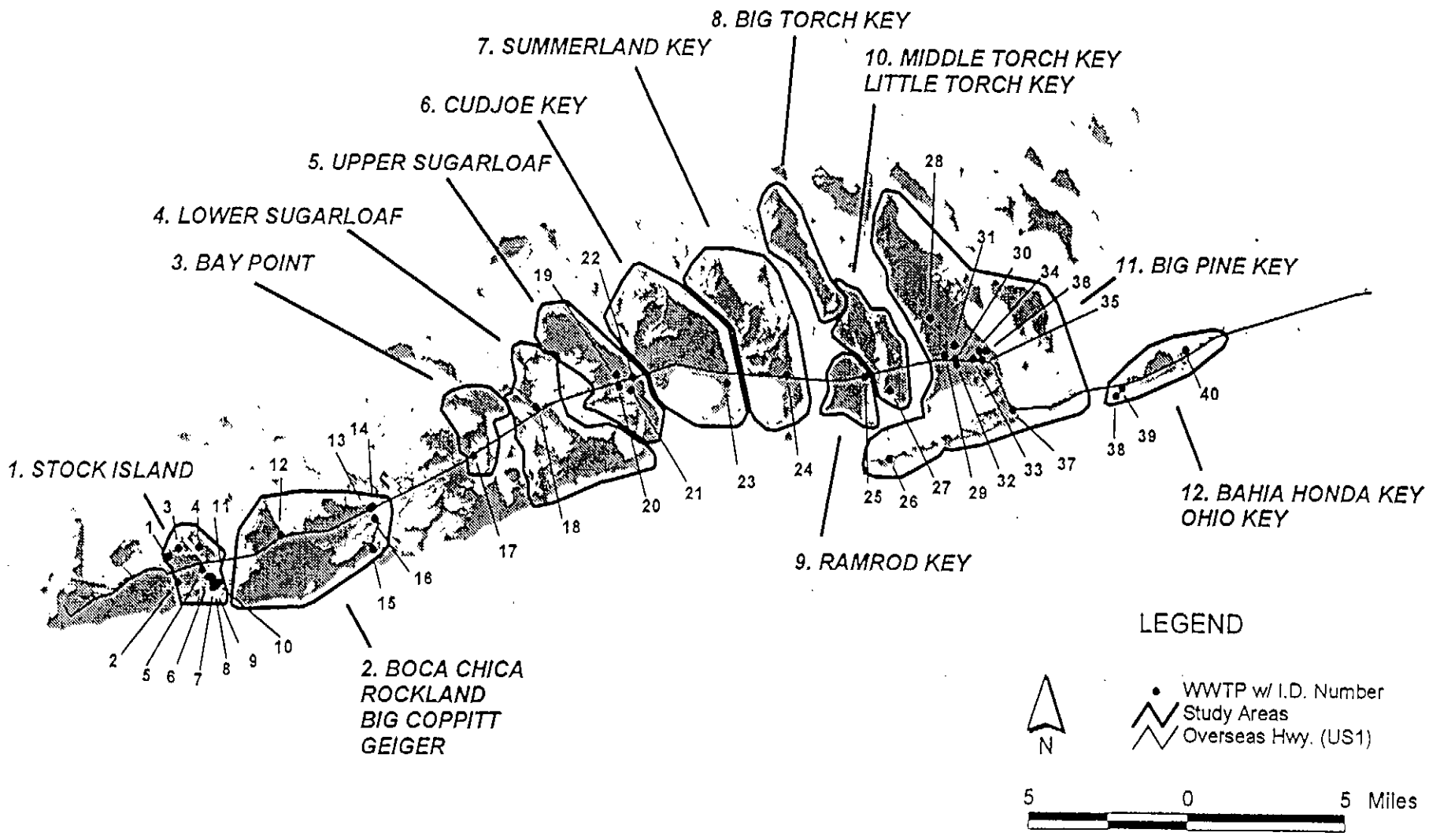
Attendees for Additional Civic/Business/Environmental Groups Meetings from March through June 1999

Name	Organization
Laurie Kamatz	Eden Pines Property Owners Association
Bob Schneider, Gene Shinkevich	Big Pine Civic Association
Charlie Mills	Keys Wide Civic Association (vacation rentals)
Jerry Cronk	
John Grunden, Ken Bosomworth, Jim Harting, Chris Bergh, Nance Knopp, Andy Knopp, Victor Chap, Roger Carpenter, David Gleason, John Muth, Keith Baguley, Dave Musselman, Betty Baguley, John A. Uurich, Pat Gasparre	Jolly Rogers Home Owners Association
Nora Williams	BOCC
Teresa Tinker	Governor's Office
Mike McDaniel	DCA
Dick Smith	FDEP
Tim McGarry	Monroe County
Alyson Matley	Solaris Hills Publications
Jodie Thomas	The Nature Conservancy
Gene Kibbe	Condo Owners Association
Bill Smith	Florida Keys Contractors Association
Vern Pokorski, Eugene Shinkevich, Marie Shinkevich, Grace Mannillo, Harold Nugent, Bob Frakes, Maye Cintron	Big Pine Key Civic Association
Barry Stieglitz	U.S. Fish & Wildlife
Joan Mowery, William L. Plummer, Ian Schwartz, C. Brooks	Upper Keys Citizens Meeting
Becky Ianotta	U.S. Representative Peter Deutsch Florida Keys Office
David Makepeace	Citizens Task Force on Wastewater
200 attendees	Key Largo Chamber of Commerce

Appendix C

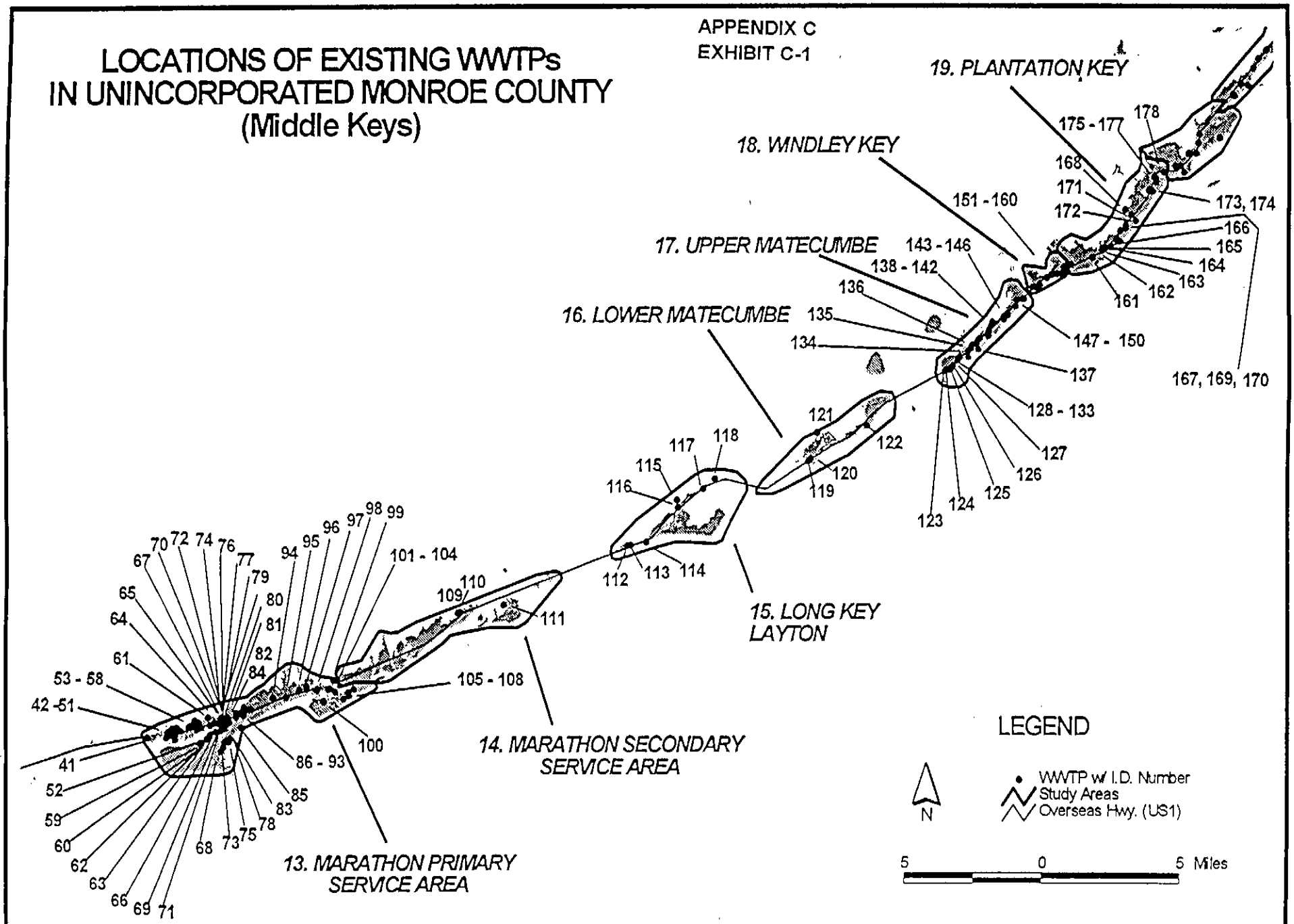
APPENDIX C
EXHIBIT C-1

LOCATIONS OF EXISTING WWTPs IN UNINCORPORATED MONROE COUNTY (Lower Keys)



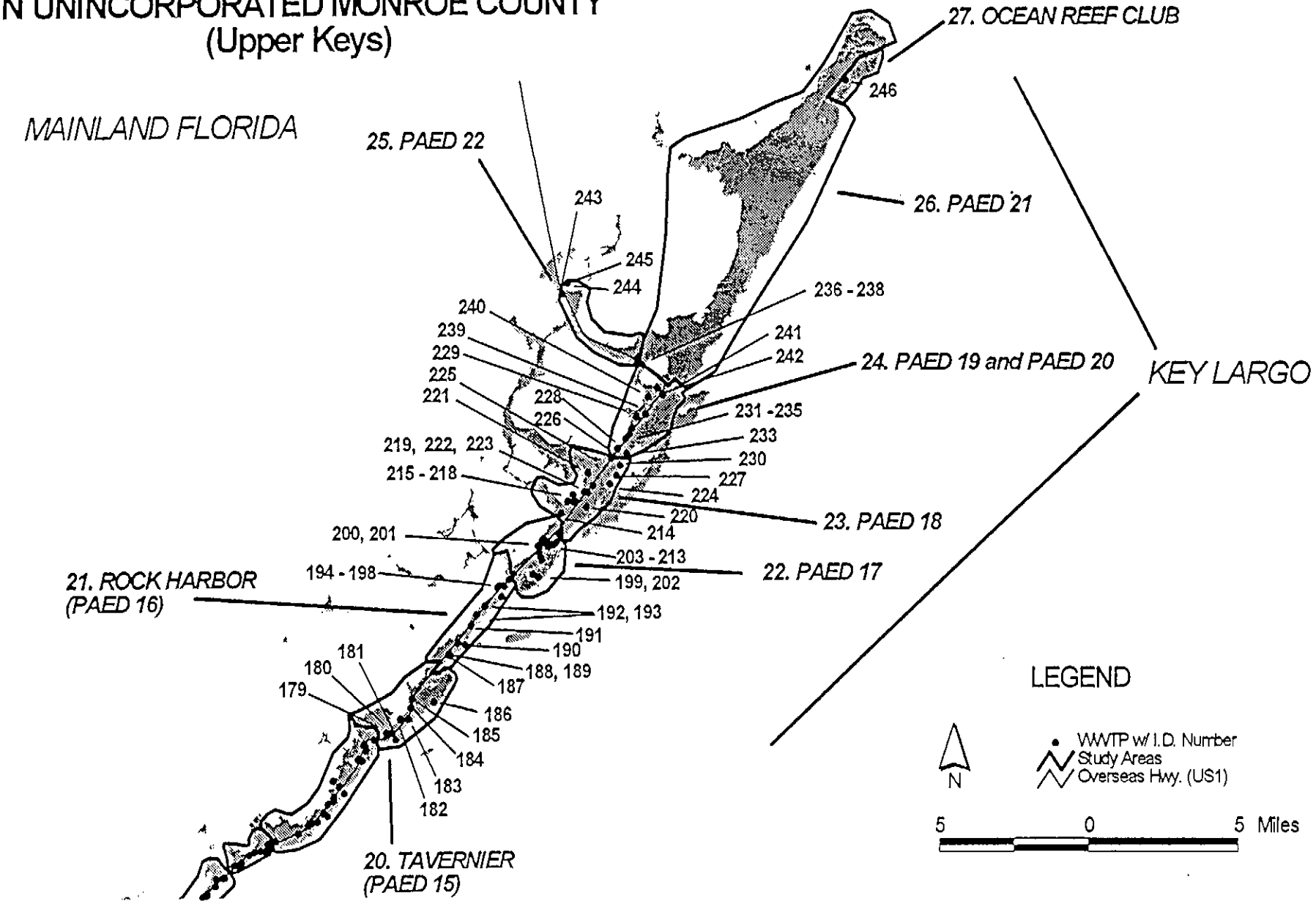
APPENDIX C
EXHIBIT C-1

LOCATIONS OF EXISTING WWTPs IN UNINCORPORATED MONROE COUNTY (Middle Keys)



APPENDIX C
EXHIBIT C-1

LOCATIONS OF EXISTING WWTPs IN UNINCORPORATED MONROE COUNTY (Upper Keys)



APPENDIX C
EXHIBIT C-2
Summary Information for FDEP Permitted Wastewater Treatment Plants
In Monroe County (Excluding Key West Area)

MAP I.D. NO	MAR. FAC. PLAN I.D.	FACILITY NAME	STUDY AREA NO.	STUDY AREA NAME	STATUS	WWTP OPERATOR	PERMITTED CAPACITY, MGD	BASIS OF PERMITTED CAPACITY	ANNUAL AVERAGE DAILY FLOW, MGD	3-MONTH MAX. ADF, MGD	MAXIMUM MONTH ADF, MGD	EXCESS CAPACITY, MGD	AVAILABLE EXCESS CAPACITY	APPROX. FACILITY AGE, YRS	GENERAL FACILITY CONDITION	NUMBER/TYPE OF CONNECTIONS SERVED	TREATMENT LEVEL	EFFLUENT DISPOSAL METHOD	REUSE POTENTIAL	POTENTIAL FOR EXPANSION	FDEP NON-COMPLIANCE ISSUES?
11		BOYD'S KEY WEST CAMPGROUND	1	Stock Island	A	DAVIS WATER ANALYSIS	0.020	AADF	0.004	0.008	0.010	0.012	0.007	25	GOOD	230 RV/TRAILER	SECONDARY	6 INJECTION WELLS	POOR	GOOD	NO
8		COCONUT GROVE MOBILE HOME PARK	1	Stock Island	A	DAVIS WATER ANALYSIS	0.006	MMADF	0.003	0.005	0.006	0.001	0.000	5	EXCELLENT	MOBILE HOMES	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
3		GERALD ADAMS ELEMENTARY SCHOOL	1	Stock Island	A	DAVIS WATER ANALYSIS	0.010	TMMADF	0.005	0.012	0.013	-0.002	0.000	3	EXCELLENT	SCHOOL	SECONDARY	2 INJECTION WELLS	POOR	POOR	MINOR
7		HARBOR SHORES MOBILE HOME PARK	1	Stock Island	A	DAVIS WATER ANALYSIS	0.015	MMADF	0.009	0.016	0.020	-0.001	0.000	20	GOOD	MOBILE HOMES	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
4		KEY HAVEN UTILITY	1	Stock Island	A	DAVIS WATER ANALYSIS	0.200	TMMADF	0.095	0.149	0.155	0.051	0.051	27/3	POOR/EX-CELLENT	SINGLE FAMILY	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
2		KEY WEST RESORT UTILITIES	1	Stock Island	A	DAVIS WATER ANALYSIS	0.499	AADF	0.161	0.223	0.272	0.276	0.276	12/1	EXCELLENT	600 SINGLE FAM. & COMMERCIAL	IQ/PART III	SPRAY IRRIGATION & 3 INJECTION WELLS	EXCELLENT	GOOD	NO
1		MONROE COUNTY DETENTION CENTER	1	Stock Island	A	DAVIS WATER ANALYSIS	0.105	MMADF	0.072	0.080	0.086	0.025	0.025	4	GOOD	JAIL & OFFICES	IQ/PART III	FLUSH & OTHER REUSE & 2 INJECTION WELLS	EXCELLENT	POOR	MINOR
9		OCEANSIDE MARINA	1	Stock Island	A	DAVIS WATER ANALYSIS	0.020	MMADF	0.002	0.004	0.004	0.016	0.011	23	FAIR	MARINA/REST	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
10		PENINSULAR MARINE ENTERPRISES	1	Stock Island	A	DAVIS WATER ANALYSIS	0.009	MMADF	0.002	0.002	0.002	0.007	0.005	4	GOOD	COMMERCIAL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
6		ROY'S TRAILER PARK	1	Stock Island	A	DAVIS WATER ANALYSIS	0.035	AADF	0.014	0.017	0.017	0.018	0.009	23	GOOD	100 RV/TRAILER	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
5		WATERS EDGE COLONY	1	Stock Island	A	DAVIS WATER ANALYSIS	0.010	MMADF	0.010	0.013	0.014	-0.003	0.000	4	GOOD	TRAILERS	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
14		CARIBBEAN VILLAGE	2	Boca Chica, R'land, B. Coppitt, Geiger	A	JOHN STEVENSON	0.006	TMMADF	0.004	0.008	0.010	-0.002	0.000	7	GOOD	31 MOTEL	SECONDARY	INJECTION WELL	POOR	POOR	MINOR
15		GEIGER KEY MARINA	2	Boca Chica, R'land, B. Coppitt, Geiger	A	DAVIS WATER ANALYSIS	0.005	TMMADF	0.003	0.004	0.006	0.001	0.000	2/22+	EX./FAIR	32 CAMP SITES & MARINA	SECONDARY	3 INJECTION WELLS	POOR	GOOD	MINOR
16		KEY WEST SEASIDE RESORT	2	Boca Chica, R'land, B. Coppitt, Geiger	A	DAVIS WATER ANALYSIS	0.040	AADF	0.017	0.040	0.042	0.000	0.000	23	GOOD	100 MOB. HOME	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
13		PORPOISE POINT REEL & RACQUET CLUB	2	Boca Chica, R'land, B. Coppitt, Geiger	A	DAVIS WATER ANALYSIS	0.005	TMMADF	0.001	0.002	0.002	0.003	0.002	6	GOOD	CONDOMINIUMS	SECONDARY	6 INJECTION WELLS	POOR	EXCELLENT	MINOR
11		US NAVAL AIR STATION BOCA CHICA	2	Boca Chica, R'land, B. Coppitt, Geiger	A	RICHARD RICE	0.400	AADF	0.220	0.410	0.514	-0.010	0.000	1	GOOD	NAVAL AIR STA.	SECONDARY	2 INJECTION WELLS	POOR	POOR	MINOR
17		BLUEWATER KEY RV PARK	3	Bay Point	A	DAVIS WATER ANALYSIS	0.020	TMMADF	0.004	0.009	0.017	0.011	0.006	7	GOOD	80 MOB. HOME	SECONDARY	2 INJECTION WELLS	POOR	GOOD	NO
18		SUGARLOAF LODGE	4	Lower Sugarloaf	A	LLOYD GOOD	0.018	AADF	0.014	0.018	0.018	0.000	0.000	26	GOOD	55 MOTEL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
20		LAZY LAKES CAMPGROUNDS	5	Upper Sugarloaf	A	ANTI-POLLUTION ASSOC.	0.010	TMMADF	0.005	0.009	0.011	0.001	0.000	20	GOOD	100 CAMPSITES	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
21		MANGROVE MAMA'S RESTAURANT	5	Upper Sugarloaf	A	DAVIS WATER ANALYSIS	0.0025	POL	0.001	0.002	0.002	0.001	0.000	5	GOOD	RESTAURANT	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
19		SUGARLOAF ELEMENTARY SCHOOL	5	Upper Sugarloaf	A	SYNAGRO-SOUTHEAST	0.008	MMADF	0.007	0.018	0.024	-0.010	0.000	1	NEW	SCHOOL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
22		SUGARLOAF KOA	5	Upper Sugarloaf	A	DAVIS WATER ANALYSIS	0.025	MMADF	0.014	0.028	0.035	-0.003	0.000	24	GOOD	350 RV/TRAILER	SECONDARY	4 INJECTION WELLS	POOR	POOR	NO
23		VENTURE OUT	6	Cudjoe Key	A	AKH WATER MANAGEMENT	0.085	MMADF	0.050	0.069	0.078	0.016	0.000	26/3	GOOD/EX.	MOBILE HOMES	SECONDARY	3 INJECTION WELLS	POOR	POOR	NO
24		SUMMERLAND PALMS TRAILER PARK	7	Summerland Key	A	AKH WATER MANAGEMENT	0.0075	TMMADF	0.002	0.002	0.003	0.005	0.003	3	EXCELLENT	RV/TRAILER	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
25		LOOE KEY REEF RESORT	9	Ramrod Key	A	DAVIS WATER ANALYSIS	0.010	MMADF	0.002	0.004	0.006	0.006	0.004	8	GOOD	20 MOTEL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
27		LUCKY'S LANDING	10	Little Torch	A	DAVIS WATER ANALYSIS	0.009	TMMADF	0.003	0.006	0.009	0.003	0.001	6	GOOD	MOBILE HOMES	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
32		BIG PINE ELEMENTARY	11	Big Pine Key	A	ANTI-POLLUTION ASSOC.	0.005	MMADF	0.001	0.001	0.001	0.004	0.003	3	GOOD	SCHOOL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
37		BIG PINE KEY FISHING LODGE	11	Big Pine Key	A	DAVIS WATER ANALYSIS	0.025	TMMADF	0.010	0.015	0.016	0.010	0.004	1	EXCELLENT	97 RV & 16 MOTEL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
31		BIG PINE KEY ROAD PRISON	11	Big Pine Key	A	DAVIS WATER ANALYSIS	0.010	TMMADF	0.007	0.009	0.010	0.001	0.000	22	GOOD	PRISON	SECONDARY	6 INJECTION WELLS	POOR	POOR	NO
33		BIG PINE MOTEL	11	Big Pine Key	A	DAVIS WATER ANALYSIS	0.005		0.003	0.006	0.008	-0.001	0.000	22	FAIR	32 MOTEL	SECONDARY	2 INJECTION WELLS	POOR	POOR	MINOR
28		BIG PINE PLAZA SHOPPING CENTER	11	Big Pine Key	A	ANTI-POLLUTION ASSOC.	0.020	TMMADF	0.015	0.022	0.024	-0.002	0.000	13	FAIR	SHOP CTR.	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
29		BREEZY PINES TRAILER PARK	11	Big Pine Key	A	DAVIS WATER ANALYSIS	0.0075	AADF	0.003	0.005	0.006	0.003	0.001	18	FAIR	100 MOB. HOMES	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
35		KEY DEER BAR-B-QUE (FORMERLY CEDAR INN)	11	Big Pine Key	A	AKH WATER MANAGEMENT	0.005	TMMADF	0.001	0.002	0.002	0.003	0.002	5	GOOD	RESTAURANT	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
26		LITTLE PALM ISLAND	11	Big Pine Key	A	TERRY GRAHAM	0.010	TMMADF	0.009	0.010	0.011	0.000	0.000	7	GOOD	30 MOTEL/REST.	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
30		MONTEGO BAY FOOD & SPIRITS	11	Big Pine Key	A	DAVIS WATER ANALYSIS	0.009	MMADF	0.001	0.001	0.002	0.008	0.005	4	GOOD	RESTAURANT	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
36		SANDS SUBDIVISION AFFORDABLE HOUSING	11	Big Pine Key	A	DAVIS WATER ANALYSIS	0.0053		0.002	0.003	0.003	0.002	0.001	5	GOOD	SINGLE FAM.	SECONDARY	2 INJECTION WELLS	POOR	POOR	MINOR
34		SEA HORSE CAMPGROUND	11	Big Pine Key	A	DAVIS WATER ANALYSIS	0.015	TMMADF	0.003	0.005	0.005	0.010	0.007	6	GOOD	125 RV/TRAILER	SECONDARY	2 INJECTION WELLS	POOR	POOR	MINOR
38		BAHIA HONDA STATE PARK, #4	12	Bahia Honda Key	A	DAVIS WATER ANALYSIS	0.0083	MMADF	0.002	0.004	0.004	0.005	0.003		GOOD	STATE PARK W/ 80 CAMP SITES & 16 RENTAL UNITS	SECONDARY	INJECTION WELL	POOR	POOR	MINOR
39		BAHIA HONDA STATE PARK, SAND SPUR 3	12	Bahia Honda Key	A	DAVIS WATER ANALYSIS	0.010	AADF	0.001	0.002	0.002	0.008	0.006	6	GOOD	STATE PARK	SECONDARY	PERC POND /INJECTION WELL	POOR	POOR	NO
40		SUNSHINE KEY CAMPING RESORT	12	Bahia Honda Key	A	SYNAGRO-SOUTHEAST	0.060	TMMADF	0.048	0.081	0.115	-0.021	0.000	1	NEW	405 RV/CAMP 23 MOTEL	SECONDARY	3 INJECTION WELLS	POOR	POOR	MAJOR
105	1	BONEFISH TOWER	13	Marathon Primary Service Area	A	AKH WATER MANAGEMENT	0.050	AADF	0.010	0.020		0.03	0.0175	20(+)	GOOD	CONDOMINIUM	SECONDARY	INJECTION WELLS	POOR	POOR	
47	3	BOOT KEY MARINA	13	Marathon Primary Service Area	A	AKH WATER MANAGEMENT	0.040	TMMADF	0.006	0.009		0.031	0.021	9	GOOD	MARINA	SECONDARY	INJECTION WELLS	POOR	POOR	
53	4	BUCCANEER	13	Marathon Primary Service Area	A	AKH WATER MANAGEMENT	0.030		0.012	0.017		0.013	0.0055	23	FAIR	MOTEL	SECONDARY	INJECTION WELLS	POOR	POOR	
68	21	CAPTAIN'S QUARTERS CONDO	13	Marathon Primary Service Area	A		0.003		0.0017	0.003		0	0	12	GOOD	CONDOMINIUM	SECONDARY	INJECTION WELLS	POOR	POOR	
45	22	CASA CAYO CONDO.	13	Marathon Primary Service Area	A		0.0032		0.0009	0.002		0.0012	0.0004	11	GOOD	CONDOMINIUM	SECONDARY	INJECTION WELLS	POOR	POOR	
59	23	COBIA POINT CONDO.	13	Marathon Primary Service Area	A		0.0042		0.0016	0.0033		0.0009	0	9	FAIR	CONDOMINIUM	SECONDARY	INJECTION WELLS	POOR	POOR	
104	24	COCO PLUM BEACH APTS.	13	Marathon Primary Service Area	A		0.0083		0.0024	0.006		0.0023	0.0002	22	POOR	APARTMENTS	SECONDARY	INJECTION WELLS	FAIR	POOR	
75	25	CORAL CLUB CONDO.	13	Marathon Primary Service Area	A		0.005		0.0014	0.0023		0.0027	0.0015	21	GOOD	CONDOMINIUM	SECONDARY	INJECTION WELLS	POOR	POOR	
99	26	CORAL LAGOON RESORT	13	Marathon Primary Service Area	A		0.0088		0.0039	0.0083		0.0005	0	23	GOOD	MOTEL	SECONDARY	INJECTION WELLS	POOR	POOR	
66	27	DOCKSIDE LOUNGE	13	Marathon Primary Service Area	A		0.0035		0.0036	0.0097		0	0	7	GOOD	BAR/REST.	SECONDARY	INJECTION WELLS	EXCELLENT	FAIR	
82	5	EASTWIND APARTMENTS	13	Marathon Primary Service Area	A	ANTI-POLLUTION ASSOC.	0.060	AADF	0.016	0.019		0.041	0.026	14	EXCELLENT	APARTMENTS	SECONDARY	INJECTION WELLS	POOR	POOR	
51	28	FARO BLANCO RESORT	13	Marathon Primary Service Area	A		0.010		0.0041	0.006		0.004	0.0015	12	GOOD	MOTEL/MARINA	SECONDARY	INJECTION WELLS	POOR	POOR	
56	6	FISHERMEN'S HOSPITAL	13	Marathon Primary Service Area	A	AKH WATER MANAGEMENT	0.021	MMADF	0.011	0.012		0.009	0.0038	6	EXCELLENT	HOSPITAL	SECONDARY	INJECTION WELLS	FAIR	POOR	
92	53	FISHMONGER (FORMERLY PERRY'S RESTAURANT)	13	Marathon Primary Service Area	A		0.004		0.0020	0.003		0.001	0	20(+)	FAIR	RESTAURANT	SECONDARY	INJECTION WELLS	POOR	POOR	
44	7	GALWAY BAY MHP	13	Marathon Primary Service Area	A	AKH WATER MANAGEMENT	0.038	MMADF	0.015	0.024		0.014	0	25	POOR	RV/TRAILER	SECONDARY	INJECTION WELLS	POOR	POOR	
46	29	GATOR'S RESTAURANT (BEING REPLACED)	13	Marathon Primary Service Area	I		0.0075		0.0010	0.003		0.0045	0.0026	9	POOR	RESTAURANT	SECONDARY	INJECTION WELLS	POOR	POOR	
64	8	GUIDANCE CLINIC	13	Marathon Primary Service Area	A	AKH WATER MANAGEMENT	0.020		0.006	0.009		0.011	0.006	5	GOOD	CLINIC	SECONDARY	INJECTION WELLS	POOR	POOR	
87	30	GULFSIDE VILLAGE	13	Marathon Primary Service Area	A		0.008		0.0028	0.006		0.002	0	9	GOOD	RETAIL STORE	SECONDARY	INJECTION WELLS	POOR	POOR	
49	9	HAMPTON INN	13	Marathon Primary Service Area	a		0.020							1	EXCELLENT	MOTEL	SECONDARY	INJECTION WELLS	FAIR	EXCELLENT	
74	31	HARBOR CLUB SOUTH CONDO.	13	Marathon Primary Service Area	A		0.010		0.0012	0.002		0.008	0.0055	20	GOOD	CONDOMINIUM	SECONDARY	INJECTION WELLS	POOR	POOR	
62	32	HARBOR HOUSE CONDO.	13	Marathon Primary Service Area	A		0.005		0.0015	0.0033		0.0017	0.0005	20	GOOD	CONDOMINIUM	SECONDARY	INJECTION WELLS	POOR	POOR	
58	10	HARBORSIDE @ MARATHON	13	Marathon Primary Service Area	NB		0.060										SECONDARY	INJECTION WELLS	POOR	POOR	
159	33	HAWKS' NEST	13	Marathon Primary Service Area	A	ED VIOLETTE	0.0100		0.0028	0.0043		0.0057	0.0032	20	GOOD	CONDOMINIUM	SECONDARY	INJECTION WELLS	POOR	POOR	
101	12	HOLIDAY INN / MARATHON	13	Marathon Primary Service Area	A	ANTI-POLLUTION ASSOC.	0.035		0.021	0.0038		0	0.0225	10	GOOD	MOTEL/REST	SECONDARY	INJECTION WELLS	POOR	POOR	
67	2	HOME DEPOT	13	Marathon Primary Service Area	A		0.010							2	EXCELLENT	RETAIL STORE	SECONDARY	INJECTION WELLS	POOR	POOR	
102	13	HOWARD JOHNSON'S	13	Marathon Primary Service Area	A	ANTI-POLLUTION ASSOC.	0.025	MMADF	0.026	0.031		0	0	11	FAIR	MOTEL/REST	SECONDARY	INJECTION WELLS			
70	34	HURRICANE/ECONO (BLACKFIN)	13	Marathon Primary Service Area	A		0.008		0.0038	0.006		0.002	0	23	GOOD	MOTEL/REST	SECONDARY	INJECTION WELLS	POOR	POOR	
90	35	INT'L HOUSE OF PANCAKES	13	Marathon Primary Service Area	A		0.0097		0.0029	0.0037		0.006	0	3	EXCELLENT	RESTAURANT	SECONDARY	INJECTION WELLS	POOR	POOR	
77	36	ISLAND CLUB CONDO.	13	Marathon Primary Service Area	A		0.008		0.0017	0.003		0.005	0.003	17	GOOD	CONDOMINIUM	SECONDARY	INJECTION WELLS			
86	39	K MART PLAZA	13	Marathon Primary Service Area	A		0.015		0.0086	0.013		0.002	0	21	FAIR	SHOPPING CENTER	SECONDARY	INJECTION WELLS			
100	15	KEY COLONY BEACH	13	Marathon Primary Service Area	A	SYNAGRO-SOUTHEAST	0.340	AADF	0.184	0.247		0	0	1	EXCELLENT	MIXED RES. & COM.	SECONDARY	INJECTION WELLS	POOR	POOR	
98	16	KEY LIME RESORT	13	Marathon Primary Service Area	A	AKH WATER MANAGEMENT	0.025	MMADF	0.011	0.014		0.011	0.0048	4	EXCELLENT	CONDOMINIUM	SECONDARY	INJECTION WELLS	POOR	POOR	
84	37	KEY RV PARK	13	Marathon Primary Service Area	A		0.015		0.0064	0.011		0.004	0.0003	25	FAIR	RV/TRAILER	SECONDARY	INJECTION WELLS	POOR	POOR	

APPENDIX C
EXHIBIT C-2
Summary Information for FDEP Permitted Wastewater Treatment Plants
In Monroe County (Excluding Key West Area)

MAP I D NO	MAR FAC PLAN I.D.	FACILITY NAME	STUDY AREA NO	STUDY AREA NAME	STATUS	WWTP OPERATOR	PERMITTED CAPACITY, MGD	BASIS OF PERMITTED CAPACITY	ANNUAL AVERAGE DAILY FLOW, MGD	3-MONTH MAX ADF, MGD	MAXIMUM MONTH ADF, MGD	EXCESS CAPACITY, MGD	AVAILABLE EXCESS CAPACITY	APPROX. FACILITY AGE, YRS.	GENERAL FACILITY CONDITION	NUMBER/TYPE OF CONNECTIONS SERVED	TREATMENT LEVEL	EFFLUENT DISPOSAL METHOD	REUSE POTENTIAL	POTENTIAL FOR EXPANSION	FDEP NON-COMPLIANCE ISSUES?
91	38	KINGSAIL RESORT	13	Marathon Primary Service Area	A		0.0033		0.0018	0.003		0.0003	0	3	GOOD	MOTEL	SECONDARY	INJECTION WELLS	POOR	POOR	
52	40	LADY ALEXANDER CONDO.	13	Marathon Primary Service Area	A		0.005		0.0008	0.0017		0.0033	0.0021	20	GOOD	CONDOMINIUM	SECONDARY	INJECTION WELLS	FAIR	POOR	
55	42	LEIGH-DE SANCTIS	13	Marathon Primary Service Area	A		0.010		0.0014	0.0018		0.0082	0.0057	9	FAIR	APARTMENTS	SECONDARY	INJECTION WELLS	POOR	POOR	
88	41	LUCY APARTMENTS	13	Marathon Primary Service Area	A		0.003		0.0022	0.005		0	0	22	FAIR	APARTMENTS	SECONDARY	INJECTION WELLS	POOR	POOR	
94	43	MARATHON AIRPORT	13	Marathon Primary Service Area	A		0.0075		0.001	0.001		0.0065	0.0046	2	EXCELLENT	AIRPORT FACILITIES	SECONDARY	INJECTION WELLS	POOR	POOR	
71	44	MARATHON COUNTRY CLUB CONDOMINIUM	13	Marathon Primary Service Area	A		0.0080		0.0026	0.0033		0.0047	0	22	GOOD	CONDOMINIUM	SECONDARY	INJECTION WELLS	POOR	POOR	
78	45	MARATHON HIGH SCHOOL	13	Marathon Primary Service Area	A		0.015		0.0035	0.008		0.007	0.0033	2	GOOD	SCHOOL	SECONDARY	INJECTION WELLS	POOR	POOR	
65	17	MARATHON KEY BEACH CLUB	13	Marathon Primary Service Area	A	AKH WATER MANAGEMENT	0.030	MMADF	0.012	0.016		0.014	0.0065	13	FAIR	MOTEL & CONDO.	SECONDARY	INJECTION WELLS	POOR	FAIR	
85	46	MARATHON MANOR	13	Marathon Primary Service Area	A		0.015		0.0010	0.0133		0.0017	0	10	GOOD	NURSING HOME	SECONDARY	INJECTION WELLS	POOR	POOR	
42	47	MARATHON MARINA	13	Marathon Primary Service Area	A		0.018									MARINA	SECONDARY	INJECTION WELLS	POOR	GOOD	
48	18	MARATHON TRAILERAMA	13	Marathon Primary Service Area	A	DAVID LIVELY	0.020		0.0094	0 012		0.008	0 003	7	GOOD	RV/TRAILER	SECONDARY	INJECTION WELLS	POOR	POOR	
106	48	MARIE'S YACHT HARBOR CLUB	13	Marathon Primary Service Area	A		0.009		0.0007	0.001		0.008	0.0058	3	GOOD	MARINA	SECONDARY	INJECTION WELLS	POOR	POOR	
43	49	MID-TOWN TRAILER PARK	13	Marathon Primary Service Area	A		0.0075		0.0026	0.0047		0.0028	0.0009	10	GOOD	RV/TRAILER	SECONDARY	INJECTION WELLS			
54	50	MONROE REG. SERV. CTR.	13	Marathon Primary Service Area	A		0.010		0 0024					3	EXCELLENT	OFFICE BLDGS.	SECONDARY	INJECTION WELLS	POOR	POOR	
96	70	OFFICE DEPOT (FORMERLY WINN DIXIE) PLAZA	13	Marathon Primary Service Area	A		0.0085		0.0048	0.007		0.0015	0	20	FAIR	SHOPPING CENTER	SECONDARY	INJECTION WELLS	POOR	POOR	
81	51	PANDA HOUSE REST.	13	Marathon Primary Service Area	A		0.005		0.0012	0.002		0.003	0 0018	7	FAIR	RESTAURANT	SECONDARY	INJECTION WELLS	POOR	POOR	
95	54	PIZZA HUT	13	Marathon Primary Service Area	A		0 008		0.0011	0.002		0.006	0.004	13	GOOD	RESTAURANT	SECONDARY	INJECTION WELLS	POOR	POOR	
79	71	PUBLIX(7)	13	Marathon Primary Service Area	A		0.030		0.0034	0.004		0.026	0.0185	2	EXCELLENT	SHOPPING CENTER	SECONDARY	INJECTION WELLS	POOR	POOR	
103	55	QUAY RESTAURANT	13	Marathon Primary Service Area	A		0.015		0.0040	0.005		0.01	0.0063	9	GOOD	RESTAURANT	SECONDARY	INJECTION WELLS	POOR	POOR	
107	56	ROYAL PLUM CONDO.	13	Marathon Primary Service Area	A		0.010		0.0040	0.008		0.002	0	11	FAIR	CONDOMINIUM	SECONDARY	INJECTION WELLS	POOR	POOR	
83	57	SCHOONER CONDO.	13	Marathon Primary Service Area	A		0.005		0.0028	0.003		0	0	20	GOOD	CONDOMINIUM	SECONDARY	INJECTION WELLS	POOR	POOR	
93	58	SEAHORSE MOTEL	13	Marathon Primary Service Area	A		0.0075		0.0017	0.0023		0.0052	0.0033	1	EXCELLENT	MOTEL	SECONDARY	INJECTION WELLS	POOR	POOR	
97	19	SEAWATCH CONDO.	13	Marathon Primary Service Area	A	AKH WATER MANAGEMENT	0.040		0.004	0.0063		0.0337	0.0237	15	GOOD	CONDOMINIUM	SECONDARY	INJECTION WELLS	FAIR	POOR	
73	59	SOMBRERO BEACH VILLAGE	13	Marathon Primary Service Area	A		0.005		0 0018	0.003		0 002	0 0008	18	GOOD	MOTEL/REST.	SECONDARY	INJECTION WELLS	POOR	POOR	
69	60	SOMBRERO COUNTRY CLUB	13	Marathon Primary Service Area	A		0.010		0.0036	0.006		0.004	0.0015	4	GOOD	BAR/REST.	SECONDARY	INJECTION WELLS	POOR	POOR	
72	20	SOMBRERO RESORT	13	Marathon Primary Service Area	A	AKH WATER MANAGEMENT	0.020	MMADF	0.007	0 0103		0 0097	0 0047	9	FAIR	CONDOMINIUM	SECONDARY	INJECTION WELLS	POOR	FAIR	
63	61	SOMBRERO RIDGE CONDO.	13	Marathon Primary Service Area	A		0.0048		0.0010	0.002		0 0028	0.0016	22	GOOD	CONDOMINIUM	SECONDARY	INJECTION WELLS	POOR	POOR	
60	62	SPANISH GALLEON	13	Marathon Primary Service Area	A		0.005		0.0029	0.004		0.001	0	21	GOOD	CONDOMINIUM	SECONDARY	INJECTION WELLS	POOR	POOR	
57	63	STANLEY SWITLIK ELEM.	13	Marathon Primary Service Area	A		0 015		0.0040	0.007		0.008	0.0043	23	GOOD	SCHOOL	SECONDARY	INJECTION WELLS	POOR	POOR	
89	64	THE REEF	13	Marathon Primary Service Area	A		0.017		0.0056	0.0073		0 0097	0.0055	22	GOOD	CONDOMINIUM	SECONDARY	INJECTION WELLS	POOR	POOR	
61	65	THE ROCK (GULFSHORE) APT.	13	Marathon Primary Service Area	A		0.0075		0.0020	0.0027		0.0048	0.0029	6	GOOD	APARTMENTS	SECONDARY	INJECTION WELLS	POOR	POOR	
80	66	TRADEWINDS WEST	13	Marathon Primary Service Area	A		0 0064		0.0013	0.002		0.0044	0.0028	22	GOOD	CONDOMINIUM	SECONDARY	INJECTION WELLS	POOR	POOR	
106	67	TREASURE CAY CONDO	13	Marathon Primary Service Area	A		0.005		0.0010	0.002		0.003	0.0018	20	GOOD	CONDOMINIUM	SECONDARY	INJECTION WELLS	POOR	POOR	
50	68	U.S. COAST GUARD STA.	13	Marathon Primary Service Area	A		0.0025		0.0020	0 003		0	0	14	GOOD	GOV'T.	SECONDARY	INJECTION WELLS	POOR	POOR	
76	69	WENDY'S	13	Marathon Primary Service Area	A		0.004		0.0022	0.0027		0.0013	0.0003	9	POOR	RESTAURANT	SECONDARY	INJECTION WELLS	POOR	POOR	
111	11	HAWK'S CAY RESORT	14	Marathon Secondary Service Area	A	ANTI-POLLUTION ASSOC.	0.198		0.058	0.070		0.126	0.077	35/2	FAIR/EXCEL	MOTEL/REST.	SECONDARY	INJECTION WELLS	POOR	GOOD	
110	14	JOLLY ROGER TRAVEL PARK	14	Marathon Secondary Service Area	A	AKH WATER MANAGEMENT	0 030	AADF	0.012	0.016		0.014	0.0055	23	GOOD	RV/TRAILER	SECONDARY	INJECTION WELLS	POOR	POOR	
109	52	PELICAN MOTEL & T.P.	14	Marathon Secondary Service Area	A		0.015		0.0014	0.003		0.012	0 0083	22	GOOD	MOTEL & RV	SECONDARY	INJECTION WELLS	POOR	POOR	
118		FIESTA KEY K. O. A.	15	Long Key/ Layton	A	ANTI-POLLUTION ASSOC.	0.060	TMMADF	0.038	0.056	0.061	0 004	0.000	7	GOOD	300 RV/TRAILER	SECONDARY	3 INJECTION WELLS	POOR	FAIR	MINOR
115		LITTLE ITALY RESTAURANT	15	Long Key/ Layton	A	ANTI-POLLUTION ASSOC.	0 0040	POL	0.001	0.002	0.002	0.002	0.001	2	EXCELLENT	RESTAURANT	SECONDARY	2 INJECTION WELLS	POOR	POOR	MINOR
112		LONG KEY OCEAN BAY CONDOMINIUM	15	Long Key/ Layton	A	ANTI-POLLUTION ASSOC.	0.007	MMADF	0.001	0.003	0.004	0.004	0.003	23	GOOD	CONDOMINIUMS	SECONDARY	1 INJECTION WELL	POOR	POOR	NO
114		LONG KEY STATE RECREATION AREA	15	Long Key/ Layton	A	ANTI-POLLUTION ASSOC.	0.010	MMADF	0 002	0 003	0.004	0.007	0.005	4	EXCELLENT	STATE PARK W/ 60 CAMP SITES	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
116		MARINE SCIENCE & CONSERVATION CENTER	15	Long Key/ Layton	A	ECOSYSTEMATICS	0 0075	MMADF	0.002	0.003	0.004	0.005	0.003	20	GOOD	EDUCATIONAL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
117		OCEANSIDE ISLE APARTMENT	15	Long Key/ Layton	A	ANTI-POLLUTION ASSOC.	0.006	AADF	0 001	0 002	0 002	0.004	0 003	4	GOOD	APARTMENTS	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
113		OUTDOOR RESORTS AT LONG KEY	15	Long Key/ Layton	A	ANTI-POLLUTION ASSOC.	0.060	MMADF	0.024	0.046	0.057	0.014	0 000	27	GOOD	RV/TRAILER	SECONDARY	3 INJECTION WELLS	POOR	POOR	NO
120		BOY SCOUTS OF AMERICA	16	Lower Matecumbe Key	A	ECOSYSTEMATICS	0.025	TMMADF	0.005	0.012	0.015	0.013	0 007	5	EXCELLENT	LODGING	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
119		CALOOSA COVE MARINA/RESORT	16	Lower Matecumbe Key	A	ECOSYSTEMATICS	0.024	MMADF	0.008	0.010	0.010	0.014	0.008	20	GOOD	28 MOTEL/REST	SECONDARY	2 INJECTION WELLS	POOR	POOR	MINOR
N/A		CAPTAIN'S COVE	16	Lower Matecumbe Key	I	NOT YET IN SERVICE	0.015	AADF						0	NEW		SECONDARY	2 INJECTION WELLS	POOR	GOOD	NO
122		MATECUMBE RESORT	16	Lower Matecumbe Key	A	ANTI-POLLUTION ASSOC.	0 010	TMMADF	0.003	0.007	0.008	0 003	0.001	13	GOOD	MOTEL	IQ/PART II	2 INJECTION WELLS & SUBSURFACE IRRIGATION	FAIR	POOR	NO
121		SANDY POINT CONDOMINIUM	16	Lower Matecumbe Key	A	ECOSYSTEMATICS	0.0033	MMADF	0.001	0.001	0.001	0 002	0.001	21	GOOD	CONDOMINIUMS	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
147		BEACON REEF CONDOMINIUM	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.024	MMADF	0.010	0.016	0.023	0.008	0.002	15	GOOD	101 CONDO	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
145		BENTLEY'S RESTAURANT	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.004	TMMADF	0.002	0 003	0.004	0.001	0.000	16/3	FAIR/GOOD	RESTAURANT	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
127		BREEZY PALMS RESORT MOTEL	17	Upper Matecumbe Key	A	ANTI-POLLUTION ASSOC.	0.015	TMMADF	0.007	0.008	0.010	0.007	0.003	25	FAIR/POOR	40 MOTEL	IQ/PART III	SPRAY IRRIGATION & INJECTION WELL	EXCELLENT	POOR	MINOR
138		CHEECA LODGE	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.070	AADF	0.036	0.045	0.046	0.025	0.008	21	GOOD	210 MOTEL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
149		CHESAPEAKE OF WHALE HARBOR (CHES. RESORT)	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.0075	AADF	0 008	0.011	0.011	-0.003	0.000	9	GOOD	RESORT	SECONDARY	3 INJECTION WELLS	POOR	POOR	NO
148		CORAL GRILL RESTAURANT	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.018	MMADF	0 005	0.007	0.009	0.011	0.007	23	FAIR	RESTAURANT	SECONDARY	2 INJECTION WELLS	POOR	POOR	MINOR
144		DAYS INN OF ISLAMORADA	17	Upper Matecumbe Key	A	ANTI-POLLUTION ASSOC.	0.0083	MMADF	0.003	0.006	0 007	0.002	0 000	15	GOOD	37 MOTEL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
132		DINO'S	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.0075	TMMADF	0.002	0.002	0.003	0.006	0 004	16	GOOD	RESTAURANT	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
134		GREEN TURTLE INN	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.010	TMMADF	0 002	0.003	0.004	0.007	0.004	14	GOOD	RESTAURANT	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
126		HAMPTON INN	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.025	MMADF	0 006	0.014	0.016	0.011	0.005	25	GOOD	85 MOTEL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
135		ISLAMORADA FISH COMPANY	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.009	AADF	0.001	0.001	0.007	-	-	<1	EXCELLENT	RESTAURANT	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
128		LA SIESTA RESORT	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.0125	MMADF	0.004	0 006	0.007	0.006	0.003	12	GOOD	52 MOTEL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
124		LAZY DAYS RESTAURANT	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0 0095	MMADF	0.002	0.002	0.002	0.008	0.005	5	GOOD	RESTAURANT	SECONDARY	3 INJECTION WELLS	POOR	POOR	NO
141		LORELEI	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.0075	MMADF	0.004	0.005	0 006	0 003	0 001	12	GOOD	BAR/REST.	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
131		MAISON MATECUMBE	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.0095	AADF	0.001	0.001	0.001	0.009	0 006	4	GOOD	CONDOMINIUMS	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
137		MEXICAN CANTINA RESTAURANT	17	Upper Matecumbe Key	A	ANTI-POLLUTION ASSOC.	0 005	MMADF	0.001	0 001	0.001	0.004	0.003	4	GOOD	RESTAURANT	SECONDARY	2 INJECTION WELLS	POOR	POOR	MINOR
136		MORADA BAY RESTAURANT	17	Upper Matecumbe Key	A	ANTI-POLLUTION ASSOC.	0.004	MMADF	<0 001	<0.001	<0.001	0.003	0.002	1	EXCELLENT	RESTAURANT	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
125		PALMS OF ISLAMORADA CONDOMINIUM	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.020	AADF	0.005	0.008	0 008	0.012	0.007	17	GOOD	80 CONDO	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO

APPENDIX C
EXHIBIT C-2
Summary Information for FDEP Permitted Wastewater Treatment Plants
In Monroe County (Excluding Key West Area)

MAP I.D NO.	MAR. FAC. PLAN I.D.	FACILITY NAME	STUDY AREA NO.	STUDY AREA NAME	STATUS	WWTP OPERATOR	PERMITTED CAPACITY, MGD	BASIS OF PERMITTED CAPACITY	ANNUAL AVERAGE DAILY FLOW, MGD	3-MONTH MAX. ADF, MGD	MAXIMUM MONTH ADF, MGD	EXCESS CAPACITY, MGD	AVAILABLE EXCESS CAPACITY	APPROX. FACILITY AGE, YRS	GENERAL FACILITY CONDITION	NUMBER/TYPE OF CONNECTIONS SERVED	TREATMENT LEVEL	EFFLUENT DISPOSAL METHOD	REUSE POTENTIAL	POTENTIAL FOR EXPANSION	FDEP NON-COMPLIANCE ISSUES?
123		PAPA JOE'S RESTAURANT	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.005	POL	0.003	0.004	0.005	0.001	0.000	15	FAIR	RESTAURANT	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
146		PELICAN PALMS TRAILER PARK	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.0075	AADF	0.003	0.008	0.010	0.000	0.000	10	GOOD	RV/TRAILER	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
129		SAND PEBBLES CONDOMINIUM	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.015	TMMADF	0.001	0.003	0.003	0.012	0.009	12	GOOD	CONDOMINIUMS	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
140		SQUID ROW RESTAURANT	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.015	AADF	0.001	0.004	0.009	0.011	0.008	6	EXCELLENT	RESTAURANT	SECONDARY	3 INJECTION WELLS	POOR	EXCELLENT	NO
142		SUNSET INN RESORT	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.014	TMMADF	0.007	0.013	0.014	0.001	0.000	5	GOOD	59 MOTEL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
133		TARPON FLATS CONDOMINIUMS	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.006	AADF	0.002	0.003	0.004	0.003	0.002	10	GOOD	CONDOMINIUMS	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
130		UNCLE'S (FORMERLY FISHERMEN'S KETTLE)	17	Upper Matecumbe Key	A	ANTI-POLLUTION ASSOC.	0.015	TMMADF	0.001	0.001	0.001	0.014	0.010	13	GOOD	RESTAURANT	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
150		WHALE HARBOR INN	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.040	TMMADF	0.006	0.008	0.009	0.032	0.022	5	GOOD	65 MOTEL/REST.	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
139		WOODY'S	17	Upper Matecumbe Key	A	ECOSYSTEMATICS	0.0033	MMADF	0.001	0.002	0.003	0.001	0.000	7	GOOD	RESTAURANT	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
157		CARELESS NAVIGATOR (F'M'RLY HOG H'V'N SP. BAR)	18	Windley Key	A	ECOSYSTEMATICS	0.009	MMADF	0.003	0.004	0.004	0.005	0.003	15	GOOD	BAR/REST	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
155		HARBOR LIGHTS MOTEL OF HOLIDAY ISLE	18	Windley Key	A	ECOSYSTEMATICS	0.020	TMMADF	0.004	0.005	0.007	0.015	0.010	9	GOOD	39 MOTEL	SECONDARY	3 INJECTION WELLS	POOR	POOR	NO
159		HAWKS CHANNEL BAR & GRILLE	18	Windley Key	A	ECOSYSTEMATICS	0.009	POL	0.001	0.001	0.002	0.008	0.006	16	GOOD	BAR/REST.	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
151		HOLIDAY ISLE RESORT	18	Windley Key	A	ECOSYSTEMATICS	0.040	AADF	0.028	0.034	0.039	0.006	0.000	27	GOOD	76 MOTEL/REST	SECONDARY	2 INJECTION WELLS	POOR	POOR	MINOR
152		HOWARD JOHNSON'S ISLAMORADA	18	Windley Key	A	ECOSYSTEMATICS	0.020	TMMADF	0.014	0.017	0.020	0.003	0.000	25	GOOD	60 MOTEL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
143		NEPTUNE'S REST. (FORMERLY THE BEACH HOUSE)	18	Windley Key	A	(TEMPORARILY OFF LINE)	0.010		0.001	0.001	0.001	0.009	0.007	8	FAIR	RESTAURANT	SECONDARY	2 INJECTION WELLS	POOR	POOR	MINOR
153		PELICAN COVE CONDOMINIUM	18	Windley Key	A	ECOSYSTEMATICS	0.015	AADF	0.005	0.008	0.009	0.007	0.003	9	GOOD	CONDOMINIUMS	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
158		SMUGGLER'S COVE MARINA & RESORT	18	Windley Key	A	ECOSYSTEMATICS	0.009	TMMADF	0.003	0.005	0.005	0.004	0.002	8	GOOD	10 MOTEL/MARINA	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
156		TROPICAL REEF RESORT	18	Windley Key	A	ECOSYSTEMATICS	0.015	MMADF	0.003	0.005	0.005	0.010	0.007	10	GOOD	51 MOTEL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
160		US COAST GUARD STATION ISLAMORADA	18	Windley Key	A	ECOSYSTEMATICS	0.005	MMADF	0.001	0.003	0.004	0.002	0.001	17	GOOD	GOVT.	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
154		WINDLEY KEY TRAILER PARK	18	Windley Key	A	ECOSYSTEMATICS	0.0075	MMADF	0.002	0.003	0.004	0.005	0.003	13	GOOD	RV/TRAILER	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
170		CORAL HARBOR CLUB	19	Plantation Key	A	ECOSYSTEMATICS	0.015	MMADF	0.008	0.013	0.014	0.002	0.000	16	GOOD	CONDOMINIUMS	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
177		CORAL SHORES HIGH SCHOOL	19	Plantation Key	A	ANTI-POLLUTION ASSOC.	0.0150	MMADF	0.004	0.007	0.007	0.008	0.004	25	GOOD	SCHOOL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
163		EXECUTIVE BAY CLUB CONDO.	19	Plantation Key	A	ECOSYSTEMATICS	0.050	AADF	0.019	0.028	0.030	0.022	0.010	17	GOOD	200 CONDO	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
169		FUTURA YACHT CLUB	19	Plantation Key	A	ECOSYSTEMATICS	0.020	AADF	0.009	0.014	0.016	0.006	0.001	18	GOOD	70 CONDO	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
176		HARBOR HOUSE PROPERTY	19	Plantation Key	A	ECOSYSTEMATICS	0.015	TMMADF	0.001	0.002	0.003	0.013	0.009	5	EXCELLENT	CONDOMINIUMS	SECONDARY	4 INJECTION WELLS	POOR	POOR	NO
172		MARINERS HOSPITAL	19	Plantation Key	A	ECOSYSTEMATICS	0.040	MMADF	0.020	0.025	0.029	0.015	0.005	23	FAIR	42-BED HOSP., 120 BED NURS. HO., & 54 CONDO	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
167		MARKER 88 RESTAURANT	19	Plantation Key	A	ECOSYSTEMATICS	0.015	TMMADF	0.002	0.002	0.003	0.013	0.009	6	GOOD	RESTAURANT	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
166		OCEAN HARBOUR CONDOMINIUM	19	Plantation Key	A	ECOSYSTEMATICS	0.024	TMMADF	0.006	0.009	0.010	0.015	0.009	8	GOOD	68 CONDO	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
161		PELICAN PLAZA (JAMMER'S)	19	Plantation Key	A	ECOSYSTEMATICS	0.015	TMMADF	0.001	0.002	0.002	0.013	0.009	6	GOOD	SHOPPING PLAZA	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
165		PLANTATION BY THE SEA	19	Plantation Key	A	ECOSYSTEMATICS	0.020	MMADF	0.009	0.011	0.011	0.009	0.004	15	GOOD	84 CONDO	SECONDARY	2 INJECTION WELLS	POOR	GOOD	NO
173		PLANTATION KEY ELEMENTARY SCHOOL	19	Plantation Key	A	ANTI-POLLUTION ASSOC.	0.020	TMMADF	0.004	0.007	0.008	0.013	0.008	20	GOOD	SCHOOL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
171		PLANTATION KEY GOVERNMENT COMPLEX	19	Plantation Key	A	ECOSYSTEMATICS	0.010	AADF	0.006	0.008	0.008	0.002	0.000	9	GOOD	GOVT.	SECONDARY	2 INJECTION WELLS	POOR	EXCELLENT	NO
162		PLANTATION YACHT HARBOR RESORT	19	Plantation Key	A	ECOSYSTEMATICS	0.035	TMMADF	0.005	0.007	0.009	0.028	0.019	23	GOOD	56 MOTEL/REST.	SECONDARY	3 INJECTION WELLS	POOR	POOR	NO
174		SEA GULLS CONDOMINIUM	19	Plantation Key	A	ECOSYSTEMATICS	0.0175	MMADF	0.005	0.007	0.010	0.011	0.006	19	GOOD	CONDOMINIUMS	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
164		SEABREEZE TRAILER PARK	19	Plantation Key	A	ECOSYSTEMATICS	0.0075	MMADF	0.002	0.004	0.004	0.004	0.002	25	GOOD	RV/TRAILER	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
168		SUMMER SEA CONDOMINIUM	19	Plantation Key	A	ECOSYSTEMATICS	0.026	AADF	0.010	0.017	0.019	0.009	0.002	20	GOOD	128 CONDO	SECONDARY	2 INJECTION WELLS	POOR	POOR	MINOR
178		TROPIC VISTA MOTEL	19	Plantation Key	A	ECOSYSTEMATICS	0.005	TMMADF	0.001	0.001	0.002	0.004	0.002	2	GOOD	26 MOTEL	SECONDARY	1 INJECTION WELL	POOR	POOR	NO
175		TUREK ENTERPRISES, INC	19	Plantation Key	A	ECOSYSTEMATICS	0.005	AADF	0.001	0.002	0.002	0.003	0.002	20	GOOD	APTS./COMM.	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
184		ANCHOR CONDOMINIUM	20	Tavernier (PAED 15)	A	ECOSYSTEMATICS	0.009	AADF	0.003	0.004	0.005	0.005	0.003	21	FAIR	CONDOMINIUMS	SECONDARY	3 INJECTION WELLS	POOR	POOR	NO
181		BLUE WATERS TRAILER VILLAGE	20	Tavernier (PAED 15)	A	ECOSYSTEMATICS	0.045	MMADF	0.018	0.022	0.024	0.023	0.011	22	GOOD	180 MOB. HOME	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
183		DRIFTWOOD TRAVEL TRAILER PARK	20	Tavernier (PAED 15)	A	ECOSYSTEMATICS	0.005	AADF	0.004	0.005	0.005	0.000	0.000	25	GOOD	RV/TRAILER	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
182		HARBOUR 92 CONDOMINIUM	20	Tavernier (PAED 15)	A	ECOSYSTEMATICS	0.010	MMADF	0.003	0.004	0.005	0.006	0.003	18	GOOD	CONDOMINIUMS	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
180		NEW MARINERS HOSPITAL	20	Tavernier (PAED 15)	A	(NOT STARTED)	0.020	MMADF				0.020	0.015	2	EXCELLENT	HOSPITAL	SECONDARY	3 INJECTION WELLS	POOR	POOR	NO
186		OCEAN POINTE COMMONS	20	Tavernier (PAED 15)	A	ECOSYSTEMATICS	0.065	TMMADF	0.023	0.033	0.038	0.032	0.015	7	GOOD	260 CONDO	SECONDARY	2 INJECTION WELLS	POOR	POOR	MINOR
185		SUNSET ACRES M. H. P.	20	Tavernier (PAED 15)	A	ECOSYSTEMATICS	0.015	AADF	0.012	0.031	0.038	-0.016	0.000	22	GOOD	MOBILE HOMES	SECONDARY	3 INJECTION WELLS	POOR	EXCELLENT	MINOR
179		TAVERNIER TOWNE SHOPPING CENTER	20	Tavernier (PAED 15)	A	SYNAGRO-SOUTHEAST	0.057	TMMADF	0.011	0.025	0.025	0.032	0.018	18/1	GOOD	SHOPPING PLAZA	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
194		AMERICA OUTDOORS CAMPGROUND	21	Rock Harbor (PAED 16)	A	SYNAGRO-SOUTHEAST	0.025	MMADF	0.005	0.011	0.012	0.014	0.007	25/1	EXCELLENT	150 RV/CAMP SITES	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
197		ANTHONY'S	21	Rock Harbor (PAED 16)	I	ECOSYSTEMATICS	0.0075	TMMADF	0.002	0.003	0.008	0.005	0.003		FAIR	RESTAURANT	SECONDARY	4 INJECTION WELLS	POOR	POOR	NO
192		BUTTONWOOD BAY CONDOMINIUMS	21	Rock Harbor (PAED 16)	A	ECOSYSTEMATICS	0.090	MMADF	0.013	0.023	0.028	0.067	0.045	23	GOOD	280 CONDO	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
189		CORAL SANDS RESORT	21	Rock Harbor (PAED 16)	A	ECOSYSTEMATICS	0.008	TMMADF	0.001	0.002	0.002	0.006	0.004	6	GOOD	MOTEL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
196		HARBORAGE CONDOMINIUMS	21	Rock Harbor (PAED 16)	A	ECOSYSTEMATICS	0.015	MMADF	0.012	0.021	0.031	-0.006	0.000	20+	GOOD	CONDOMINIUMS	SECONDARY	6/3 INJECTION WELLS	POOR	POOR	MAJOR
187		KEY LARGO OCEAN RESORT	21	Rock Harbor (PAED 16)	A	ECOSYSTEMATICS	0.050/0.070	MMADF	0.024	0.046	0.060	0.004	0.000	24	FAIR	180 RV/TRAILER	SECONDARY	3 INJECTION WELLS	POOR	POOR	NO
198		LANDINGS OF LARGO	21	Rock Harbor (PAED 16)	A	ECOSYSTEMATICS	0.100	MMADF	0.027	0.060	0.063	0.040	0.015	15	GOOD	128 CONDO	SECONDARY	1 INJECTION WELL	POOR	POOR	NO
188		PARADISE POINT M. H. P.	21	Rock Harbor (PAED 16)	A	ECOSYSTEMATICS	0.0032	MMADF	0.001	0.001	0.002	0.002	0.001	22	FAIR	MOBILE HOMES	SECONDARY	3 INJECTION WELLS	POOR	POOR	NO
195		ROCK HARBOR CLUB	21	Rock Harbor (PAED 16)	A	ECOSYSTEMATICS	0.020	MMADF	0.004	0.005	0.006	0.015	0.010	5	GOOD	80 CONDO	SECONDARY	3 INJECTION WELLS	POOR	POOR	NO
191		SILVER SHORES MOBILE HOME PARK	21	Rock Harbor (PAED 16)	A	ECOSYSTEMATICS	0.083	MMADF	0.022	0.031	0.032	0.052	0.031	18	GOOD	200 MOB. HOME	SECONDARY	4 INJECTION WELLS	POOR	FAIR[29]	NO
190		SUNSET HAMMOCK CONDOMINIUM	21	Rock Harbor (PAED 16)	A	ECOSYSTEMATICS	0.020	TMMADF	0.002	0.005	0.007	0.014	0.009	12	GOOD	CONDOMINIUMS	SECONDARY	3 INJECTION WELLS	POOR	POOR	NO
193		WESTIN (FORMERLY SHERATON KEY LARGO RESORT)	21	Rock Harbor (PAED 16)	A	ECOSYSTEMATICS	0.080	MMADF	0.020	0.024	0.026	0.056	0.036	10	GOOD	200 MOTEL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
212		BEST WESTERN SUITES OF KEY LARGO	22	Key Largo (PAED 17)	A	ECOSYSTEMATICS	0.020	TMMADF	0.006	0.009	0.010	0.011	0.006	8	GOOD	40 CONDO	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
203		CAFE LARGO	22	Key Largo (PAED 17)	A	ECOSYSTEMATICS	0.015	AADF	0.003	0.005	0.006	0.010	0.007	3	EXCELLENT	RESTAURANT	SECONDARY	1 INJECTION WELL	POOR	POOR	NO
210		HOLIDAY BY THE SEA CONDOMINIUM	22	Key Largo (PAED 17)	A	ECOSYSTEMATICS	0.005	TMMADF	0.001	0.002	0.002	0.003	0.002	21	GOOD	CONDOMINIUMS	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
208		HOLIDAY INN (KEY LARGO)	22	Key Largo (PAED 17)	A	ECOSYSTEMATICS	0.030	AADF	0.022	0.031	0.032	-0.001	0.000	27	FAIR	132 MOTEL	SECONDARY	6 INJECTION WELLS	POOR	EXCELLENT	NO
202		KAWAMA YACHT CLUB CONDOMINIUM	22	Key Largo (PAED 17)	A	ECOSYSTEMATICS	0.080	MMADF	0.012	0.015	0.016	0.065	0.045	23	GOOD	CONDOMINIUMS	SECONDARY	2 INJECTION WELLS	POOR	EXCELLENT	NO
207		KEY LARGO HARBOR MARINA	22	Key Largo (PAED 17)	A	ECOSYSTEMATICS	0.010	TMMADF	0.001	0.001	0.001	0.009	0.007	1	EXCELLENT	MARINA/REST	SECONDARY	2 INJECTION WELLS	POOR	EXCELLENT	NO
199		KEY LARGO YACHT CLUB & CONDO	22	Key Largo (PAED 17)	A	ECOSYSTEMATICS	0.020	AADF	0.002	0.003	0.004	0.017	0.012	12	GOOD	25 CONDO/MARINA	SECONDARY	2 INJECTION WELLS	POOR	GOOD	MAJOR
200		MARINA DEL MAR (MARR RESORTS)	22	Key Largo (PAED 17)	A	ECOSYSTEMATICS	0.049	TMMADF	0.010	0.017	0.021	-0.002	0.000	16	FAIR	76 MOTEL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
201		MARINA DEL MAR BAYSIDE (SNOOK'S)	22	Key Largo (PAED 17)	A	ECOSYSTEMATICS	0.035	MMADF	0.007	0.009	0.010	0.026	0.017	10	GOOD	56 MOTEL/REST	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
213		MARINER'S CLUB (FORMERLY SUNDAY BAY)	22	Key Largo (PAED 17)	I	SYNAGRO-SOUTHEAST	0.030					0.030	0.023		FAIR	CONDOMINIUMS	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
211		OCEAN DIVERS, INC.	22	Key Largo (PAED 17)	A	ECOSYSTEMATICS	0.0075	TMMADF	0.001	0.002	0.002	0.006	0.004	13	GOOD	DIVE FACILITY W/ REST. & BAR	SECONDARY	2 INJECTION WELLS	POOR	POOR	MINOR
205		PILOT HOUSE RESTAURANT	22	Key Largo (PAED 17)	A	ECOSYSTEMATICS	0.015	TMMADF				0.015	0.011		GOOD	RESTAURANT	SECONDARY	2 INJECTION WELLS	POOR	FAIR	NO
204		PIZZA HUT RESTAURANT, KEY LARGO	22	Key Largo (PAED 17)	A	ECOSYSTEMATICS	0.010	AADF	0.002	0.002	0.003	0.008	0.005	11	GOOD	RESTAURANT	SECONDARY	INJECTION WELL	POOR	POOR	NO

APPENDIX C
EXHIBIT C-2
Summary Information for FDEP Permitted Wastewater Treatment Plants
In Monroe County (Excluding Key West Area)

MAP I.D NO.	MAR FAC. PLAN I.D	FACILITY NAME	STUDY AREA NO.	STUDY AREA NAME	STATUS	WWTP OPERATOR	PERMITTED CAPACITY, MGD	BASIS OF PERMITTED CAPACITY	ANNUAL AVERAGE DAILY FLOW, MGD	3-MONTH MAX ADF, MGD	MAXIMUM MONTH ADF, MGD	EXCESS CAPACITY, MGD	AVAILABLE EXCESS CAPACITY	APPROX. FACILITY AGE, YRS.	GENERAL FACILITY CONDITION	NUMBER/TYPE OF CONNECTIONS SERVED	TREATMENT LEVEL	EFFLUENT DISPOSAL METHOD	REUSE POTENTIAL	POTENTIAL FOR EXPANSION	FDEP NON-COMPLIANCE ISSUES?
206		RAMADA INN KEY LARGO	22	Key Largo (PAED 17)	A	ECOSYSTEMATICS	0.030	MMADF	0.006	0.009	0.010	0.021	0.013	5	EXCELLENT	88 MOTEL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
N/A		WAFFLE HOUSE	22	Key Largo (PAED 17)	A	SYNAGRO-SOUTHEAST	0.003	TMMADF						0	NEW		SECONDARY	3 INJECTION WELLS	POOR	GOOD	NO
209		WALDORF PLAZA SHOPPING CENTER	22	Key Largo (PAED 17)	A	ECOSYSTEMATICS	0.015/0.030	AADF	0.007	0.013	0.015	0.017	0.010	25	FAIR	SHOPPING PLAZA	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
214		CALUSA CAMP RESORT	23	Key Largo (PAED 18)	A	ECOSYSTEMATICS	0.060	AADF	0.011	0.019	0.022	0.041	0.026	20	POOR	475 CAMP SITES & 14 MOTEL RV/TRAILER	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
217		COASTAL WATERWAY TRAILER PARK	23	Key Largo (PAED 18)	A	ECOSYSTEMATICS	0.005	MMADF	0.001	0.001	0.002	0.004	0.002	20	GOOD	RV/TRAILER	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
223		FISH HOUSE RESTAURANT	23	Key Largo (PAED 18)	A	ECOSYSTEMATICS	0.004	TMMADF	0.001	0.001	0.001	0.003	0.002	2	EXCELLENT	RESTAURANT	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
225		FLORIDA BAY CLUB	23	Key Largo (PAED 18)	A	SYNAGRO-SOUTHEAST	0.010	TMMADF	0.003	0.007	0.008	0.003	0.000	<1	NEW	CONDOMINIUMS	BAT/ SECONDARY	2 INJECTION WELLS	POOR	GOOD	MINOR
221		HOWARD JOHNSON'S KEY LARGO	23	Key Largo (PAED 18)	A	ECOSYSTEMATICS	0.015/0.035	TMMADF	0.025	0.031	0.032	0.004	0.000	26	GOOD	100 MOTEL	SECONDARY	2 INJECTION WELLS	POOR	GOOD	NO
224		JOHN PENNEKAMP CORAL REEF STATE PARK	23	Key Largo (PAED 18)	A	H2O UTILITIES	0.014	AADF	0.014	0.027	0.028	-0.013	-0.016	<1	NEW	STATE PARK W/ 47 CAMP SITES	SECONDARY	2 INJECTION WELLS	POOR	POOR	MAJOR
220		KEY LARGO KAMPGROUND & MARINA	23	Key Largo (PAED 18)	A	ECOSYSTEMATICS	0.030	MMADF	0.008	0.012	0.019	0.018	0.011	22	GOOD	170 CAMPSITES	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
219		KEY LARGO QUAY	23	Key Largo (PAED 18)	A	ECOSYSTEMATICS	0.012	MMADF	0.002	0.003	0.004	0.009	0.006		FAIR	RESTAURANT	SECONDARY	1 INJECTION WELL	POOR	POOR	NO
230		KOBLICK MARINE CENTER	23	Key Largo (PAED 18)	A	ECOSYSTEMATICS	0.015	TMMADF	0.001	0.002	0.002	0.013	0.009	7	GOOD	COMMERCIAL	SECONDARY	2 INJECTION WELLS	POOR	FAIR	NO
218		LARGO PARK (FORMERLY GLEN'S TRAILER PARK)	23	Key Largo (PAED 18)	A	ECOSYSTEMATICS	0.020	MMADF	0.004	0.007	0.007	0.013	0.008	23	GOOD	90 RV/TRAILER	SECONDARY	1 INJECTION WELL	POOR	POOR	NO
215		NEWPORT VILLAGE APARTMENTS	23	Key Largo (PAED 18)	A	ECOSYSTEMATICS	0.024	MMADF	0.005	0.006	0.006	0.018	0.012	5	GOOD	APARTMENTS	SECONDARY	3 INJECTION WELLS	POOR	POOR	NO
222		PARADISE PUB	23	Key Largo (PAED 18)	A	ECOSYSTEMATICS	0.0036	TMMADF	0.001	0.001	0.001	0.003	0.002	8	GOOD	BAR/REST.	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
226		PINK PLAZA (NORTH KEY LARGO PLAZA)	23	Key Largo (PAED 18)	A	ECOSYSTEMATICS	0.020	AADF	0.007	0.018	0.033	0.002	0.000	10	GOOD	SHOPPING PLAZA	SECONDARY	3 INJECTION WELLS	POOR	POOR	NO
227		SANCTUARY CONDOMINIUM	23	Key Largo (PAED 18)	A	ECOSYSTEMATICS	0.010	MMADF	0.001	0.001	0.001	0.009	0.007	~20	GOOD	CONDOMINIUMS	SECONDARY	2 INJECTION WELLS	POOR	POOR	MAJOR
216		TRADEWINDS/K-MART SHOPPING CENTER	23	Key Largo (PAED 18)	A	ECOSYSTEMATICS	0.020	MMADF	0.010	0.016	0.020	0.004	0.000	10	GOOD	SHOPPING PLAZA	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
238		DANNY'S WATERWAY RESTAURANT	24	Key Largo (PAED 19/20)	A	ECOSYSTEMATICS	0.008	TMMADF	0.001	0.003	0.005	0.005	0.000	1	EXCELLENT	RESTAURANT	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
242		FLORIDA KEYS RV PARK	24	Key Largo (PAED 19/20)	A	ECOSYSTEMATICS	0.015	TMMADF	0.004	0.012	0.014	0.003	0.000	25	NEW	139 RV/TRAILER	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
231		HOBO'S MARINA	24	Key Largo (PAED 19/20)	A	ECOSYSTEMATICS	0.0075	AADF	0.001	0.001	0.001	0.007	0.005	6	GOOD	MARINA	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
228		ITALIAN FISHERMAN RESTAURANT	24	Key Largo (PAED 19/20)	A	ECOSYSTEMATICS	0.015	TMMADF	0.002	0.003	0.004	0.012	0.008	13	FAIR	RESTAURANT	IQ/PART II	SUBSURFACE IRRIGATION & 4 INJECTION WELLS	GOOD	GOOD	MAJOR
232		KELLY'S MOTEL & TRAILER PARK	24	Key Largo (PAED 19/20)	A	ECOSYSTEMATICS	0.010	AADF	0.003	0.004	0.005	0.006	0.004	5	GOOD	26 MOTEL & RV	SECONDARY	2 INJECTION WELLS	POOR	POOR	MINOR
229		KEY LARGO BEACH RESORT (MARRIOTT)	24	Key Largo (PAED 19/20)	A	ECOSYSTEMATICS	0.050		0.030	0.037	0.039	0.013	0.001	4	GOOD	153 MOTEL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
240		KEY LARGO ELEMENTARY SCHOOL	24	Key Largo (PAED 19/20)	A	ECOSYSTEMATICS	0.025	TMMADF	0.008	0.014	0.015	0.011	0.005	25	GOOD	SCHOOL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
241		LAKE SURPRISE II CONDO.	24	Key Largo (PAED 19/20)	A	ECOSYSTEMATICS	0.0065	TMMADF	0.003	0.005	0.005	0.002	0.000	7	GOOD	CONDOMINIUMS	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
234		MOONBAY CONDOMINIUM	24	Key Largo (PAED 19/20)	A	ECOSYSTEMATICS	0.026	AADF	0.007	0.011	0.012	0.015	0.009	20	GOOD	84 CONDO	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
233		SENOR FRIJOLES RESTAURANT	24	Key Largo (PAED 19/20)	A	ECOSYSTEMATICS	0.0046	MMADF	0.001	0.002	0.003	0.003	0.001	10	GOOD	RESTAURANT	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
235		TAMARIND BAY CLUB, INC.	24	Key Largo (PAED 19/20)	A	ANTI-POLLUTION ASSOC.	0.015	MMADF	0.004	0.006	0.007	0.009	0.005	15	GOOD	CONDOMINIUMS	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
239		WINN DIXIE (KEY LARGO)	24	Key Largo (PAED 19/20)	A	ECOSYSTEMATICS	0.005	MMADF	0.003	0.004	0.005	0.001	0.000	9	GOOD	COMMERCIAL	SECONDARY	3 INJECTION WELLS	POOR	EXCELLENT	NO
237		ANCHORAGE RESORT & YACHT CLUB	25	Key Largo (PAED 22)	A	ECOSYSTEMATICS	0.010	TMMADF	0.004	0.005	0.005	0.005	0.003	23	GOOD	30 MOTEL	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
244		BAREFOOT CAY (FORMERLY KEY LARGO MARINA)	25	Key Largo (PAED 22)	A	ECOSYSTEMATICS	0.045	MMADF	0.003	0.005	0.005	0.040	0.029	5	GOOD	30 HOUSEBOATS	SECONDARY	2 INJECTION WELLS	POOR	POOR	NO
243		CROSS KEY INC.	25	Key Largo (PAED 22)	NB	(NOT STARTED)	0.005	TMMADF				0.005	0.004	9		MARINA/REST	SECONDARY	3 INJECTION WELLS	POOR	POOR	NO
236		GILBERT'S HOTEL AND MARINA	25	Key Largo (PAED 22)	A	ECOSYSTEMATICS	0.010	AADF	0.003	0.005	0.009	0.005	0.003	14	FAIR	32 HOTEL & MARINA	BAT	INJECTION WELLS			NO
245		POINT LAURA	25	Key Largo (PAED 22)	NB	(NOT STARTED)	0.015					0.015	0.011			RV/TRAILER	SECONDARY	INJECTION WELLS			NO
246		OCEAN REEF CLUB	27	Ocean Reef Club	A	N. KEY LARGO UTILITY CO	0.550	TMMADF	0.252	0.299	0.323	0.251	0.251	12/1	GOOD/EX	750 SF, 850 MF, 170 MOTEL & 400 ERCS COM.	SECONDARY	4 INJECTION WELLS	POOR	GOOD	MINOR

Notes:

1. Status designations:
   A = Active
   I = Inactive
   NB = Not built
2. Designations for basis of permitted capacity are given only for facilities with capacities greater than 0.020 MGD and are as follows:
   MMADF = maximum monthly average daily flow
   TMMADF = 3-month maximum average daily flow
   AADF = average annual daily flow
   POL = potential organic loading
3. Excess capacity is calculated as the difference between permitted capacity and TMMADF.
4. Available excess capacity is calculated as the difference between 75 % of the permitted capacity and TMMADF for all WWTPs with permitted capacities of 0.100 MGD or less. For WTPs with permitted capacities greater than 0.100 MGD, available excess capacity is calculated as the difference between the permitted capacity and TMMADF.
5. Reuse potential for all facilities with capacities less than 0.020 MGD is assumed to be "poor". These facilities would be limited to subsurface drip irrigation systems, provided application areas are available.
6. Expansion potential for all facilities with capacities less than 0.020 MGD is assumed to be "poor". Designations for expansion potential are as follows:
   Poor = less than 50% increase in WWTP footprint feasible
   Fair = up to 100% increase in WWTP footprint feasible
   Good = up to 200% increase in WWTP footprint feasible
   Excellent = more than 200% increase in WWTP footprint feasible
7. Where two ages or conditions are shown, one represents original plant and the other represents the most recent expansion.
8. Under" Treatment Level", IQ Part II or III indicates irrigation quality effluent meeting requirements of Part II or III, Rule 62-610.
9. Operator Information: All facilities formerly operated by Anti-Pollution Associates, Davis Water Analysis, AKH and Ecosystematics are now operated by Synagro-Southeast, except for John Pennenkamp SP, Kelly's, Ocean Harbor Club, Hobo's and Dino's, which are operated by H2O Utility Services

APPENDIX C
EXHIBIT C-3
Estimated 1998 Wastewater Flows

No.	Study Area	Total Residential Flow mgd	EDUs	gpd/EDU	Total Nonresidential Flow mgd	EDUs	Total Study Area Flow[5] mgd	EDUs
1	Stock Island[4]	0.2811	1,668	168	0.1408	838	0.4219	2,506
2	Boca Chica,Rockland,Big Coppitt,Geiger[1]	0.1795	1,208	149	0.1773	1,190	0.3568	2,398
3	Bay Point	0.0421	352	119	0.0067	56	0.0488	408
4	Lower Sugarloaf	0.1088	600	181	0.0104	57	0.1192	657
5	Upper Sugarloaf	0.0363	233	156	0.0270	173	0.0633	406
6	Cudjoe Key	0.1733	1,577	110	0.0087	79	0.1820	1,656
7	Summerland Key	0.1066	717	149	0.0109	73	0.1175	790
8	Big Torch/ Middle Torch	0.0112	56	200	0.0000	0	0.0112	56
9	Ramrod Key	0.0601	413	146	0.0069	47	0.0670	460
10	Little Torch	0.0933	690	135	0.0038	28	0.0971	718
11	Big Pine Key[2]	0.3431	2,600	132	0.0922	698	0.4353	3,298
12	Bahia Honda Key	0.0000	0	160	0.0603	377	0.0603	377
13	Marathon Primary Service Area[3]	0.7866	4,979	160	0.6180	3,863	1.4046	8,842
14	Marathon Secondary Service Area	0.1360	764	172	0.1159	674	0.2519	1,438
15	Long Key/ Layton	0.0229	197	116	0.0608	524	0.0837	721
16	Lower Matecumbe Key	0.1427	943	151	0.0350	232	0.1777	1,175
17	Upper Matecumbe Key	0.1729	1,034	167	0.1895	1,135	0.3624	2,169
18	Windley Key	0.0062	41	150	0.1201	801	0.1263	842
19	Plantation Key	0.4644	2,943	158	0.1681	1,064	0.6325	4,007
20	Tavernier (PAED 15)	0.2320	1,858	125	0.0720	576	0.3040	2,434
21	Rock Harbor (PAED 16)	0.1379	1,201	115	0.0504	438	0.1883	1,639
22	Key Largo (PAED 17)	0.2857	1,840	155	0.1971	1,272	0.4828	3,112
23	Key Largo (PAED 18)	0.2916	2,175	134	0.0870	649	0.3786	2,824
24	Key Largo (PAED 19/20)	0.2601	1,818	143	0.1764	1,234	0.4365	3,052
25	Key Largo (PAED 22)	0.0049	30	160	0.0090	56	0.0139	86
26	Key Largo (PAED 21)	0.0176	110	160	0.0192	120	0.0368	230
27	Ocean Reef Club	0.2016	1,800	112	0.0840	750	0.2856	2,550
	TOTAL (Average for gpd/EDU)	4.5985	31,847	145	2.5475	17,004	7.1460	48,851

[1]Includes 0.105 mgd (705 EDUs) nonresidential flows for NAS Boca Chica.

[2]Residential flows for Big Pine Key (Study Area 11) include 20,000 gpd for homes not connected to FKAA water system (approximately 150 homes on Big Pine Key and No Name Key @ 132 gpd per home.

[3]Total flows indicated for the Marathon Primary Service Area (Study Area 13, 1.40 mgd) include wastewater flows for the City of Key Colony Beach (0.186 mgd total, with 1,290 total EDUs).

[4]Includes 0.256 mgd (1,524 EDUs) from KW Resort and Key Haven Utilities

[5]Excludes small contribution from live-aboard boats. See Table 3-7 in Technical Memorandum No. 3 for live-aboard flows.

APPENDIX C
EXHIBIT C-4
Estimated 2008 Wastewater Flows

No.	Study Area	Total Residential Flow mgd	EDUs	gpd/EDU	Total Nonresidential Flow mgd	EDUs	Total Study Area Flow[5] mgd	EDUs
1	Stock Island[4]	0.2976	1,772	168	0.1444	860	0.4421	2,631
2	Boca Chica,Rockland,Big Coppitt,Geiger[1]	0.1954	1,311	149	0.1806	1,212	0.3760	2,523
3	Bay Point	0.0440	370	119	0.0073	62	0.0513	431
4	Lower Sugarloaf	0.1397	772	181	0.0165	91	0.1561	863
5	Upper Sugarloaf	0.0415	266	156	0.0282	180	0.0696	446
6	Cudjoe Key	0.2065	1,878	110	0.0193	175	0.2258	2,053
7	Summerland Key	0.1298	871	149	0.0163	110	0.1461	981
8	Big Torch/ Middle Torch	0.0163	81	200	0.0009	4	0.0171	86
9	Ramrod Key	0.0821	562	146	0.0122	83	0.0942	645
10	Little Torch	0.1034	766	135	0.0065	48	0.1098	814
11	Big Pine Key[2]	0.3432	2,600	132	0.0922	698	0.4354	3,298
12	Bahia Honda Key	0.0000	0	160	0.0603	377	0.0603	377
13	Marathon Primary Service Area[3]	0.8354	5,221	160	0.6265	3,916	1.4620	9,137
14	Marathon Secondary Service Area	0.2008	1,167	172	0.1206	701	0.3214	1,869
15	Long Key/ Layton	0.0233	201	116	0.0609	525	0.0843	726
16	Lower Matecumbe Key	0.1578	1,045	151	0.0377	250	0.1955	1,295
17	Upper Matecumbe Key	0.1830	1,096	167	0.1917	1,148	0.3747	2,244
18	Windley Key	0.0065	43	150	0.1202	801	0.1266	844
19	Plantation Key	0.5122	3,241	158	0.1786	1,131	0.6908	4,372
20	Tavernier (PAED 15)	0.2403	1,922	125	0.0743	594	0.3145	2,516
21	Rock Harbor (PAED 16)	0.1434	1,247	115	0.0520	452	0.1954	1,699
22	Key Largo (PAED 17)	0.3139	2,025	155	0.2065	1,332	0.5204	3,358
23	Key Largo (PAED 18)	0.2987	2,229	134	0.0886	661	0.3873	2,890
24	Key Largo (PAED 19/20)	0.2610	1,825	143	0.1791	1,253	0.4401	3,078
25	Key Largo (PAED 22)	0.0048	30	160	0.0090	56	0.0138	86
26	Key Largo (PAED 21)	0.0198	124	160	0.0197	123	0.0395	247
27	Ocean Reef Club	0.2181	1,947	112	0.0840	750	0.3021	2,697
	TOTAL (Average for gpd/EDU)	5.0183	34,613	145	2.6341	17,594	7.6524	52,207

[1]Includes 0.105 mgd (705 EDUs) nonresidential flows for NAS Boca Chica.

[2]Residential flows for Big Pine Key (Study Area 11) include 20,000 gpd for homes not connected to FKAA water system (approximately 150 homes on Big Pine Key and No Name Key @ 132 gpd per home.

[3]Total flows indicated for the Marathon Primary Service Area (Study Area 13, 1.45 mgd) include wastewater flows for the City of Key Colony Beach (0.199 mgd total, with 1,380 total EDUs).

[4]Includes 0.269 mgd (1,600 EDUs) from KW Resort and Key Haven Utilities

[5]Excludes small contribution from live-aboard boats. See Table 3-7 in Technical Memorandum No. 3 for live-aboard flows.

APPENDIX C
EXHIBIT C-5
Estimated 2018 Wastewater Flows

No.	Study Area	Total Residential Flow			Total Nonresidential Flow		Total Study Area Flow[5]	
		mgd	EDUs	gpd/EDU	mgd	EDUs	mgd	EDUs
1	Stock Island[4]	0.3150	1,875	168	0.1481	882	0.4631	2,757
2	Boca Chica,Rockland,Big Coppitt,Geiger[1]	0.2108	1,415	149	0.1839	1,234	0.3947	2,649
3	Bay Point	0.0461	387	119	0.0079	67	0.0540	454
4	Lower Sugarloaf	0.1708	943	181	0.0225	124	0.1933	1,068
5	Upper Sugarloaf	0.0466	299	156	0.0293	188	0.0759	487
6	Cudjoe Key	0.2393	2,175	110	0.0298	271	0.2691	2,446
7	Summerland Key	0.1527	1,025	149	0.0218	146	0.1745	1,171
8	Big Torch/ Middle Torch	0.0213	107	200	0.0018	9	0.0231	115
9	Ramrod Key	0.1038	711	146	0.0174	119	0.1212	830
10	Little Torch	0.1136	842	135	0.0091	68	0.1227	909
11	Big Pine Key[2]	0.3432	2,600	132	0.0922	698	0.4354	3,298
12	Bahia Honda Key	0.0000	0	160	0.0603	377	0.0603	377
13	Marathon Primary Service Area[3]	0.8742	5,464	160	0.6351	3,969	1.5093	9,433
14	Marathon Secondary Service Area	0.2238	1,301	172	0.1254	729	0.3492	2,030
15	Long Key/ Layton	0.0238	205	116	0.0611	527	0.0849	732
16	Lower Matecumbe Key	0.1732	1,147	151	0.0404	267	0.2136	1,415
17	Upper Matecumbe Key	0.1934	1,158	167	0.1939	1,161	0.3873	2,319
18	Windley Key	0.0068	45	150	0.1202	802	0.1270	847
19	Plantation Key	0.5593	3,540	158	0.1891	1,197	0.7485	4,737
20	Tavernier (PAED 15)	0.2483	1,986	125	0.0765	612	0.3248	2,598
21	Rock Harbor (PAED 16)	0.1487	1,293	115	0.0536	467	0.2024	1,760
22	Key Largo (PAED 17)	0.3552	2,292	155	0.2159	1,393	0.5711	3,685
23	Key Largo (PAED 18)	0.3170	2,365	134	0.0934	697	0.4104	3,062
24	Key Largo (PAED 19/20)	0.2725	1,905	143	0.1819	1,272	0.4544	3,178
25	Key Largo (PAED 22)	0.0048	30	160	0.0090	56	0.0138	86
26	Key Largo (PAED 21)	0.0221	138	160	0.0202	126	0.0423	264
27	Ocean Reef Club	0.2345	2,094	112	0.0840	750	0.3185	2,844
	TOTAL (Average for gpd/EDU)	5.4208	37,343	145	2.7239	18,208	8.1447	55,551

[1]Includes 0.105 mgd (705 EDUs) nonresidential flows for NAS Boca Chica.

[2]Residential flows for Big Pine Key (Study Area 11) Include 20,000 gpd for homes not connected to FKAA water system (approximately 150 homes on Big Pine Key and No Name Key @ 132 gpd per home.

[3]Total flows indicated for the Marathon Primary Service Area (Study Area 13, 1.47 mgd) include wastewater flows for the City of Key Colony Beach (0.212 mgd total, with 1,470 total EDUs).

[4]Includes 0.282 mgd (1,677 EDUs) from KW Resort and Key Haven Utilities

[5]Excludes small contribution from live-aboard boats. See Table 3-7 in Technical Memorandum No. 3 for live-aboard flows.

APPENDIX C
EXHIBIT C-6
Estimated Distribution of Wastewater Flow by Treatment Methods

		Onsite Systems							
		ATU		Septic		Sub-Std. Septic		Cesspool	
No.	Study Area	No.	Flow, mgd	No.	Flow, mgd	No.	Flow, mgd	No.	Flow, mgd
1	Stock Island	5	0.0012	423	0.1045	18	0.0044	27	0.0067
2	Boca Chica	18	0.0044	915	0.2248	43	0.0105	64	0.0157
3	Bay Point	7	0.0013	168	0.0322	23	0.0045	35	0.0067
4	Lower Sugarloaf	38	0.0087	417	0.0957	1	0.0003	2	0.0005
5	Upper Sugarloaf	13	0.0019	205	0.0298	10	0.0015	15	0.0022
6	Cudjoe Key	137	0.0213	669	0.1042	17	0.0026	25	0.0039
7	Summerland Key	34	0.0057	628	0.1056	10	0.0017	15	0.0025
8	Big Torch/Middle Torch Key	0	0.0000	49	0.0099	3	0.0005	4	0.0008
9	Ramrod Key	110	0.0174	287	0.0455	5	0.0008	8	0.0013
10	Little Torch Key	18	0.0027	536	0.0812	27	0.0040	40	0.0061
11	Big Pine Key	158	0.0219	2,198	0.3042	157	0.0217	235	0.0325
12	Bahia Honda/Ohio Key	0	0.0000	5	0.0093	0	0.0000	0	0.0000
13	Marathon Primary	21	0.0051	1,702	0.4100	853	0.2054	1,279	0.3081
14	Marathon Secondary	9	0.0022	684	0.1688	16	0.0039	24	0.0059
15	Long Key/Layton	2	0.0002	149	0.0136	4	0.0004	6	0.0005
16	Lower Matecumbe	0	0.0000	722	0.1471	27	0.0054	40	0.0082
17	Upper Matecumbe	11	0.0051	394	0.1829	40	0.0186	60	0.0278
18	Windley Key	0	0.0000	19	0.0530	1	0.0037	2	0.0056
19	Plantation Key	1	0.0002	1,832	0.4467	117	0.0286	176	0.0429
20	Tavernier, PAED 15	2	0.0005	722	0.1945	53	0.0144	80	0.0215
21	Rock Harbor, PAED 16	0	0.0000	829	0.0493	40	0.0024	60	0.0036
22	PAED 17	11	0.0033	1,188	0.3614	51	0.0156	77	0.0234
23	PAED 18	21	0.0029	1,545	0.2100	214	0.0291	321	0.0436
24	PAED 19 & 20	15	0.0037	1,209	0.2997	107	0.0264	160	0.0397
25	PAED 22	0	0.0000	0	0.0000	0	0.0000	0	0.0000
26	PAED 21	6	0.0027	51	0.0228	10	0.0045	15	0.0067
27	Ocean Reef Club	2	0.0003	256	0.0333	0	0.0000	0	0.0000
	TOTALS	639	0.1129	17,802	3.7401	1,847	0.4110	2,770	0.6165

APPENDIX C
EXHIBIT C-6 (continued)
Estimated Distribution of Wastewater Flow by Treatment Methods

No.	Study Area	Total Onsite		Total Unknown Systems**		FDEP-Permitted WWTPs		Live-Aboards		Total Wastewater
		No.	Flow, mgd	No.	Flow, mgd	No.	Flow, mgd	No.	Flow, mgd	Flow, mgd
1	Stock Island	473	0.1169			10	0.3050	171	0.0043	0.4262
2	Boca Chica*	1040	0.2554			2	0.2450	24	0.0006	0.3611
3	Bay Point	233	0.0447			1	0.0040	15	0.0004	0.0491
4	Lower Sugarloaf	458	0.1052			1	0.0140	4	0.0001	0.1193
5	Upper Sugarloaf	243	0.0353			4	0.0280	9	0.0002	0.0635
6	Cudjoe Key	848	0.1320			1	0.0500	0	0.0000	0.1820
7	Summerland Key	687	0.1155			1	0.0020	13	0.0003	0.1178
8	Big Torch/Middle Torch Key	56	0.0112			0	0.0000	0	0.0000	0.0112
9	Ramrod Key	410	0.0650			1	0.0020	0	0.0000	0.0670
10	Little Torch Key	621	0.0941			1	0.0030	15	0.0004	0.0974
11	Big Pine Key	2748	0.3803			11	0.0550	34	0.0009	0.4362
12	Bahia Honda/Ohio Key	5	0.0093			3	0.0510	33	0.0008	0.0611
13	Marathon Primary	3855	0.9286			68	0.4760	418	0.0105	1.4151
14	Marathon Secondary	733	0.1809			3	0.0710	14	0.0004	0.2523
15	Long Key/Layton	161	0.0147			7	0.0690	25	0.0006	0.0843
16	Lower Matecumbe	789	0.1607			4	0.0170	22	0.0006	0.1783
17	Upper Matecumbe	505	0.2344			28	0.1280	111	0.0028	0.3652
18	Windley Key	22	0.0622			10	0.0640	72	0.0018	0.1280
19	Plantation Key	2126	0.5185			18	0.1140	132	0.0033	0.6358
20	Tavernier, PAED 15	857	0.2309			8	0.0730	58	0.0015	0.3054
21	Rock Harbor, PAED 16	929	0.0553			12	0.1330	179	0.0045	0.1928
22	PAED 17	1327	0.4038			15	0.0790	82	0.0021	0.4849
23	PAED 18	2101	0.2856			15	0.0930	38	0.0010	0.3796
24	PAED 19 & 20	1491	0.3695			12	0.0670	42	0.0011	0.4376
25	PAED 22	0	0.0000			6	0.0100	4	0.0001	0.0101
26	PAED 21	82	0.0367			0	0.0000	4	0.0001	0.0368
27	Ocean Reef Club	258	0.0336			1	0.2520	70	0.0018	0.2874
	TOTALS	23,058	4.8805			243	2.4050	1,589	0.0397	7.32

* FDEP flow records for NAS Boca Chica WWTP (0.245 mgd) reflect high infiltration and inflow (I/I), which has been substantially corrected. The I/I is estimated as plant flow prior to 1998 (0.245 mgd) less average water use (0.105 mgd).

This I/I (0.140 mgd was subtracted from the calculated total wastewater flow for Study Area 2.

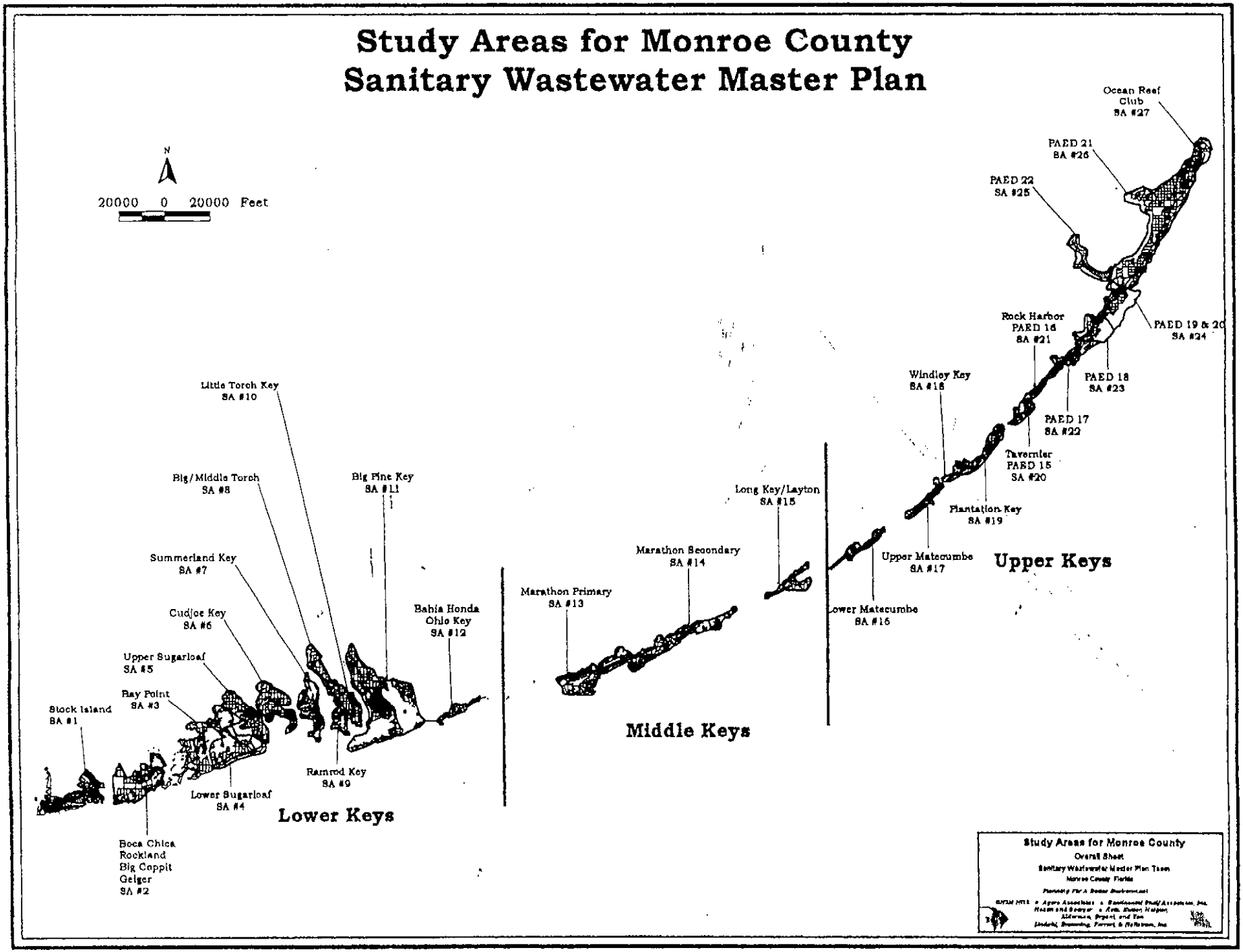
** The unknown systems for each study area are included in the numbers of onsite treatment systems in preceding columns

Appendix D

EXHIBIT D-1

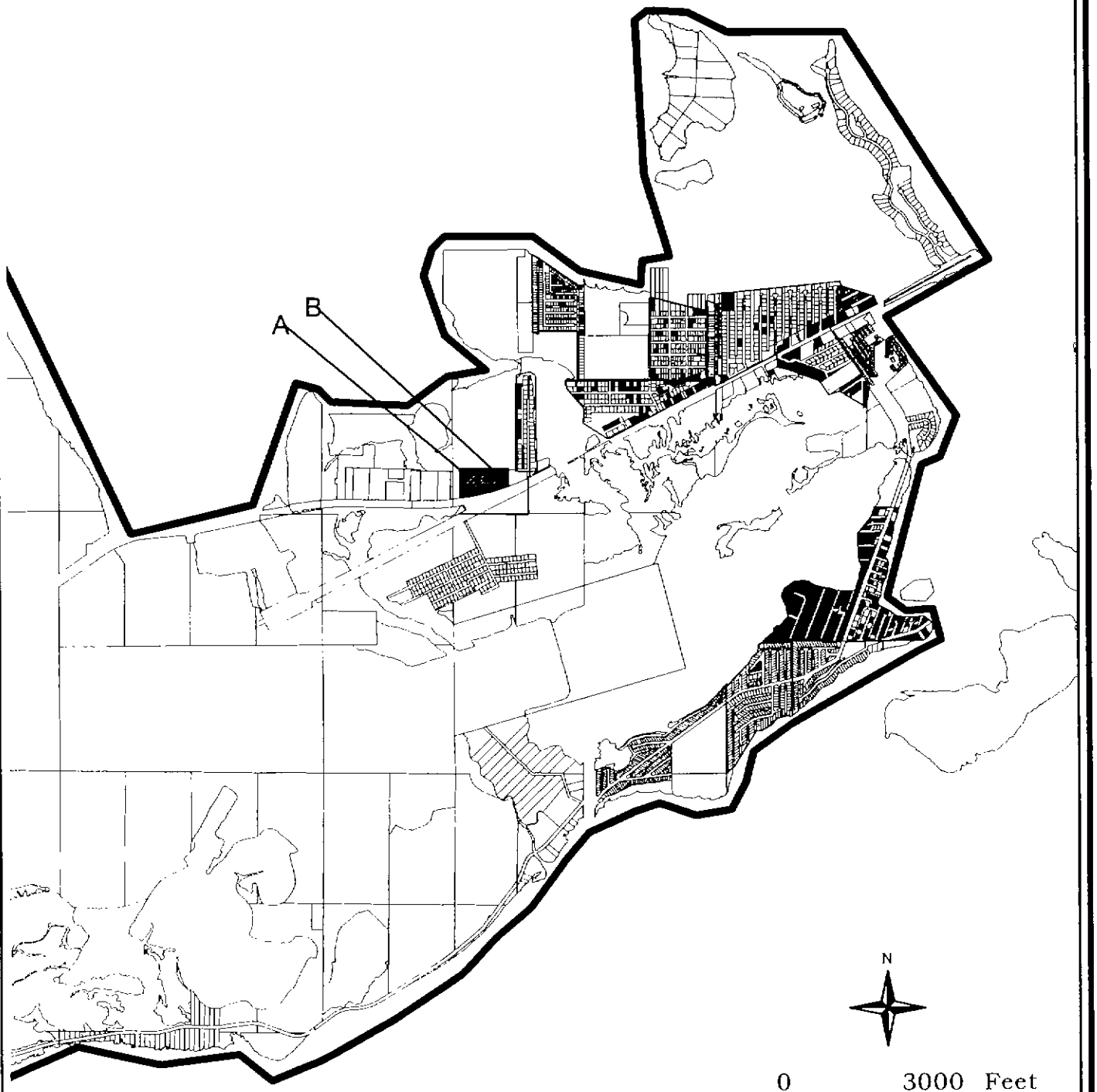
Potential Wastewater Treatment Plant Sites

Study Areas for Monroe County
Sanitary Wastewater Master Plan



Potential WWTP Sites

Boca Chica
(S.A. 2)



Legend

- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

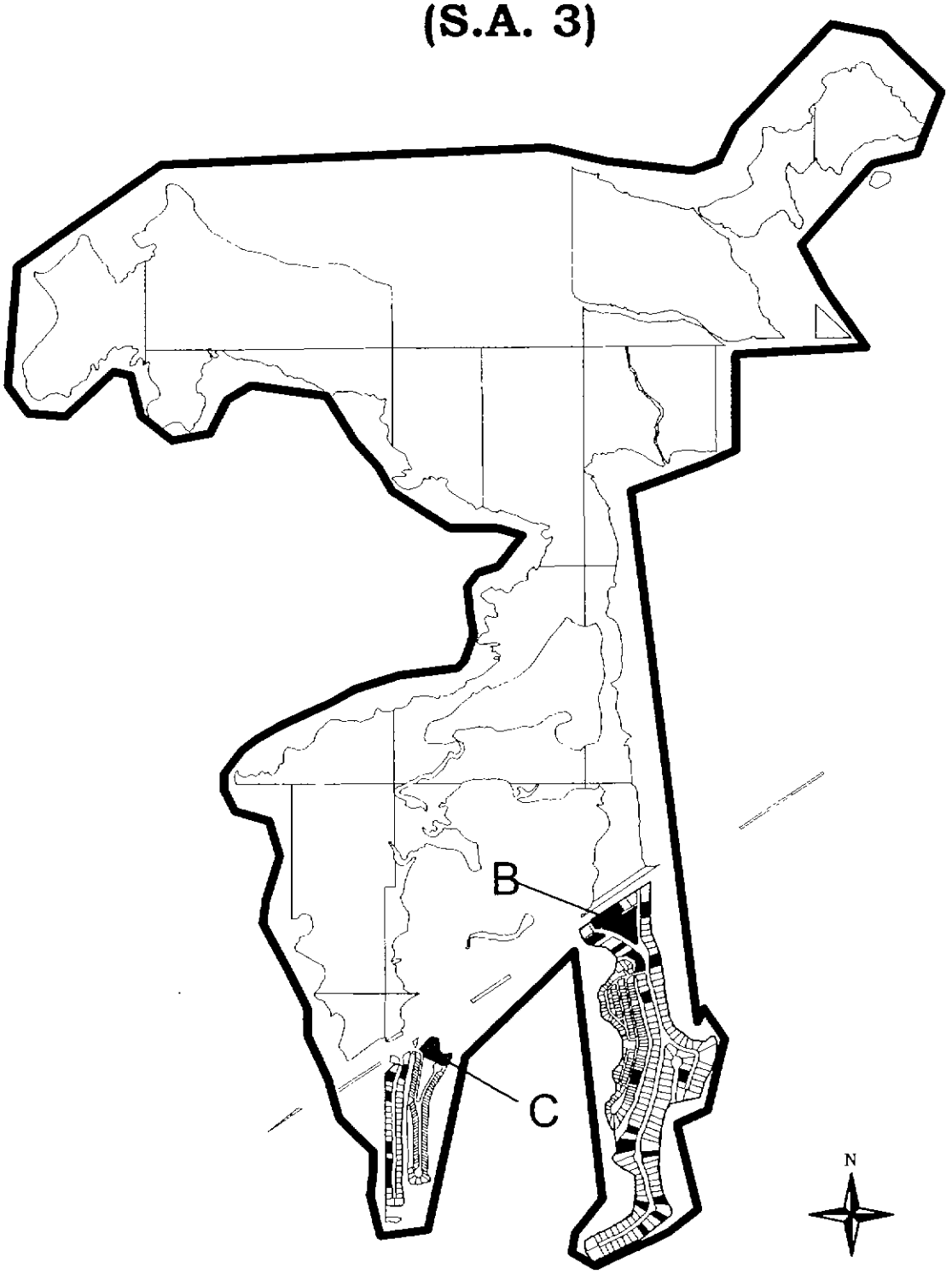
June 2000

Potential WWTP Sites
Boca Chica - Study Area 2
Sanitary Wastewater Master Plan Team
Monroe County, Florida
Planning For A Better Environment

Potential WWTP Sites

Bay Point

(S.A. 3)



Legend

- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

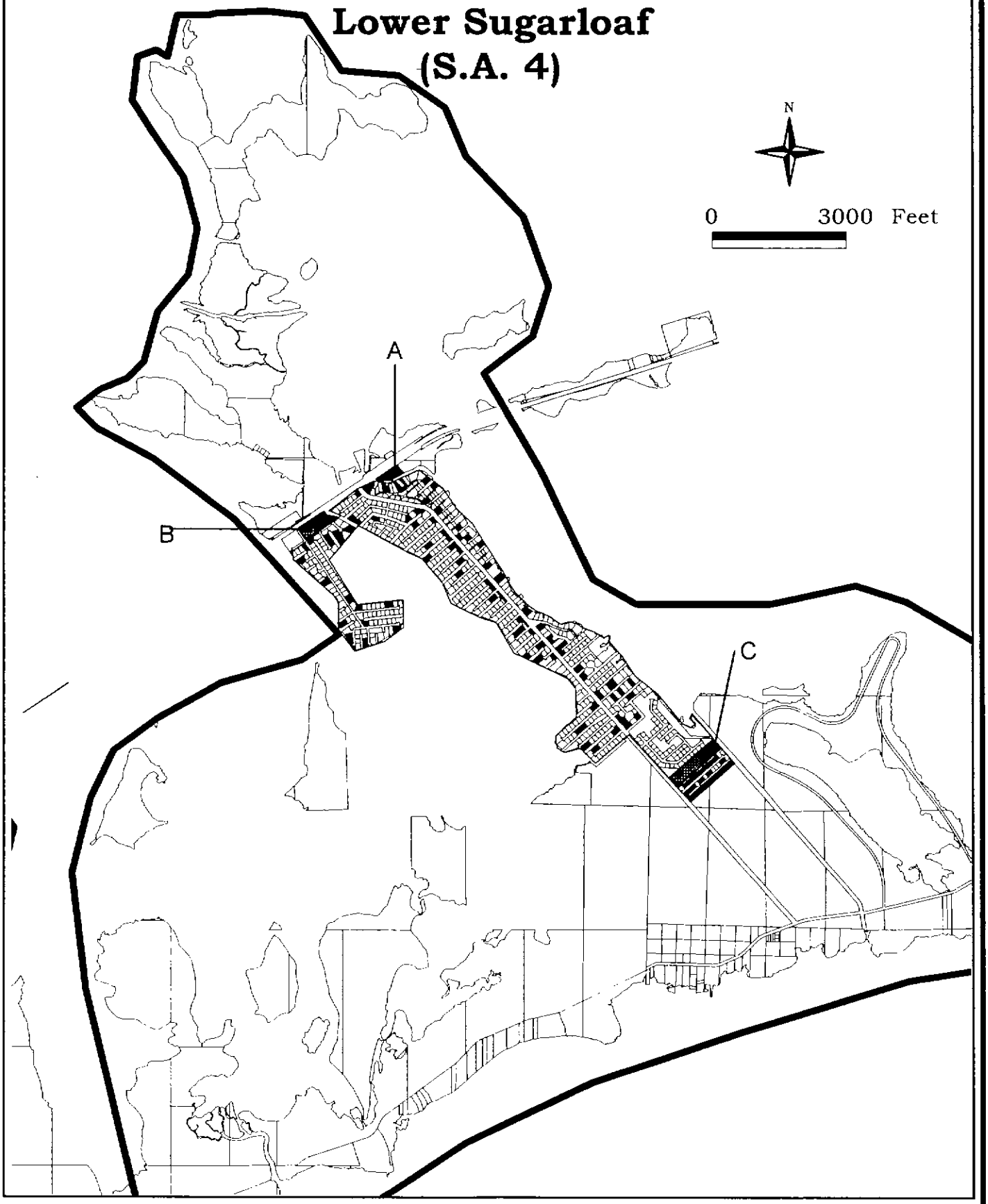
June 2000

Potential WWTP Sites
Bay Point - Study Area 3
Sanitary Wastewater Master Plan Team
Monroe County, Florida
Planning For A Better Environment
CH2M HILL • Ayres Associates • Contoocook Shelf Assessments, Inc.
Keith and Schnars • Kerr, Eubler, Vaughn, Alderman, Bryant, and Tee
Landahl, Brownlee, Ferrero, & Nordstrom, Inc.

Potential WWTP Sites

Lower Sugarloaf

(S.A. 4)



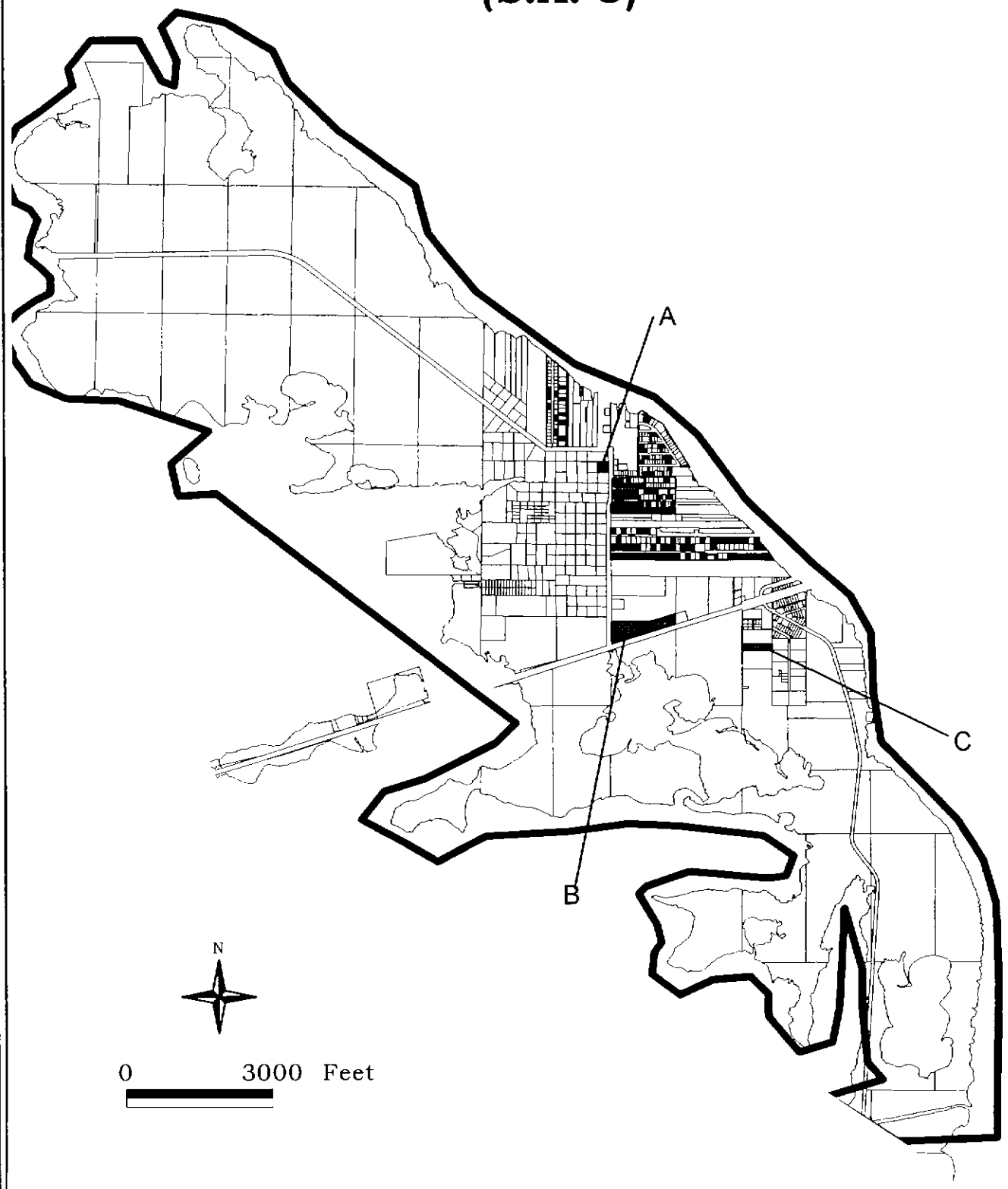
Legend

- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

June 2000

Potential WWTP Sites
Lower Sugarloaf - Study Area 4
Sanitary Wastewater Master Plan Team
Monroe County, Florida

Potential WWTP Sites
Upper Sugarloaf
(S.A. 5)



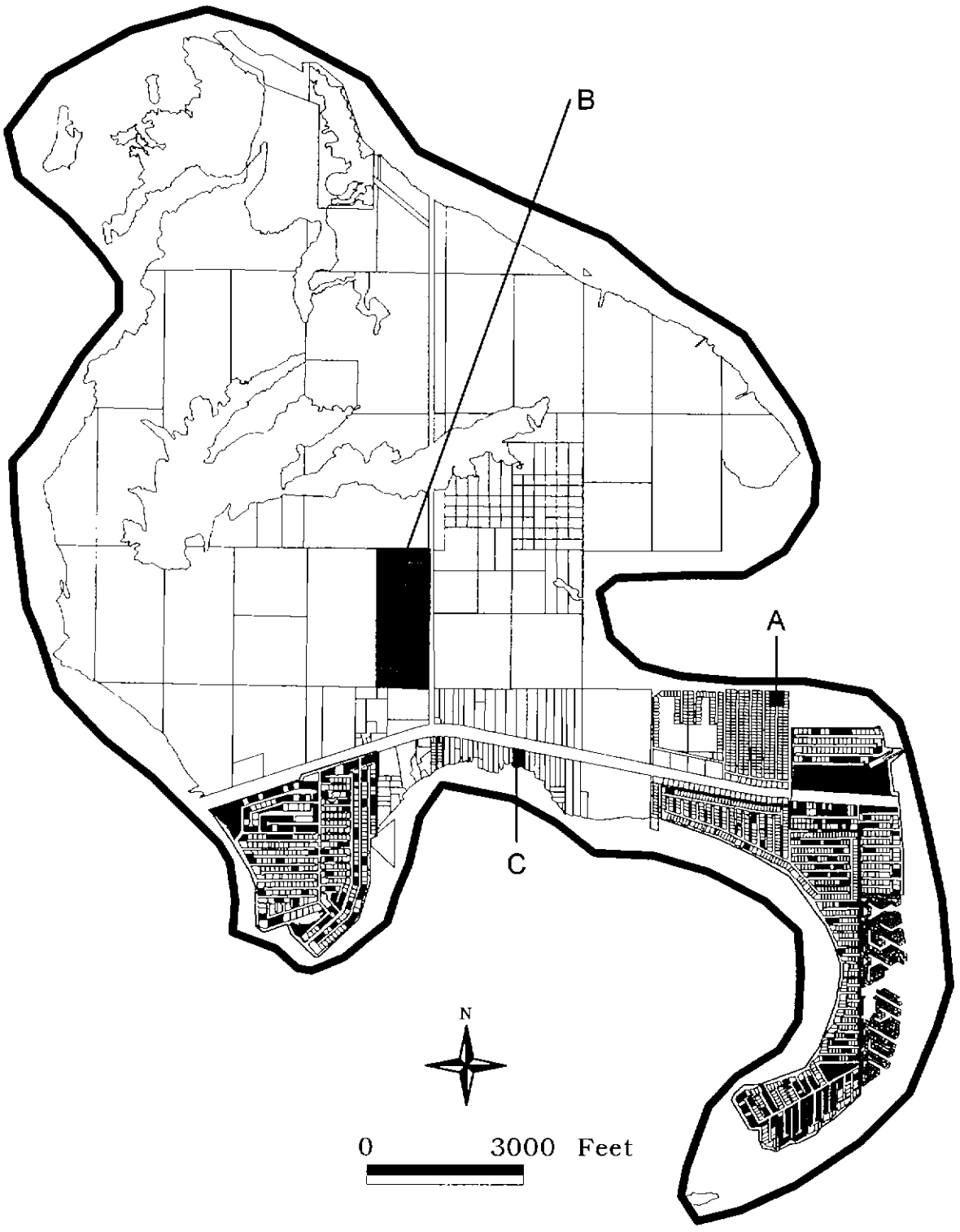
Legend

- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

June 2000

Potential WWTP Sites
Upper Sugarloaf - Study Area 5
Sanitary Wastewater Master Plan Team
Monroe County, Florida
Planning For A Better Environment

Potential WWTP Sites
Cudjoe Key
(S.A. 6)



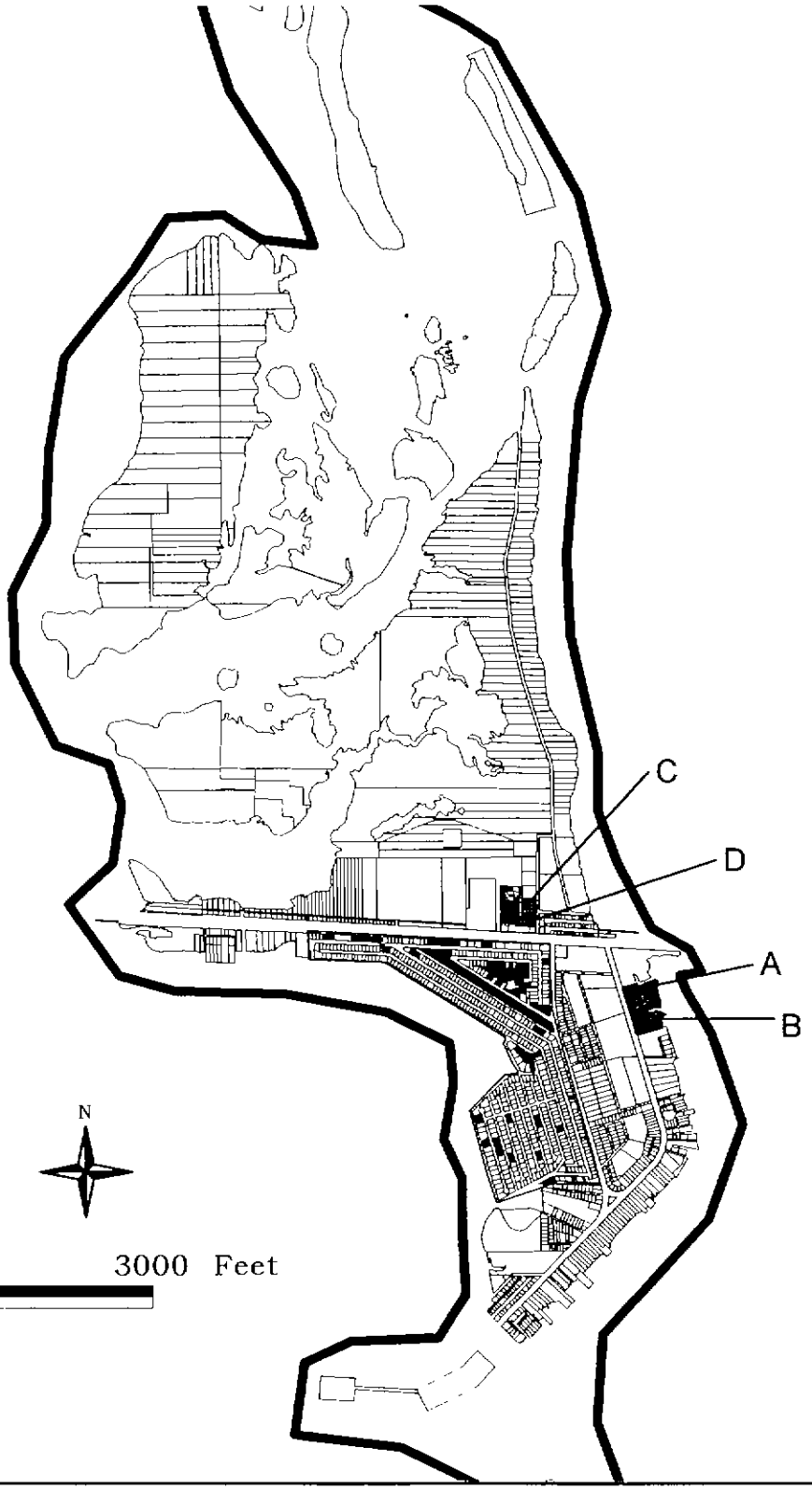
Legend

- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

Potential WWTP Sites
Cudjoe Key - Study Area 6
Sanitary Wastewater Master Plan Team
Monroe County, Florida

June 2000

Potential WWTP Sites
Summerland Key
(S.A. 7)



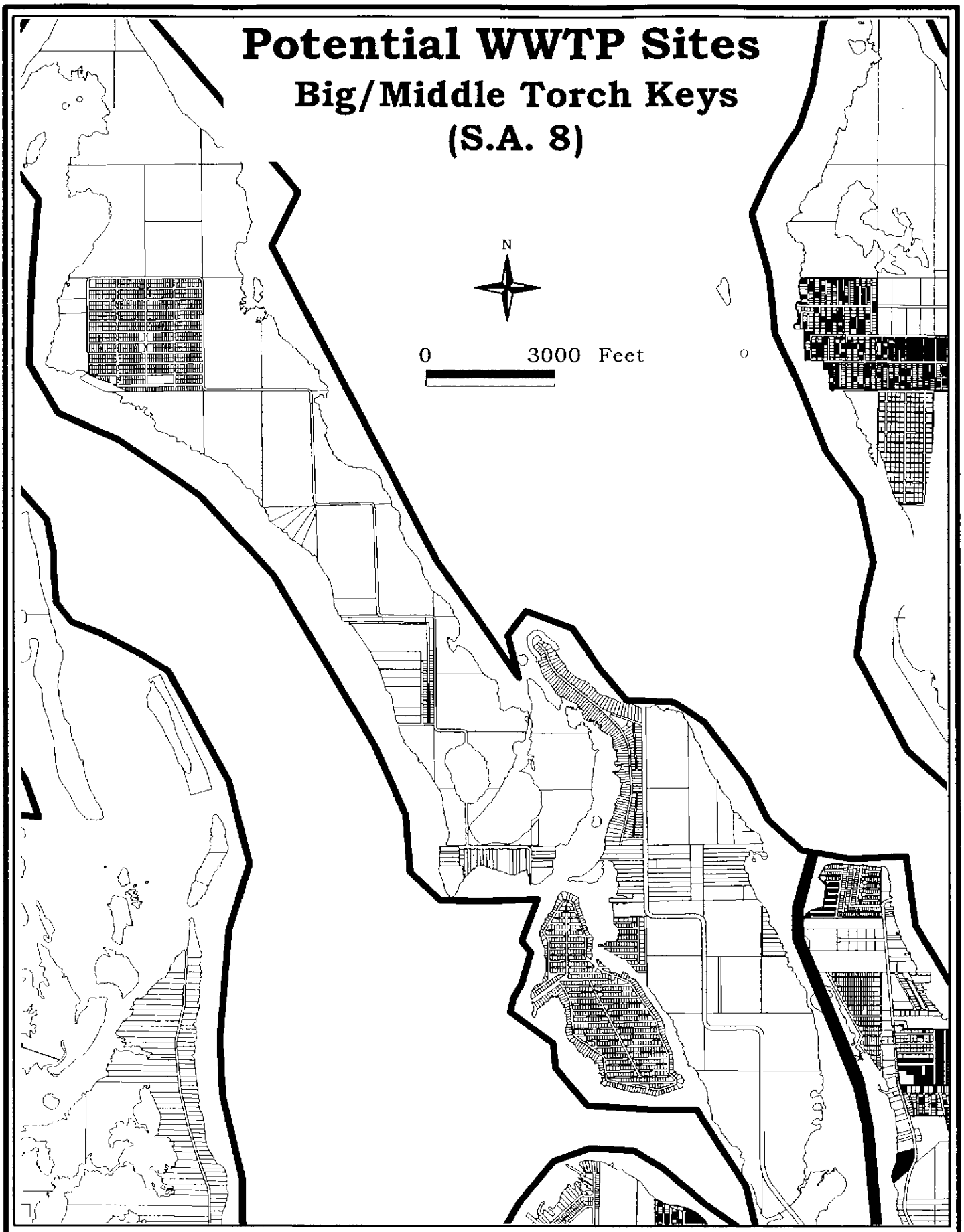
Legend

- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

Potential WWTP Sites
Summerland Key - Study Area 7
Sanitary Wastewater Master Plan Team
Monroe County, Florida
Planning For A Better Environment

June 2000

Potential WWTP Sites
Big/Middle Torch Keys
(S.A. 8)



Legend

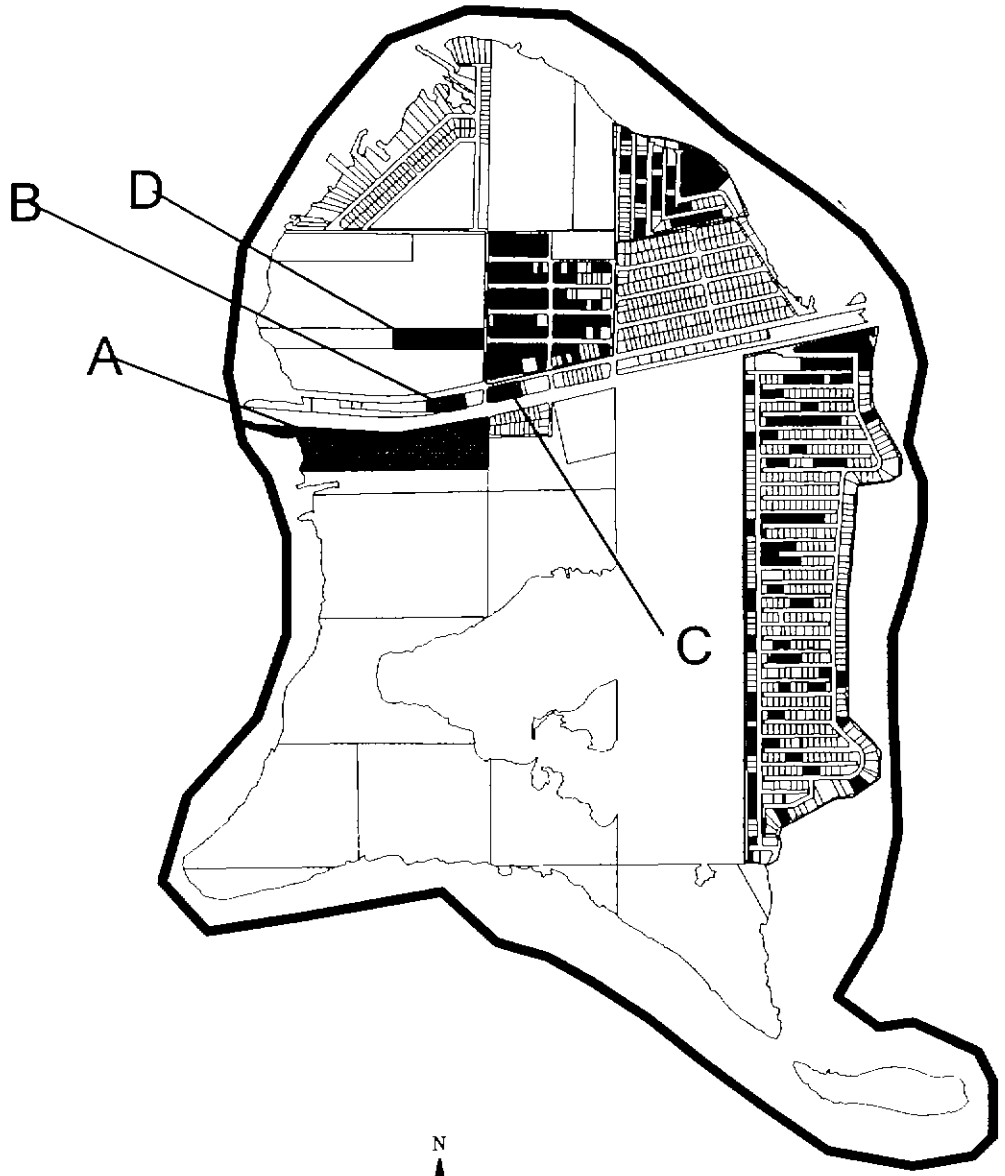
- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

June 2000

Potential WWTP Sites
Big/Middle Torch Keys - Study Area 8
Sanitary Wastewater Master Plan Team
Monroe County, Florida

Potential WWTP Sites

Ramrod Key
(S.A. 9)



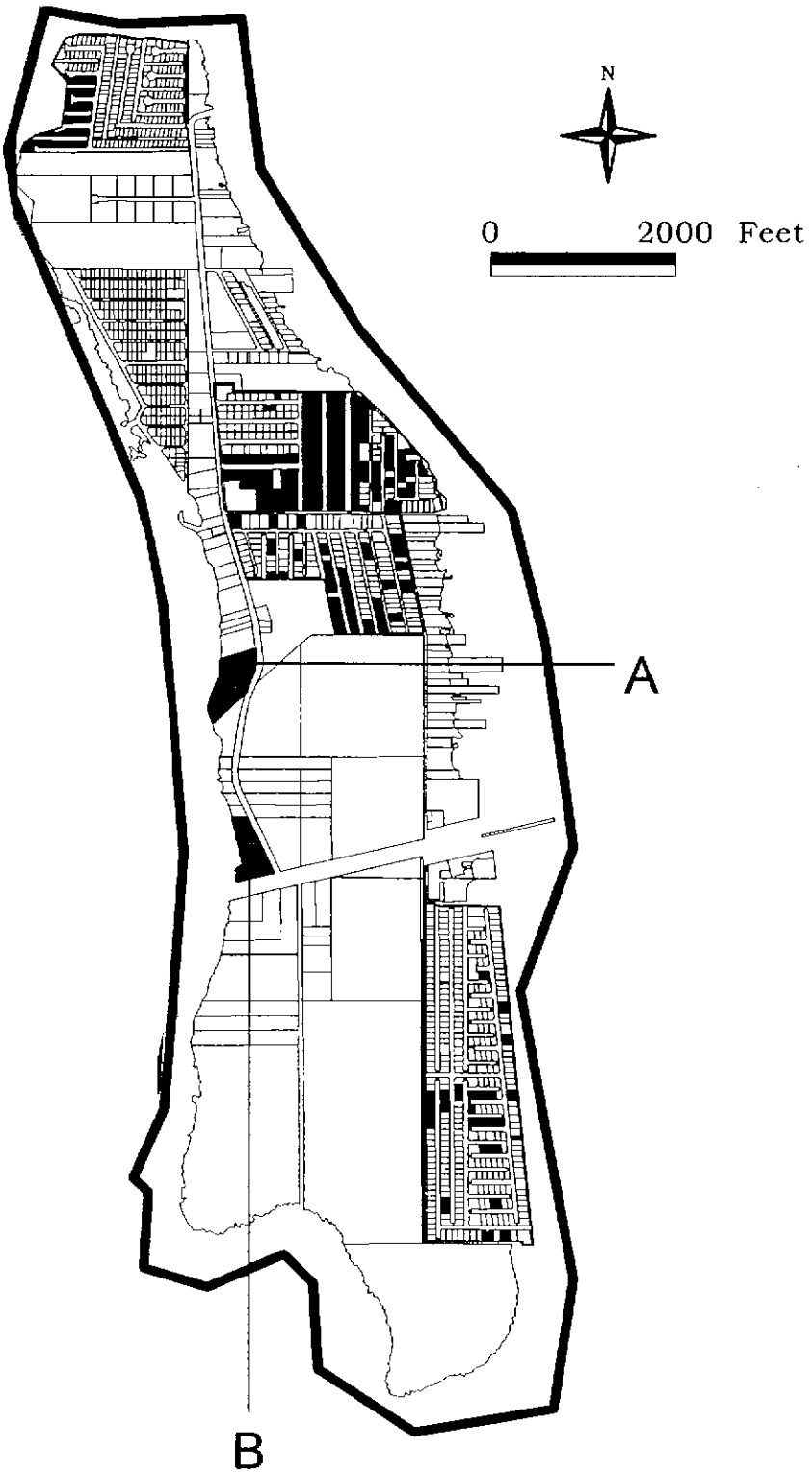
Legend

- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

June 2000

Potential WWTP Sites
Ramrod Key - Study Area 9
Sanitary Wastewater Master Plan Team
Monroe County, Florida
Planning For A Better Environment

Potential WWTP Sites
Little Torch Key
(S.A. 10)



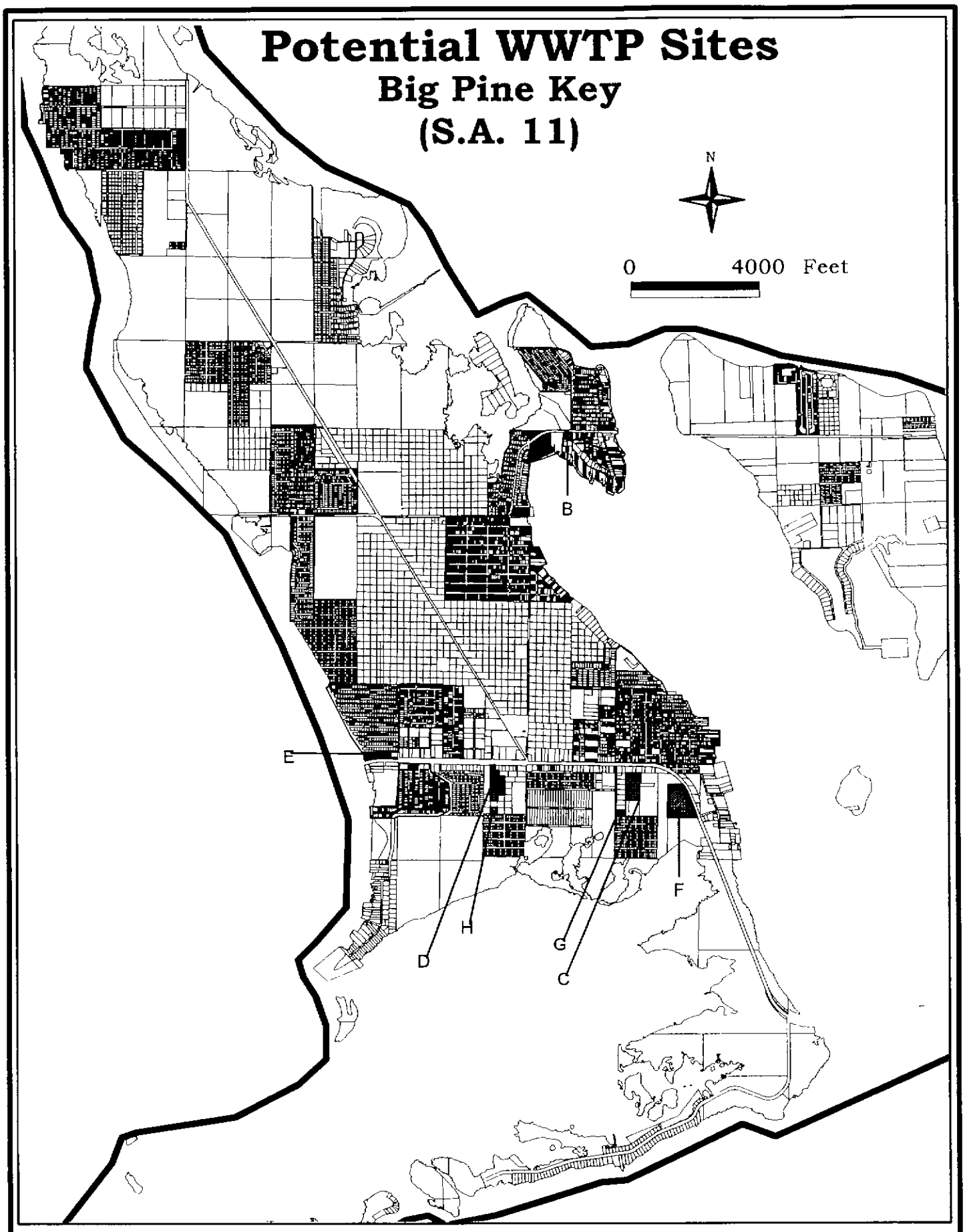
Legend

- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

June 2000

Potential WWTP Sites
Little Torch Key - Study Area 10
Sanitary Wastewater Master Plan Team
Monroe County, Florida

Potential WWTP Sites
Big Pine Key
(S.A. 11)



Legend

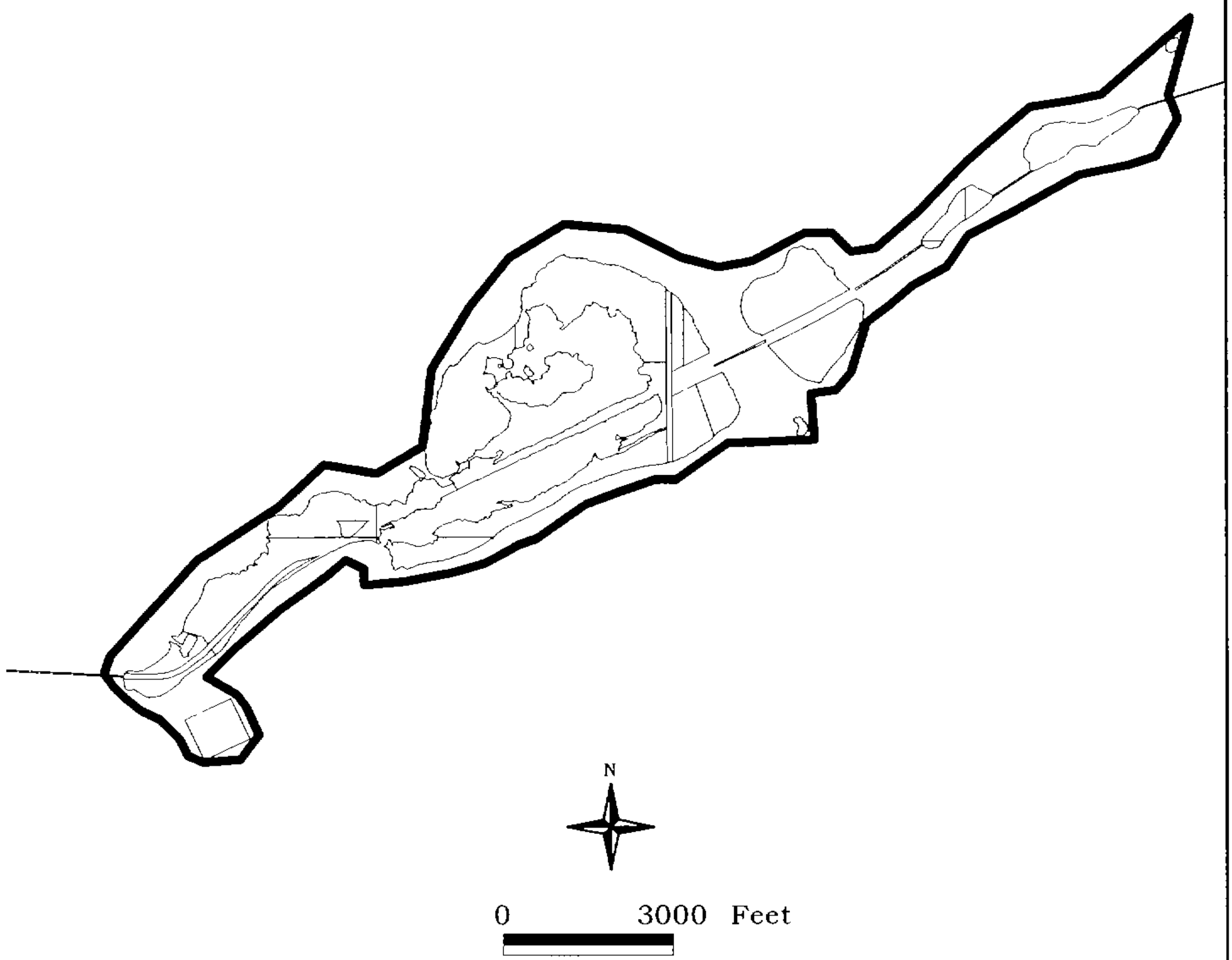
- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

June 2000

Potential WWTP Sites
Big Pine Key - Study Area 11
Sanitary Wastewater Master Plan Team
Monroe County, Florida
Planning For A Better Environment
CAMP HILL ■ Ayres Associates ■ Camp Dresser & McKee Inc
Hazen and Sawyer ■ Katz, Kutter, Haigler
Alderman, Bryant and Tew
Lindahl, Riemann, Ferman, & Hellstrom, Inc

Potential WWTP Sites

Bahia Honda Key
(S.A. 12)



Legend

- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

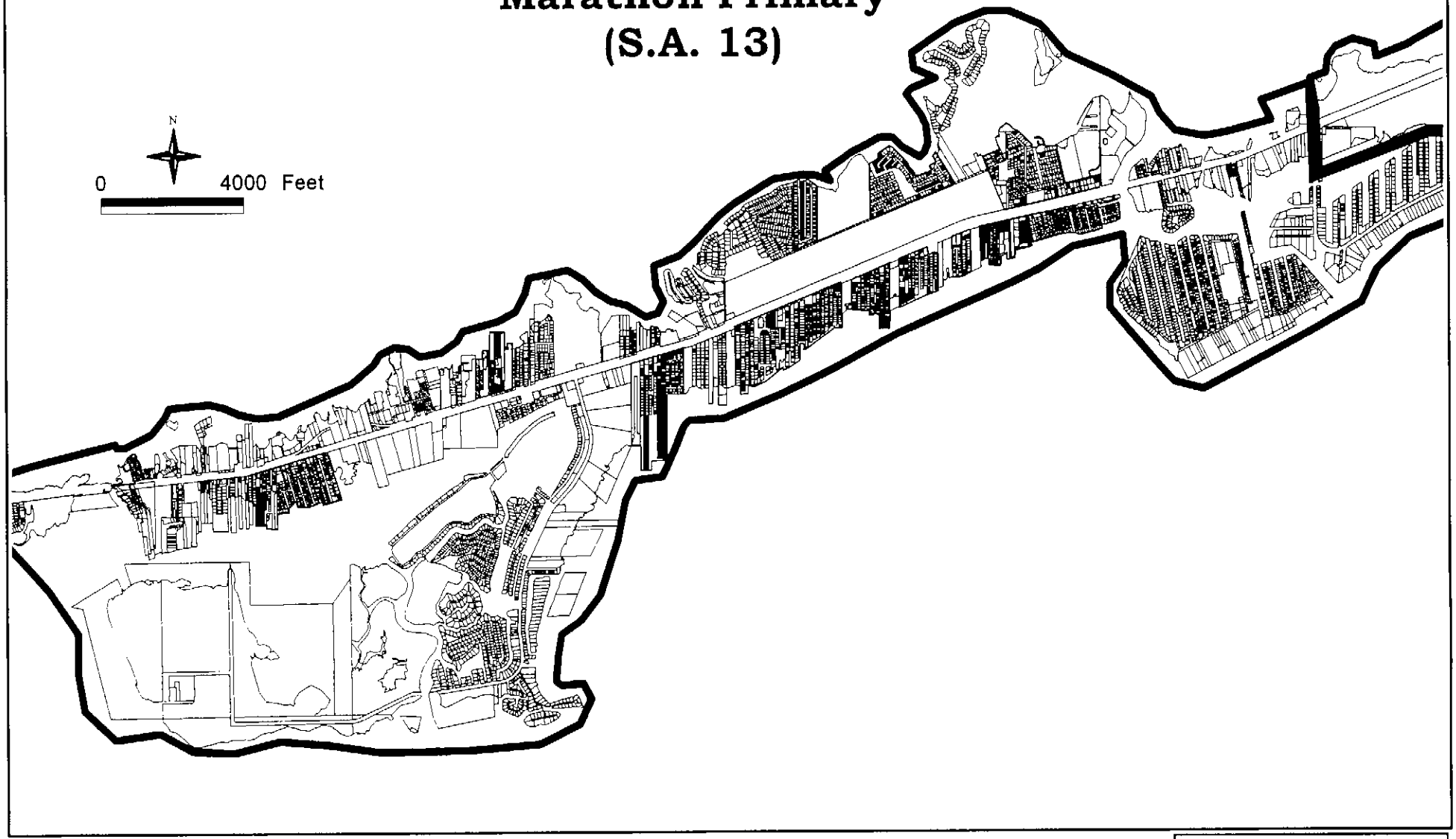
June 2000

Potential WWTP Sites
Bahia Honda Key - Study Area 12
Sanitary Wastewater Master Plan Team
Monroe County, Florida
Planning For A Better Environment
CH2M HILL ■ Ayres Associates ■ Continental Shelf Associates, Inc
Hazen and Sawyer ■ Katz, Kutter, Haigler,
Alderman, Bryant, and Yon
Lindahl, Browning, Ferrari, & Hellstrom, Inc

Potential WWTP Sites

Marathon Primary

(S.A. 13)



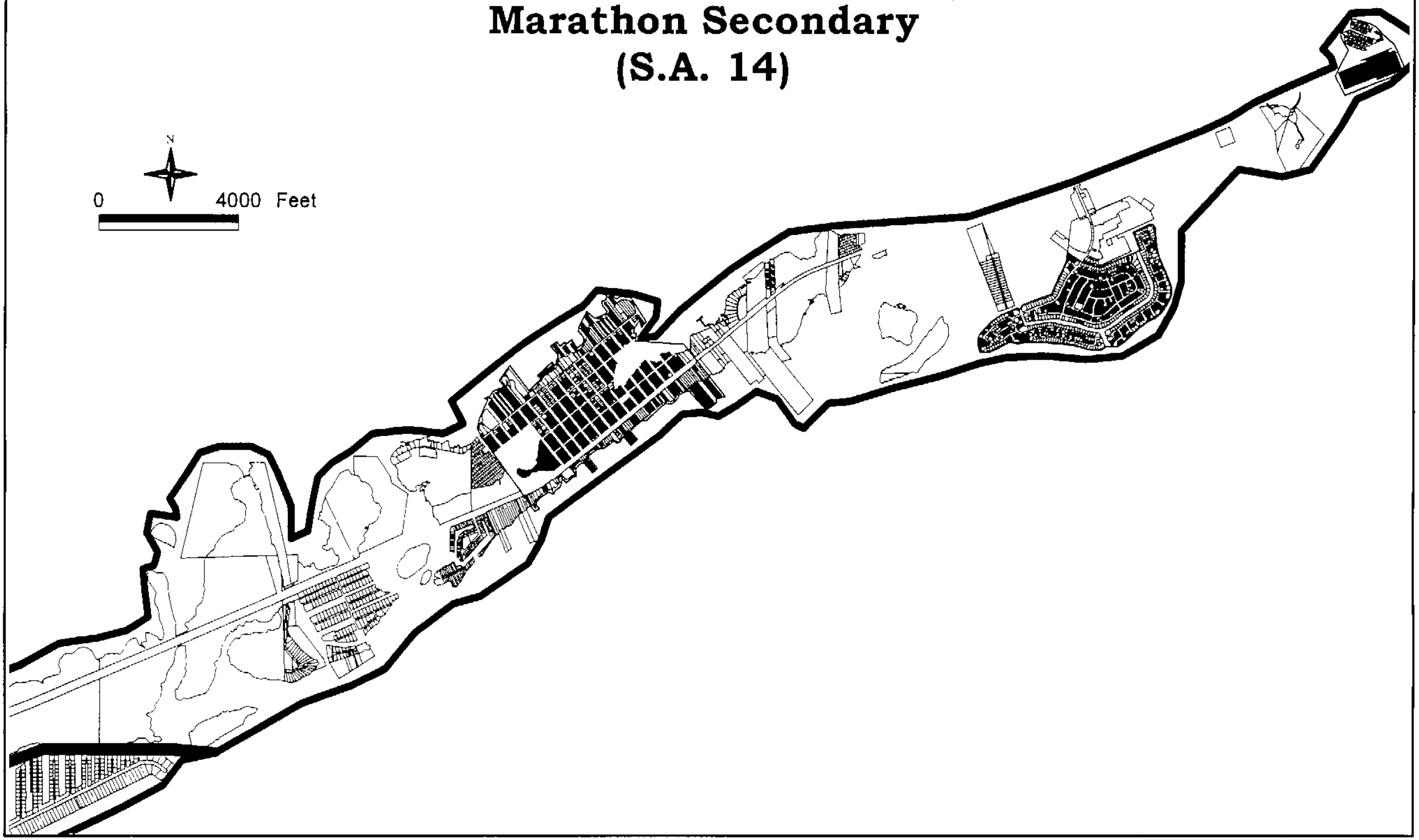
Legend

- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

Potential Sites For WWTP's
Marathon Primary - Study Area 13
Sanitary Wastewater Master Plan Team
Monroe County, Florida
Planning For A Better Environment
CH2M HILL ■ Ayers Associates ■ Continental Reef Associates, Inc.
Nolen and Sawyer ■ Parr, Rutter, Mangler, Alderman, Bryant, and Tan
Lindahl, Browning, Ferrero, & Hellstrom, Inc.

June 2000

Potential WWTP Sites
Marathon Secondary
(S.A. 14)



Legend

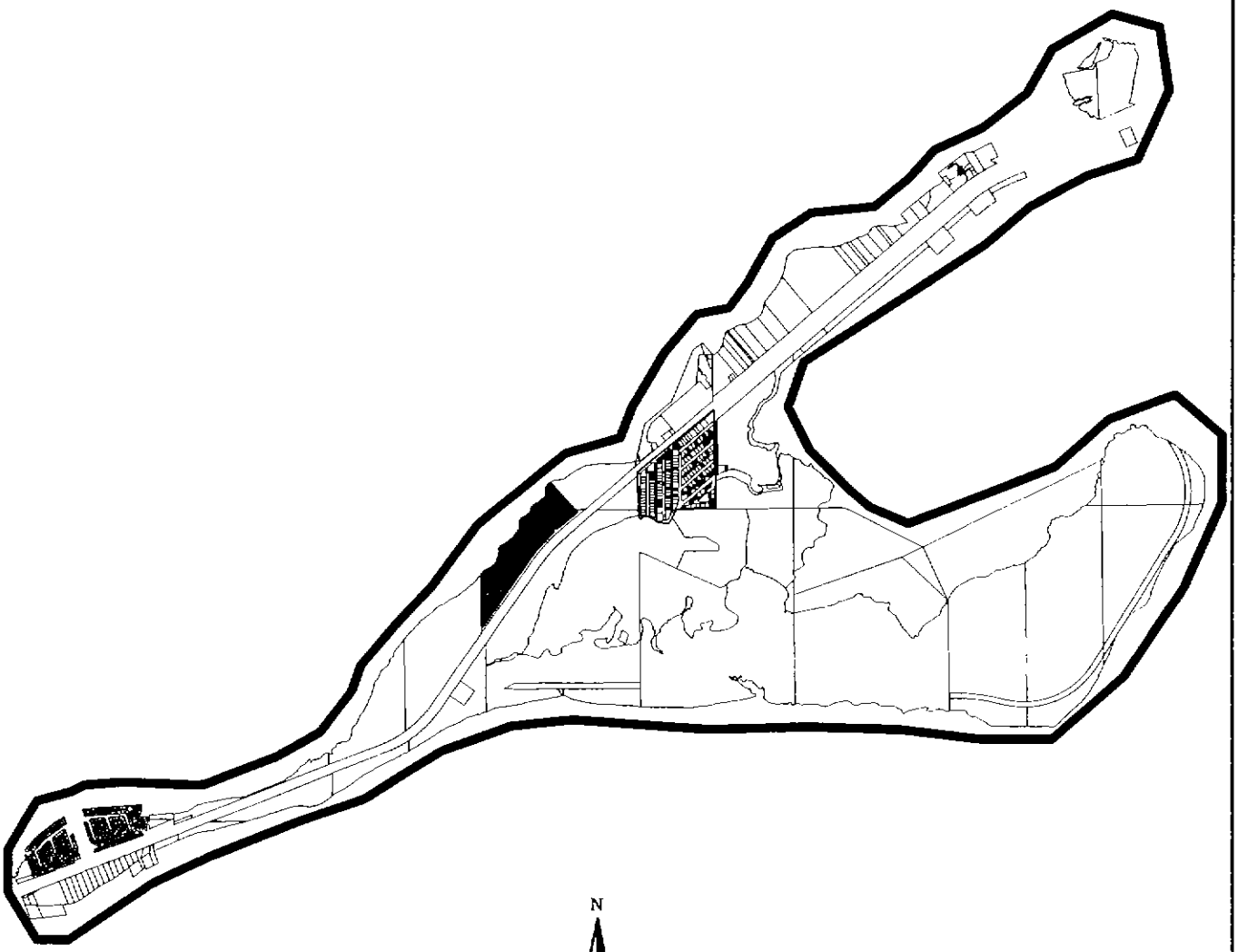
- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

June 2000

Potential Sites For WWTP's
Marathon Secondary - Study Area 14
Sanitary Wastewater Master Plan Team
Monroe County, Florida

Potential WWTP Sites

Long Key/Layton
(S.A. 15)



Legend

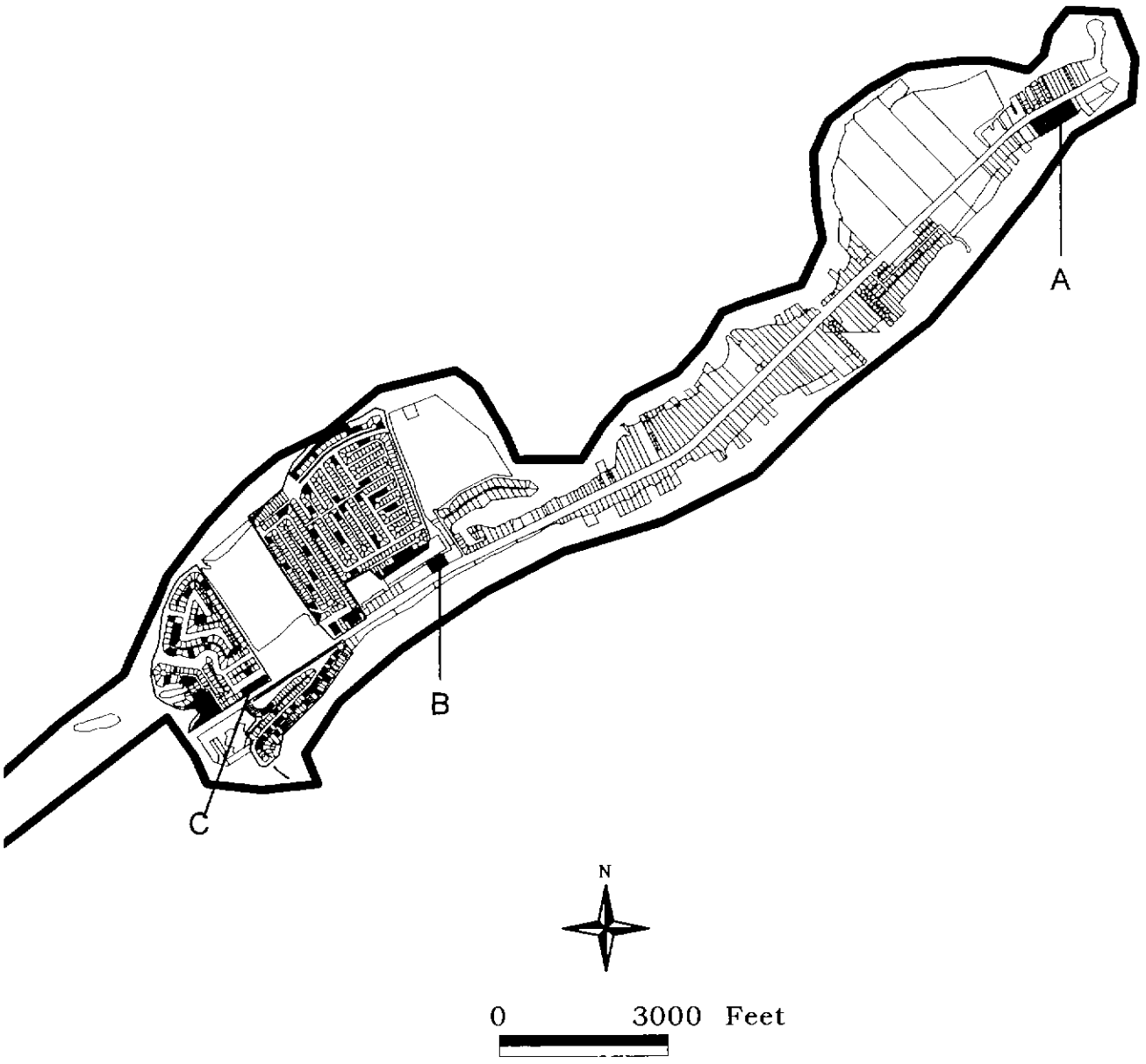
- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

June 2000

Potential WWTP Sites
Long Key/Layton - Study Area 15
Sanitary Wastewater Master Plan Team
Monroe County, Florida

Potential WWTP Sites

Lower Matecumbe
(S.A. 16)



Legend

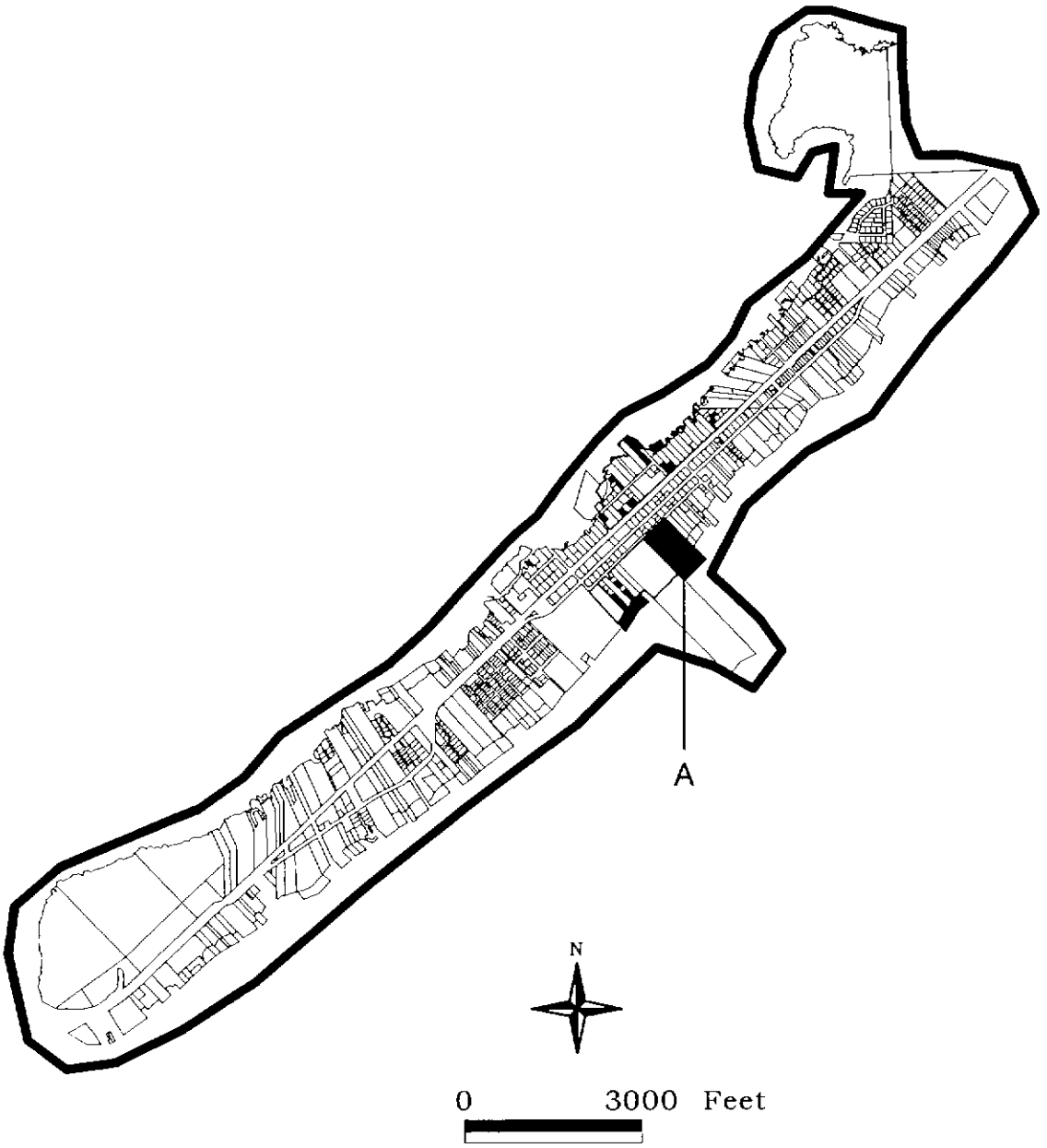
- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

June 2000

Potential WWTP Sites
Lower Matecumbe - Study Area 16
Sanitary Wastewater Master Plan Team
Monroe County, Florida
Planning For A Better Environment
CH2M HILL • Ayres Associates • Continental Shelf Associates, Inc.
Harris and Sawyer • R. Earl Turner, Naugler, Alderman, Bryant, and Yon
Lindahl, Browning, Ferrari, & Hellstrom, Inc.

Potential WWTP Sites

Upper Matecumbe
(S.A. 17)



Legend

- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

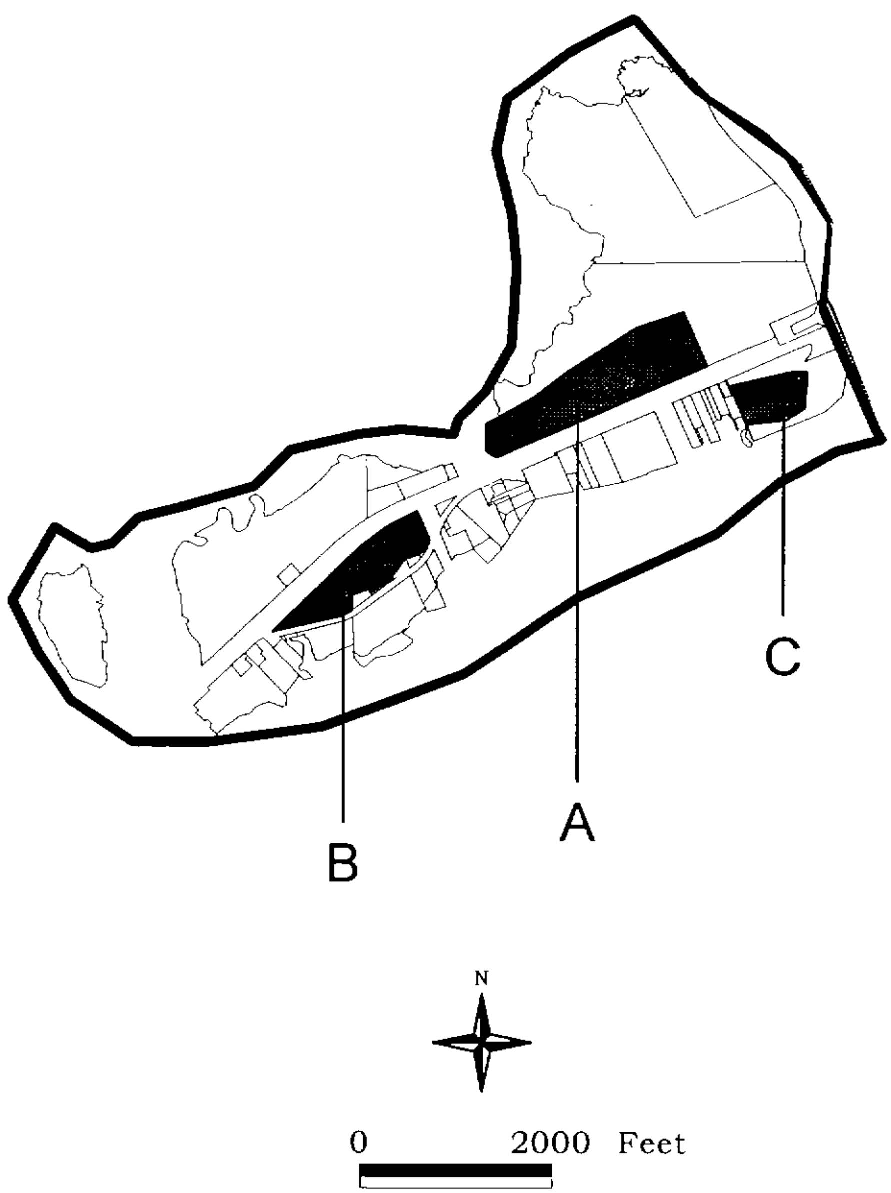
June 2000

Potential WWTP Sites
Upper Matecumbe - Study Area 17
Sanitary Wastewater Master Plan Team
Monroe County, Florida
Planning For A Better Environment

CH2M HILL • Apex Associates • Commercial Shelf Associates, Inc.
Hazen and Sawyer • Keith, Kutler, Hoepfer, Alderman, Bryans, and Tim
Lindahl, Browning, Ferren, & Hallstrom, Inc.

Potential WWTP Sites

Windley Key
(S.A. 18)



Legend

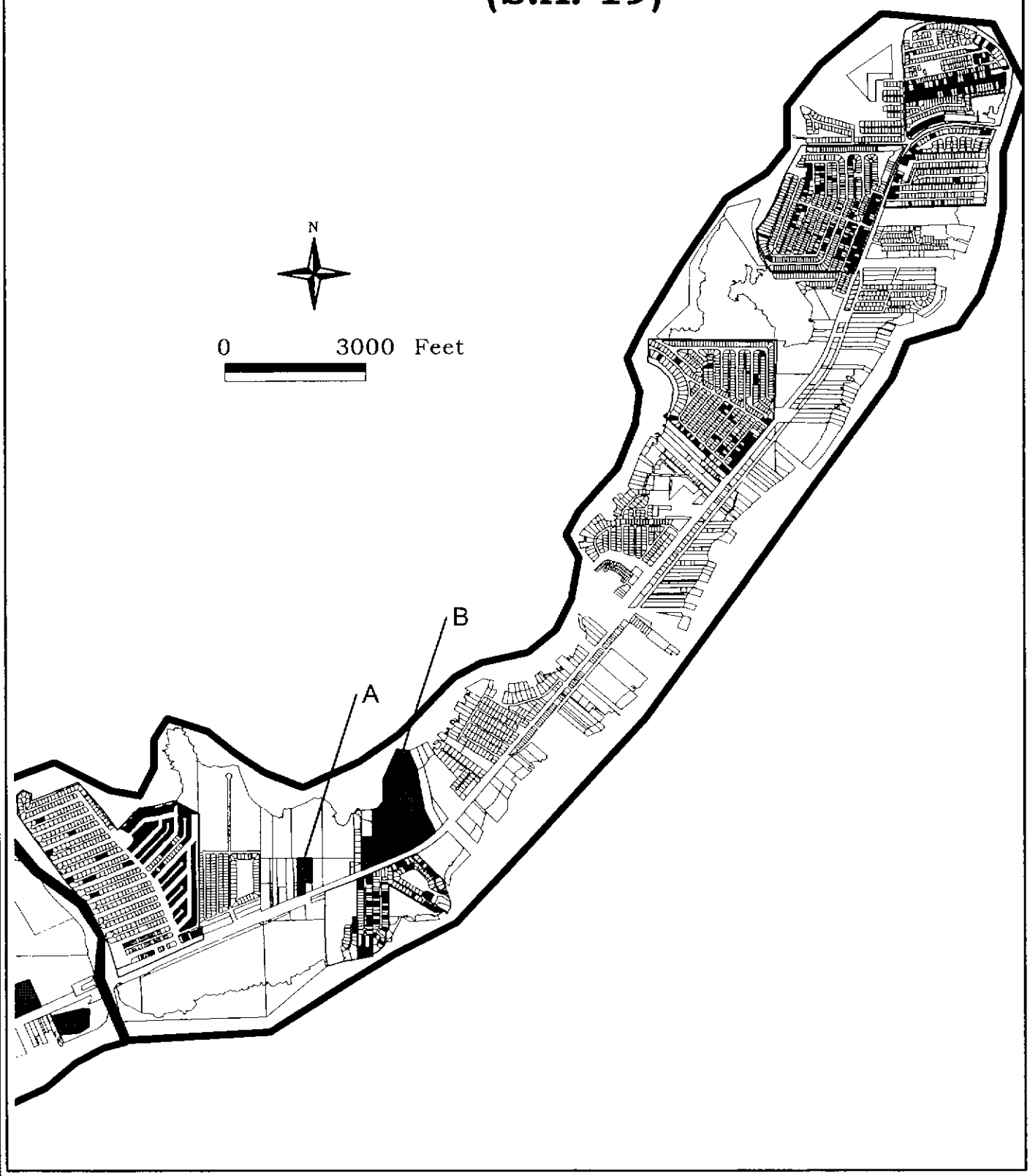
- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

June 2000

Potential WWTP Sites
Windley Key - Study Area 18
Sanitary Wastewater Master Plan Team
Monroe County Florida
Planning For A Better Environment
CH2M HILL ■ Ayres Associates ■ Continental Shelf Associates, Inc
Hazen and Sawyer ■ Katz, Kutter, Haigler,
Alderman, Bryant, and Yon
Lindahl, Browning, Ferrari, & Hellstrom, Inc

Potential WWTP Sites

Plantation Key
(S.A. 19)



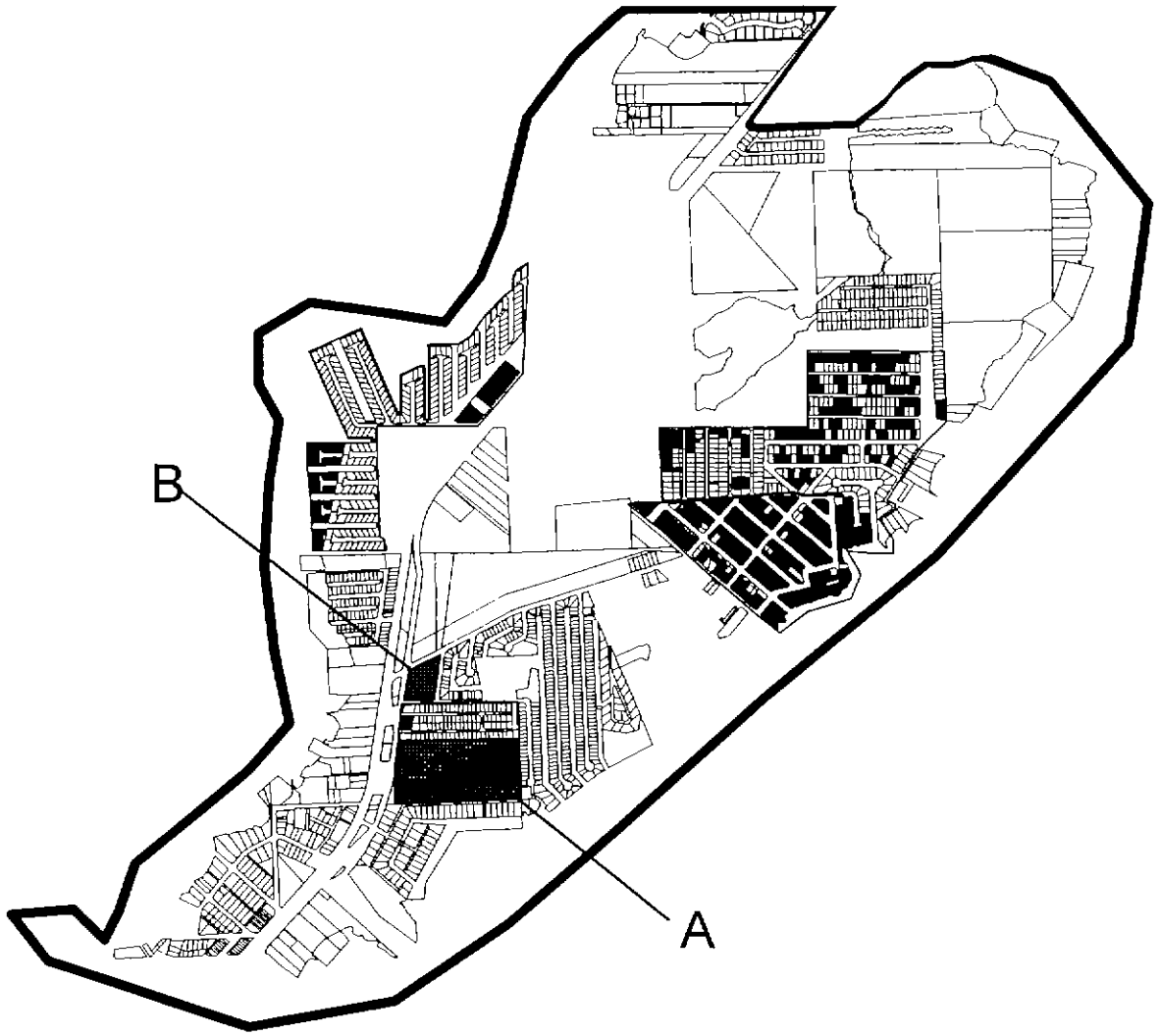
Legend

- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

June 2000

Potential WWTP Sites
Plantation Key - Study Area 19
Sanitary Wastewater Master Plan Team
Monroe County, Florida
Planning For A Better Environment

Potential WWTP Sites
Tavernier
PAED 15
(S.A. 20)



0 2000 Feet

Legend

- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

June 2000

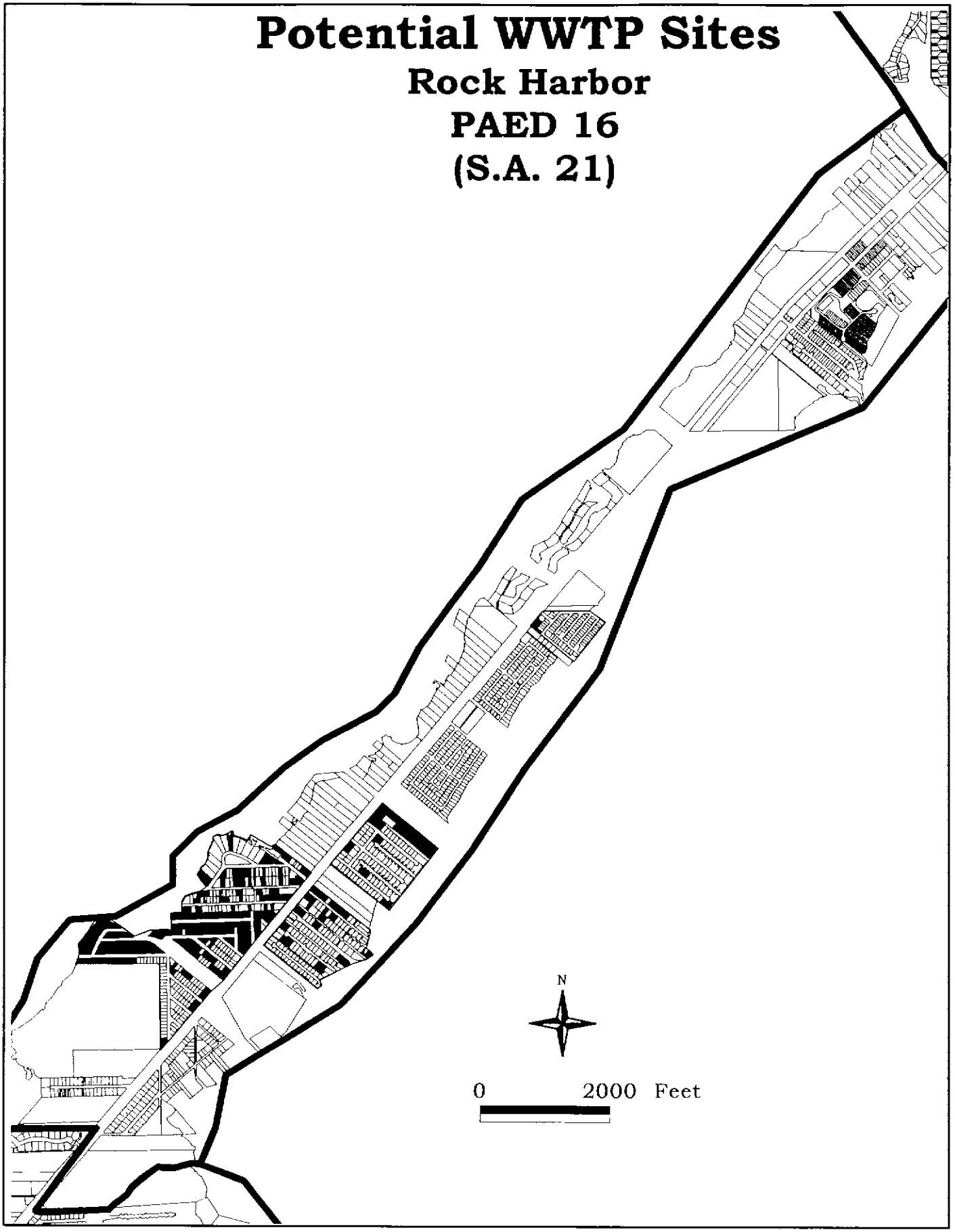
Potential WWTP Sites
Tavernier PAED 15 - Study Area 20
Sanitary Wastewater Master Plan Team
Monroe County, Florida

Potential WWTP Sites

Rock Harbor

PAED 16

(S.A. 21)



Legend

- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

June 2000

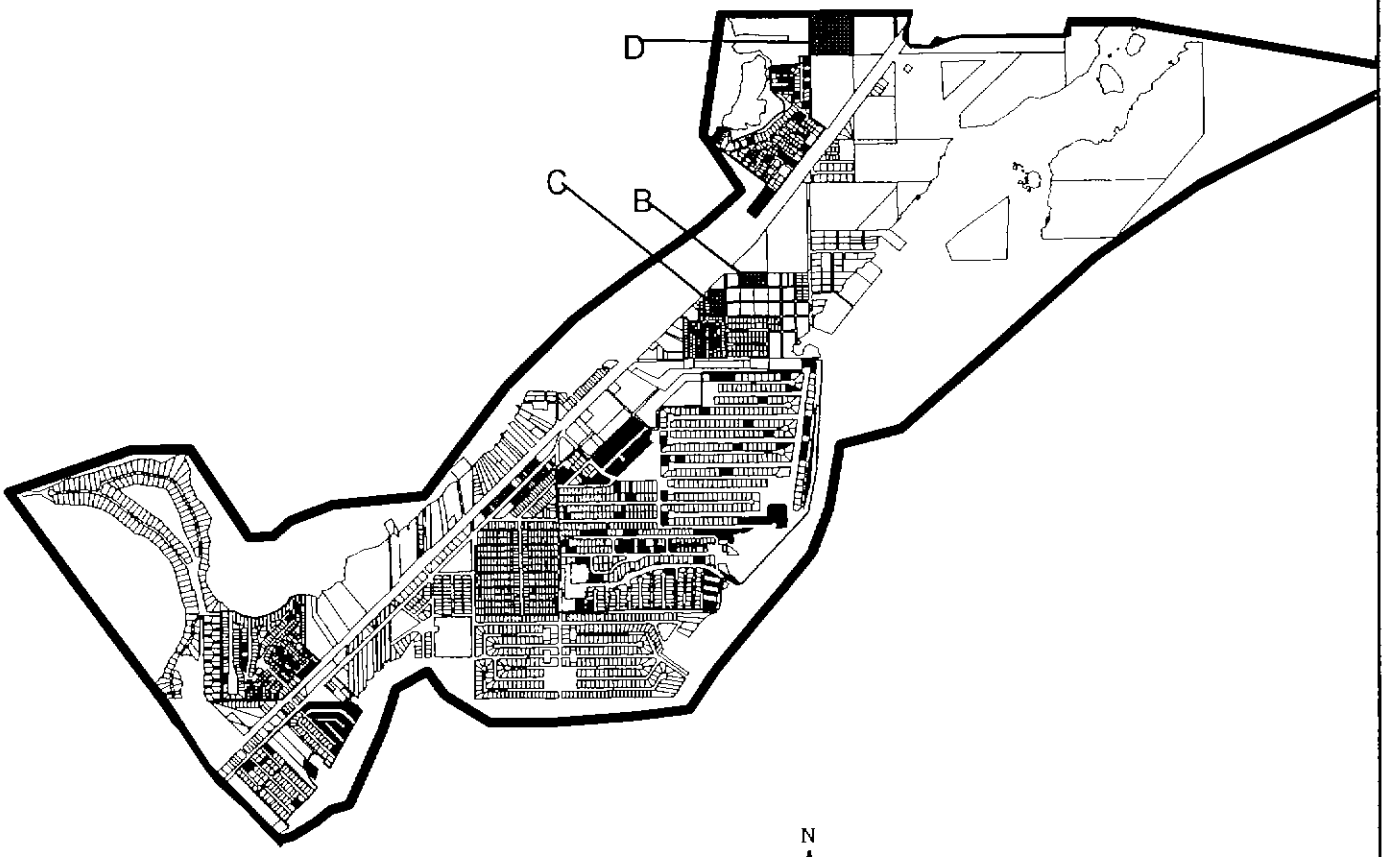
Potential WWTP Sites
Rock Harbor PAED 16 - Study Area 21
Sanitary Wastewater Master Plan Team
Monroe County, Florida
Planning For A Better Environment
CH2M HILL & Apex Associates & Commercial Shelf Associates, Inc
Keys and Sawyer & Carr, Riker, Hagler, Alderman, Bryant, and Tee
Landers, Browning, Ferrari, & Wilkinson, Inc

Potential WWTP Sites

Key Largo

PAED 17

(S.A. 22)



N

0 3000 Feet

Legend

- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

Potential WWTP Sites
Key Largo PAED 17 - Study Area 22
Sanitary Wastewater Master Plan Team
Monroe County, Florida

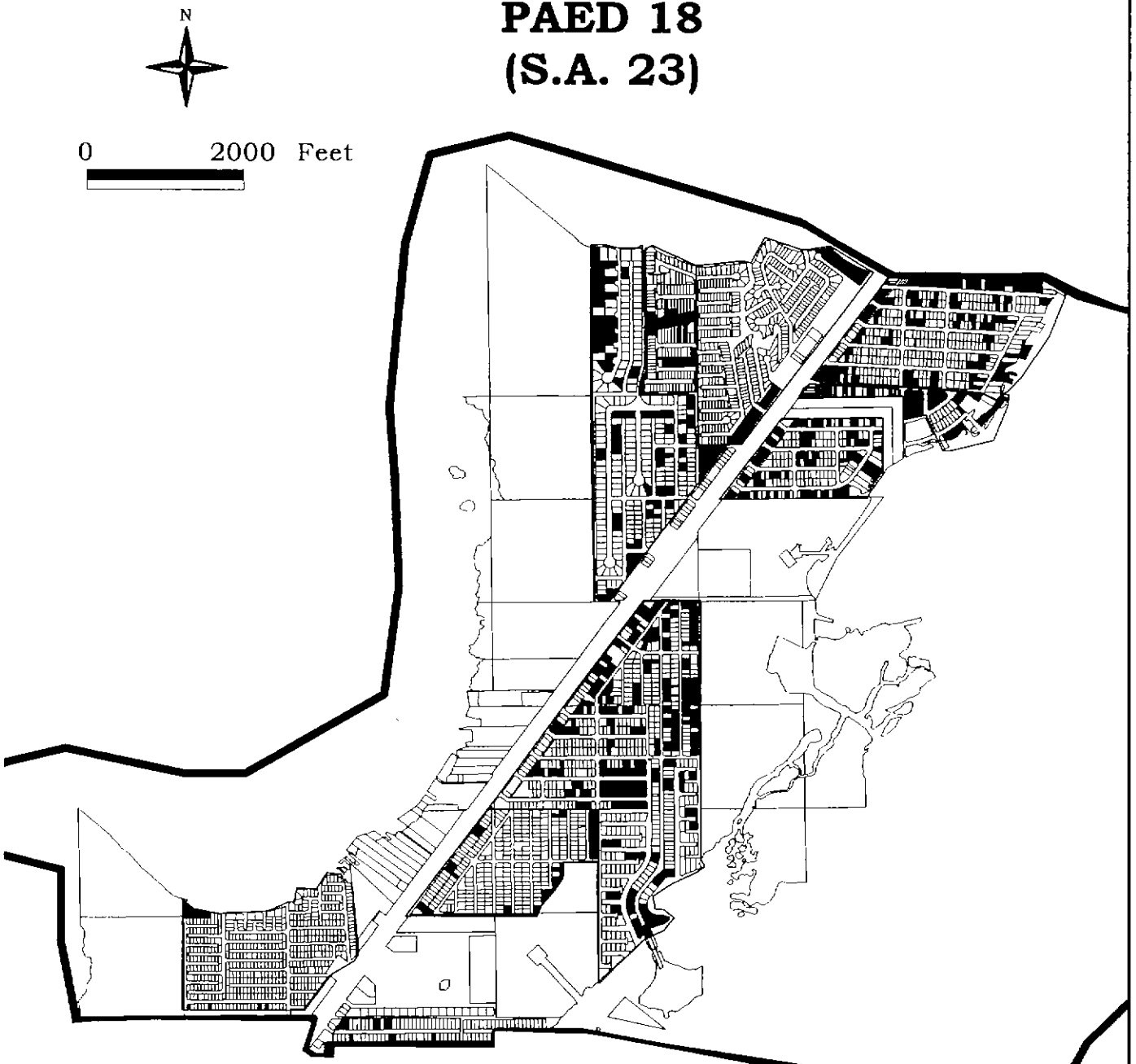
June 2000

Potential WWTP Sites

Key Largo

PAED 18

(S.A. 23)



Legend

- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

June 2000

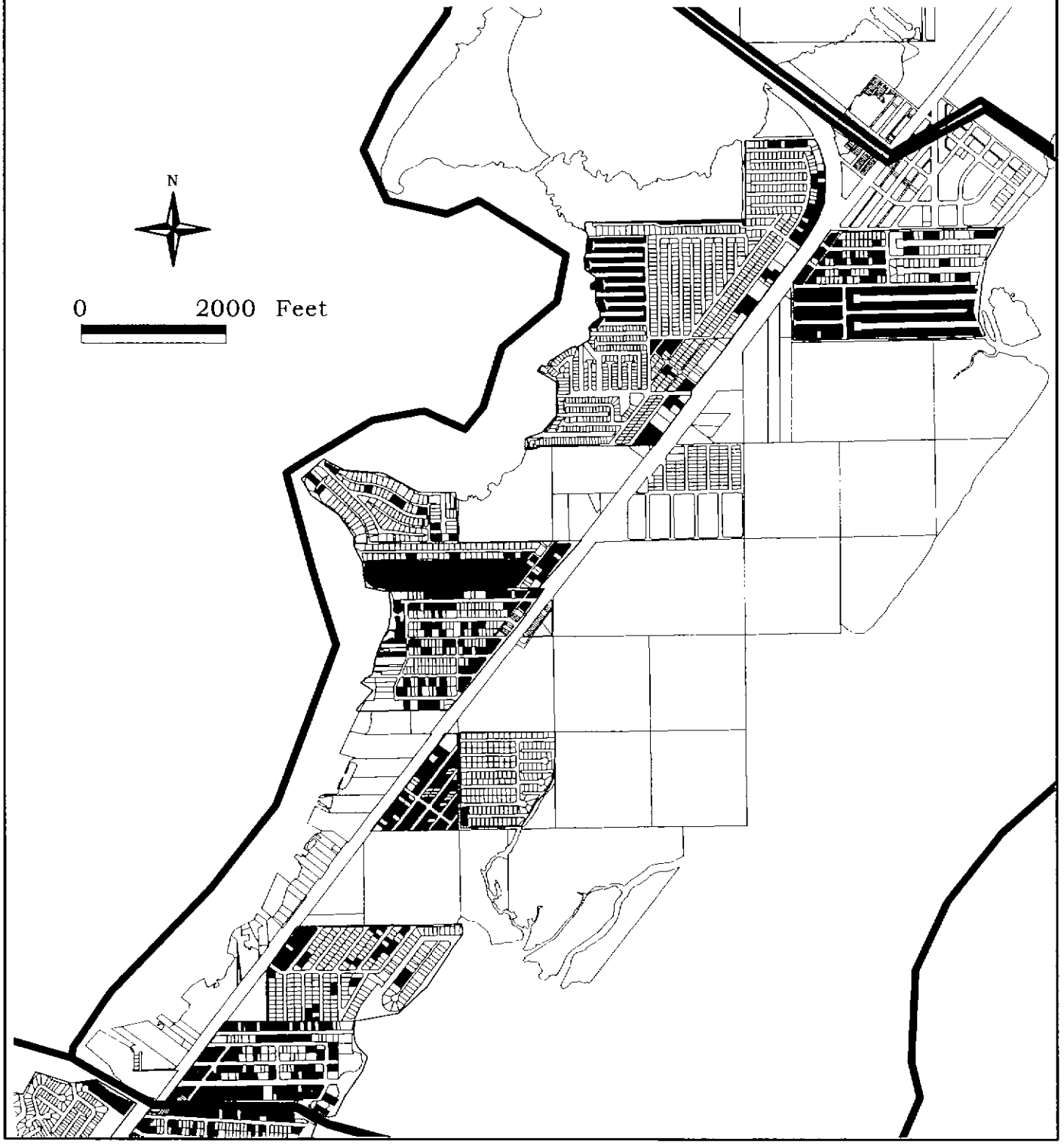
Potential WWTP Sites
Key Largo PAED 18 - Study Area 23
Sanitary Wastewater Master Plan Team
Monroe County, Florida
Planning For A Better Environment
CH2M HILL, Apex Associates, Continental Shelf Associates, Inc., Hanks and Sawyer, R. Earl, Keller, Hoagler, Alderman, Bryant, and Yon, Lindahl, Browning, Ferrari, & Hellstrom, Inc.

Potential WWTP Sites

Key Largo

PAED 19 & 20

(S.A. 24)



Legend

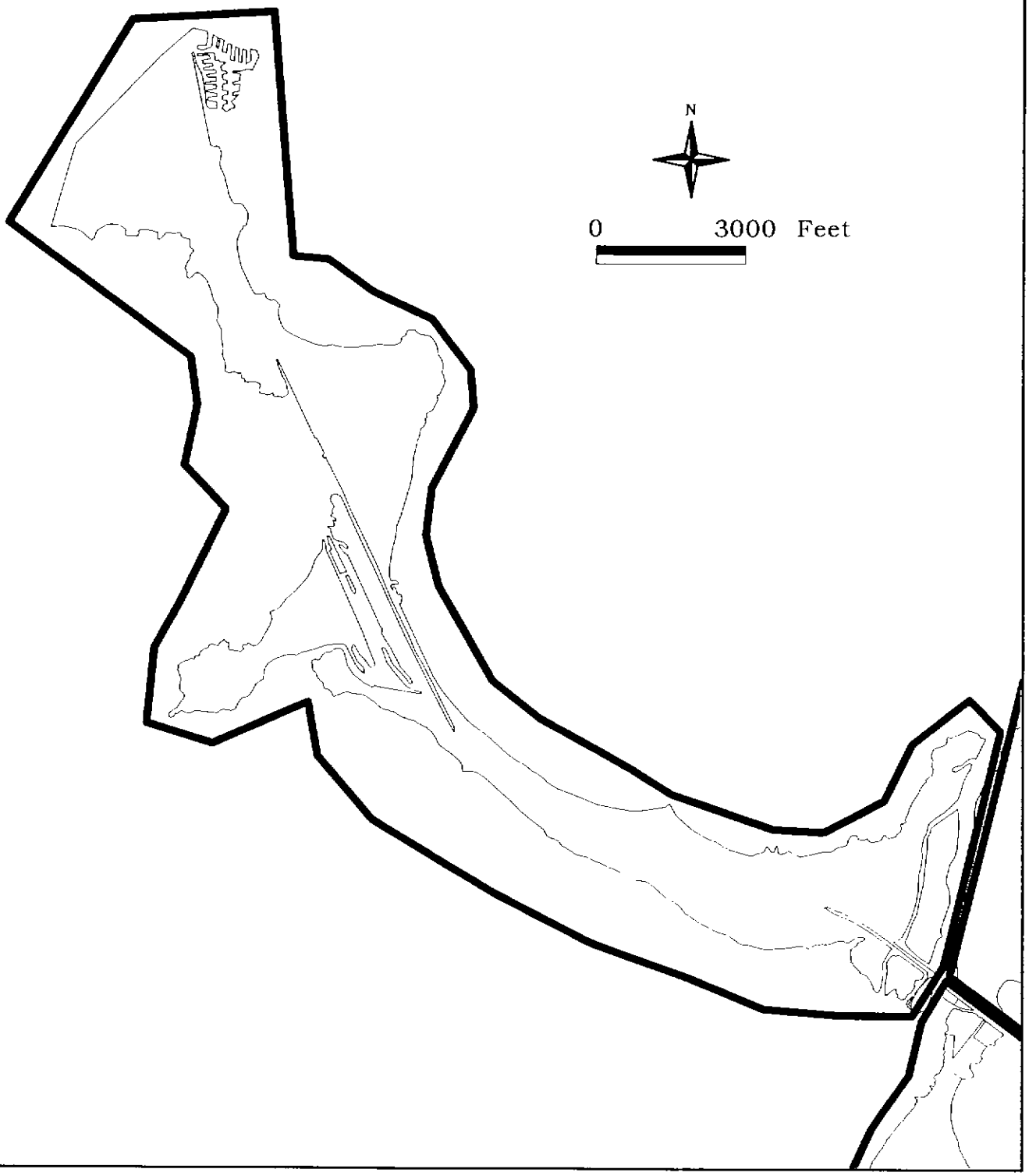
- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

Potential WWTP Sites
Key Largo PAED 19 & 20 - Study Area 24
Sanitary Wastewater Master Plan Team
Monroe County, Florida

June 2000

Potential WWTP Sites

Key Largo
PAED 22
(S.A. 25)



Legend

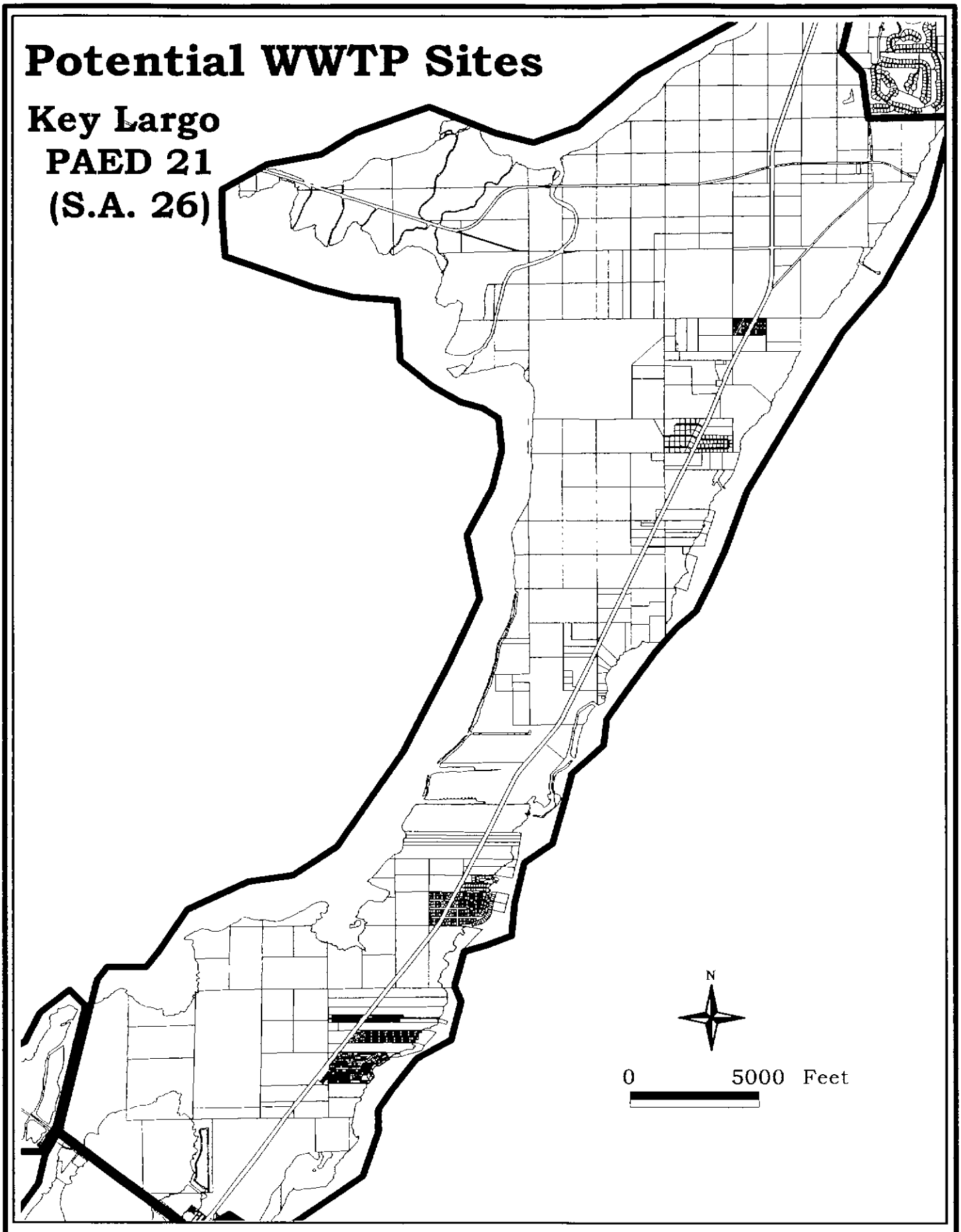
- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

June 2000

Potential WWTP Sites
Key Largo PAED 22 - Study Area 25
Sanitary Wastewater Master Plan Team
Monroe County, Florida
Planning for a Better Environment
CH2M HILL • Ayres Associates • Continental Shelf Associates, Inc.
Hazen and Sawyer • Katz, Kutter, Haigler
Alderman, Bryant, and Yon
Lambert, Browning, Ferrari, & Nadeem, Inc.

Potential WWTP Sites

Key Largo
PAED 21
(S.A. 26)



Legend

- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

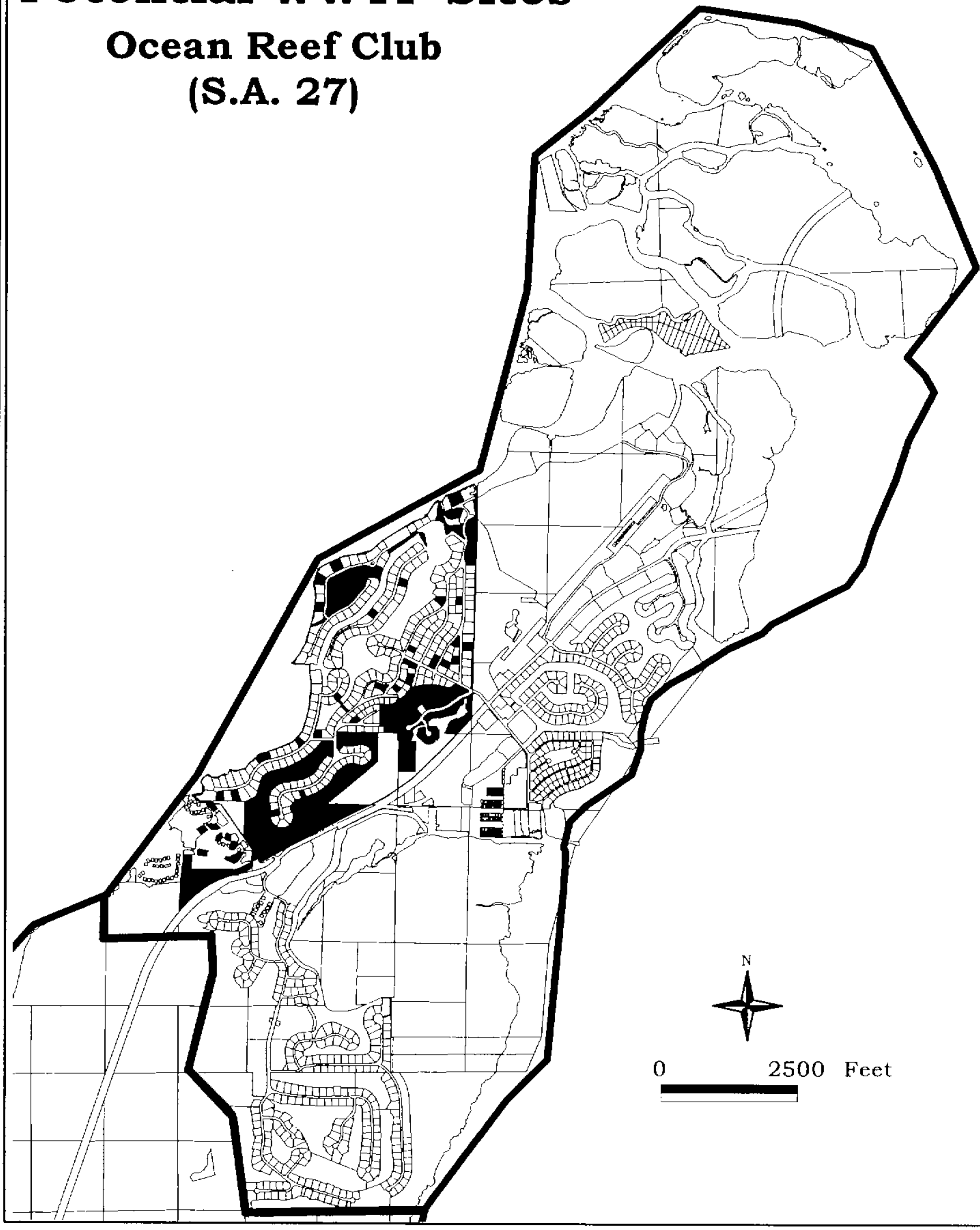
June 2000

Potential WWTP Sites
Key Largo PAED 21 - Study Area 26
Sanitary Wastewater Master Plan Team
Monroe County, Florida
Planning For A Better Environment
CH2M HILL, Applied Assessment, Centaurus Staff Associates, Inc., Hazen and Sawyer, R. Kent, Eugene Hargiss, Alderman, Bryant, and Yon, Lindahl, Browning, Ferran, & Kalstrom, Inc.

Potential WWTP Sites

Ocean Reef Club

(S.A. 27)



Legend

- Boundary of Potential Hotspot
- Potential WWTP Site (Large)
- Potential Vacuum Station Site or WWTP Site (Small)
- Parcel

Potential WWTP Sites
Ocean Reef Club - Study Area 27
Sanitary Wastewater Master Plan Team
Monroe County, Florida

June 2000

EXHIBIT D-2

Model Output Numeric Scores

Siting Decision Model Scores
WWTP Sites <0.5 MGD
Lower Keys

Project Number	Project Name	[illegible]	Public Acceptance	Environmental Impact	Cost	[illegible]
16	Site No. 16, Summerland B	11.36	57.95	7.16	18.18	94.66
13	Site No. 13, Cudjoe Key B	6.82	57.95	7.95	18.18	90.91
31	Site No. 31, Big Pine F	11.36	51.48	7.95	18.18	88.98
28	Site No. 28, Big Pine C	11.36	51.48	7.95	17.27	88.07
10	Site No. 10, Upper Sugarloaf B	11.36	48.86	7.95	18.18	86.36
20	Site No. 20, Ramrod Key A	11.36	48.86	7.16	17.27	84.66
1	Site No. 1, Boca Chica A	11.36	51.48	7.16	13.64	83.64
2	Site No. 2, Boca Chica B	11.36	48.86	7.16	15.45	82.84
15	Site No. 15, Summerland A	11.36	48.86	3.18	18.18	81.59
25	Site No. 25, Little Torch B	4.55	57.95		18.18	80.68
23	Site No. 23, Ramrod Key D	11.36	42.39	7.16	17.27	78.18
24	Site No. 24, Little Torch A		57.95		17.27	75.23
21	Site No. 21, Ramrod Key B		57.95		11.82	69.77
5	Site No. 5, Bay Point C		57.95		10.00	67.95
11	Site No. 11, Upper Sugarloaf C		51.48		16.36	67.84
14	Site No. 14, Cudjoe Key C		48.86		16.36	65.23
32	Site No. 32, Big Pine G		51.48		12.73	64.20
30	Site No. 30, Big Pine E	11.36	28.75	7.16	15.45	62.73
4	Site No. 4, Bay Point B		48.86		12.73	61.59
12	Site No. 12, Cudjoe Key A		48.86		10.00	58.86
8	Site No. 8, Lower Sugarloaf C	11.36	20.23	7.95	18.18	57.73
22	Site No. 22, Ramrod Key C		42.39		10.91	53.30
7	Site No. 7, Lower Sugarloaf B	11.36	15.11	7.95	16.36	50.80
17	Site No. 17, Summerland C		17.95		17.27	35.23
18	Site No. 18, Summerland D		17.95		14.55	32.50
9	Site No. 9, Upper Sugarloaf A		31.02			31.02
27	Site No. 27, Big Pine B		21.59		9.09	30.68
6	Site No. 6, Lower Sugarloaf A		17.39		10.91	28.30

Siting Decision Model Scores
WWTP Sites - 0.5-1.0 MGD
Lower Keys

[illegible]	[illegible]	[illegible]	Public Acceptance	Environmental Impact	Cost	[illegible]
13	Site No. 13, Cudjoe Key B	6.82	57.95	7.95	18.18	90.91
31	Site No. 31, Big Pine F	11.36	51.48	7.16	18.18	88.18
28	Site No. 28, Big Pine C	11.36	51.48	7.16	17.27	87.27
10	Site No. 10, Upper Sugarloaf B	11.36	48.86	7.16	18.18	85.57
16	Site No. 16, Summerland B	4.55	57.95	3.18	18.18	83.86
2	Site No. 2, Boca Chica B	7.95	48.86	3.18	15.45	75.45
1	Site No. 1, Boca Chica A	4.55	51.48	3.18	13.64	72.84
23	Site No. 23, Ramrod Key D	4.55	42.39	3.18	17.27	67.39
15	Site No. 15, Summerland A		48.86		18.18	67.05
20	Site No. 20, Ramrod Key A		48.86		17.27	66.14
8	Site No. 8, Lower Sugarloaf C	11.36	20.23	3.18	18.18	52.95
30	Site No. 30, Big Pine E	4.55	28.75	3.18	15.45	51.93
7	Site No. 7, Lower Sugarloaf B	11.36	15.11	3.18	16.36	46.02

Siting Decision Model Scores
WWTP Sites 1.0 - 2.0 MGD
Lower Keys

Project Number	Project Name	Site Selection	Public Acceptance	Environmental Impact	Cost	Overall
13	Site No. 13, Cudjoe Key B	6.82	57.95	7.95	18.18	90.91
10	Site No. 10, Upper Sugarloaf B	7.95	48.86	3.18	18.18	78.18
31	Site No. 31, Big Pine F	4.55	51.48	3.18	18.18	77.39
28	Site No. 28, Big Pine C	4.55	51.48	3.18	17.27	76.48
8	Site No. 8, Lower Sugarloaf C		20.23		18.18	38.41
7	Site No. 7, Lower Sugarloaf B		15.11		16.36	31.48

Siting Decision Model Scores
WWTP Sites - 2.0 - 5.0 MGD
Lower Keys

[illegible]	[illegible]	[illegible]	Public Acceptance	Environmental Impact	Cost	[illegible]
13	Site No. 13, Cudjoe Key B	6.82	57.95	7.95	18.18	90.91
10	Site No. 10, Upper Sugarloaf B	4.55	48.86	3.18	18.18	74.77
31	Site No. 31, Big Pine F		51.48		18.18	69.66
28	Site No. 28, Big Pine C		51.48		17.27	68.75

Siting Decision Model Scores
WWTP Sites <0.5 MGD
Middle and Upper Keys (Excluding Marathon)

Project Number	Project Name	[illegible]	Public Acceptance	Environmental Impact	Cost	[illegible]
52	Site No. 52, Key Largo PAED 17 B	7.95	57.95	3.18	7.27	76.36
43	Site No. 43, Windley Key B	11.36	35.23	7.95	16.36	70.91
44	Site No. 44, Windley Key C	11.36	35.23	7.16	13.64	67.39
42	Site No. 42, Windley Key A	11.36	35.23	7.95	12.73	67.27
54	Site No. 54, Key Largo PAED 17 D	11.36	35.23	7.95	11.82	66.36
48	Site No. 48, Tavernier PAED 15 B	11.36	35.23	3.18	16.36	66.14
45	Site No. 45, Plantation Key A		48.86		15.45	64.32
39	Site No. 39, Lower Matecumbe B		51.48		10.00	61.48
46	Site No. 46, Plantation Key B	6.82	28.75	7.95	13.64	57.16
40	Site No. 40, Lower Matecumbe C	4.55	35.23	3.18	11.82	54.77
47	Site No. 47, Tavernier PAED 15 A	11.36	15.11	7.95	17.27	51.70
41	Site No. 41, Upper Matecumbe A	11.36	21.59	3.18	8.18	44.32
38	Site No. 38, Lower Matecumbe A	11.36	21.59	3.18	3.64	39.77
53	Site No. 53, Key Largo PAED 17 C	4.55	21.59	3.18	9.09	38.41

Siting Decision Model Scores
WWTP Sites - 0.5-1.0 MGD
Middle and Upper Keys (Excluding Marathon)

Ranking Number	Description	[illegible]	Public Acceptance	Environmental Impact	Cost	[illegible]
43	Site No. 43, Windley Key B	11.36	35.23	7.16	16.36	70.11
42	Site No. 42, Windley Key A	11.36	35.23	7.95	12.73	67.27
46	Site No. 46, Plantation Key B	6.82	28.75	7.95	13.64	57.16
54	Site No. 54, Key Largo PAED 17 D		35.23	7.16	11.82	54.20
47	Site No. 47, Tavernier PAED 15 A	11.36	15.11	7.95	17.27	51.70
48	Site No. 48, Tavernier PAED 15 B		35.23		16.36	51.59
44	Site No. 44, Windley Key C		35.23		13.64	48.86
41	Site No. 41, Upper Matecumbe A		21.59		8.18	29.77
38	Site No. 38, Lower Matecumbe A		21.59		3.64	25.23

Siting Decision Model Scores
WWTP Sites - 1.0 - 2.0 MGD
Middle and Upper Keys (Excluding Marathon)

[illegible]	[illegible]	[illegible]	Public Acceptance	Environmental Impact	Cost	[illegible]
42	Site No. 42, Windley Key_A	7.95	35.23	7.16	12.73	63.07
43	Site No. 43, Windley Key_B	7.95	35.23	3.18	16.36	62.73
46	Site No. 46, Plantation Key_B	11.36	28.75	7.95	13.64	61.70
54	Site No. 54, Key Largo PAED 17_D	7.95	35.23		11.82	55.00
47	Site No. 47, Tavernier PAED 15_A	11.36	15.11	7.16	17.27	50.91

Siting Decision Model Scores
WWTP Sites - 2.0 - 5.0 MGD
Middle and Upper Keys (Excluding Marathon)

Project Number	Project Name	Benefit-Cost Ratio	Public Acceptance	Environmental Impact	Cost	Total Score
46	Site No. 46, Plantation Key B	11.36	28.75	7.95	13.64	61.70
43	Site No. 43, Windley Key B	4.55	35.23	3.18	16.36	59.32
42	Site No. 42, Windley Key A	7.95	35.23	3.18	12.73	59.09
54	Site No. 54, Key Largo PAED 17 D	4.55	35.23	3.18	11.82	54.77
47	Site No. 47, Tavernier PAED 15 A	7.95	15.11	3.18	17.27	43.52

Appendix E

APPENDIX E
EXHIBIT E-1
Top Three Wastewater Management Alternatives Meeting Current Effluent Standards

Study Area	First	Score	$/MO/EDU	$/YR/EDU	Second	Score	$/MO/EDU	Third	Score	$/MO/EDU
SA 1 - Stock Island	Collect/Treat	81	$56	$676	Cluster OWNRS	52	$97	OWNRS	43	$119
SA 2 - Big Coppitt et.al.	Collect/Treat	78	$101	$1,214	Cluster OWNRS	52	$143	OWNRS	42	$187
SA 3 - Bay Point	Collect/Treat	64	$99	$1,183	Cluster OWNRS	55	$94	OWNRS	40	$141
SA 4 - Lower Sugarloaf	Collect/Treat	69	$136	$1,629	Cluster OWNRS	55	$132	OWNRS	42	$186
SA 5 - Upper Sugarloaf	Collect/Treat	57	$148	$1,772	Cluster OWNRS	55	$121	OWNRS	40	$171
SA 6 - Cudjoe Key	Collect/Treat	74	$91	$1,091	Cluster OWNRS	54	$100	OWNRS	42	$140
SA 7 - Summerland Key	Collect/Treat	77	$119	$1,423	Cluster OWNRS	55	$142	OWNRS	42	$211
SA 8 - Big / Middle Torch	Cluster OWNRS	65	$128	$1,538	OWNRS	62	$212	Collect/Treat	50	$525
SA 9 - Ramrod Key	Collect/Treat	64	$143	$1,718	Cluster OWNRS	58	$141	OWNRS	43	$215
SA 10 - Little Torch Key	Collect/Treat	75	$123	$1,476	Cluster OWNRS	56	$126	OWNRS	42	$197
SA 11 - Big Pine Key	Collect/Treat	76	$109	$1,313	Cluster OWNRS	56	$128	OWNRS	42	$197
SA 11-1 - Big Pine Key Area 1	Collect/Treat	64	$130	$1,564	Cluster OWNRS	56	$130	OWNRS	43	$198
SA 11-2 - Big Pine Key Area 2	Collect/Treat	78	$112	$1,347	Cluster OWNRS	57	$128	OWNRS	42	$197
SA 11-3 - Big Pine Key Area 3	Collect/Treat	64	$176	$2,108	Cluster OWNRS	57	$130	OWNRS	43	$198
SA 12 - Bahia Honda/Ohio	Collect/Treat	67	$69	$828	OWNRS	40	$69	Cluster OWNRS	36	$72
SA 15 - Long Key / Layton	Collect/Treat	53	$121	$1,456	Cluster OWNRS	46	$115	OWNRS	42	$125
SA 16 - Lower Matecumbe Key	Collect/Treat	78	$110	$1,315	Cluster OWNRS	52	$155	OWNRS	42	$203
SA 17 - Upper Matecumbe Key	Collect/Treat	82	$74	$893	Cluster OWNRS	42	$166	OWNRS	40	$174
SA 18 - Windley Key	Collect/Treat	78	$55	$665	OWNRS	43	$125	Cluster OWNRS	41	$131
SA 19 - Plantation Key	Collect/Treat	82	$77	$927	Cluster OWNRS	51	$145	OWNRS	43	$182
SA 20 - Tavernier (PAED 15)	Collect/Treat	81	$64	$772	Cluster OWNRS	49	$100	OWNRS	40	$125
SA 21 - Rock Harbor (PAED 16)	Collect/Treat	82	$85	$1,022	Cluster OWNRS	52	$121	OWNRS	39	$169
SA 22 - Key Largo (PAED 17)	Collect/Treat	81	$82	$982	Cluster OWNRS	50	$122	OWNRS	42	$152
SA 23 - Key Largo (PAED 18)	Collect/Treat	82	$85	$1,016	Cluster OWNRS	55	$123	OWNRS	40	$185
SA 24 - Key Largo (PAED 19/20)	Collect/Treat	82	$80	$964	Cluster OWNRS	50	$133	OWNRS	42	$167
SA 25-1 - Key Largo (PAED 22, Area 1)	Cluster OWNRS	52	$509	$6,113	Collect/Treat	50	$580	OWNRS	44	$564
SA 25-2 - Key Largo (PAED 22, Area 2)	Collect/Treat	66	$74	$884	N/R	N/R	N/R	N/R	N/R	N/R
SA 26 - Key Largo (PAED 21)	Cluster OWNRS	57	$141	$1,690	OWNRS	56	$157	Collect/Treat	47	$227
SA 27 - Ocean Reef Club	Collect/Treat	80	$52	$623	Cluster OWNRS	52	$79	OWNRS	49	$87

APPENDIX E
EXHIBIT E-2
Combinations of Study Areas Significant to Formulating Master Plan Recommendations

Study Area Combinations		Wastewater System Design Flow	Monthly Cost per EDU by Combining	Weighted Study Area Monthly Cost per EDU	Cost Savings by Combining		
Nos.	Names	(mgd)	($/EDU/Mo)	($/EDU/Mo)(1)	Yes/No (2)	%(3)	Remarks
1, 2	Stock Island, Boca Chica	0.90	127	85	No	+69	Effluent disposal by shallow injection wells for both individual study areas and combination of study areas. If effluent disposal were by deep injection wells for combination of study areas, combination cost would increase by $14/EDU/Mo, or 49 percent greater than weighted monthly cost.
2, 3	Boca Chica, Bay Point	0.41	118	101	No	+17	
3, 4	Bay Point, Lower Sugarloaf	0.22	133	121	No	+10	
1, 2, 3, 4, 5, 6, 7	Stock Island, Boca Chica, Bay Point, Lower Sugarloaf, Upper Sugarloaf, Cudjoe, Summerland	1.27	147	100	No	+47	Effluent disposal by shallow injection wells for individual study areas. For combinations Florida Statute requires effluent disposal by deep injection wells. Deep injection wells increase annual costs by $438,000, or about $5/EDU/Mo.
3, 4, 5, 6, 7	Bay Point, Lower Sugarloaf, Upper Sugarloaf, Cudjoe, Summerland	0.71	119	110	No	+8	Effluent disposal by shallow injection wells for both individual study areas and combination of study areas. If effluent disposal were by deep injection wells for combination of study areas, combination cost would increase by $11/EDU/Mo, or 18 percent greater than weighted monthly cost.
5, 6, 7	Upper Sugarloaf, Cudjoe, Summerland	0.49	112	107	No	+5	
5, 6	Upper Sugarloaf, Cudjoe	0.33	102	102	-	0	
6, 7	Cudjoe, Summerland	0.41	105	102	No	+3	
9, 10, 11	Ramrod, Little Torch, Big Pine	0.81	112	115	Yes	-3	Effluent disposal by shallow injection wells for both individual study areas and combination of study areas. If effluent disposal were by deep injection wells for combination of study areas, combination cost would increase by $10/EDU/Mo, or 9 percent greater than weighted monthly cost.
9, 10	Ramrod, Little Torch	0.22	137	131	No	+4	
10, 11	Little Torch, Big Pine	0.72	108	112	Yes	-3	Effluent disposal by shallow injection wells for both individual study areas and combination of study areas. If effluent disposal were by deep injection wells for combination of study areas, combination cost would increase by $11/EDU/Mo, or 10 percent greater than weighted monthly cost.
16, 17, 18, 19	Lower Matecumbe, Upper Matecumbe, Windley, Plantation	1.49	80	79	No	+1	Wastewater treatment plant within service area. Effluent disposal by shallow injection wells for individual study areas. For combinations Florida Statute requires effluent disposal by deep injection wells. Deep injection wells increase annual costs by $438,000, or about $4/EDU/Mo.
17, 18, 19	Upper Matecumbe, Windley, Plantation	1.29	73	74	Yes	-1	Wastewater treatment plant within service area. Effluent disposal by shallow injection wells for individual study areas. For combinations Florida Statute requires effluent disposal by deep injection wells. Deep injection wells increase annual costs by $438,000, or about $5/EDU/Mo.
20, 21, 22, 23, 24	Tavernier (PAED 15), Rock Harbor (PAED 16), PAED 17, PAED 18, PAED 19/20	2.06	70	79	Yes	-11	Wastewater Treatment Plant within service area. Effluent disposal by shallow injection wells for individual study areas. For combinations Florida Statute requires effluent disposal by deep injection wells. Deep injection wells increase annual costs by $438,000, or about $3/EDU/Mo.
20, 21, 22, 23, 24	Tavernier (PAED 15), Rock Harbor (PAED 16), PAED 17, PAED 18, PAED 19/20	2.06	85	79	No	+8	Wastewater transmitted out of Keys to Miami-Dade
20, 21, 22, 23, 24, 27	Tavernier (PAED 15), Rock Harbor (PAED 16), PAED 17, PAED 18, PAED 19/20, Ocean Reef Club	2.38	112	79	No	+42	Wastewater transmitted to Ocean Reef Club. Effluent disposal by shallow injection wells for individual study areas. For combinations Florida Statute requires effluent disposal by deep injection wells. Deep injection wells increase annual costs by $438,000, or about $2/EDU/Mo.
17, 18, 19, 20, 21, 22, 23, 24	Upper Matecumbe, Windley, Plantation, Tavernier (PAED 15), Rock Harbor PAED 16), PAED 17, PAED 18, PAED 19/20	3.35	68	77	Yes	-12	Wastewater Treatment Plant within service area. Effluent disposal by shallow injection wells for individual study areas. For combinations Florida Statute requires effluent disposal by deep injection wells. Deep injection wells increase annual costs by $468,000, or about $2/EDU/Mo.

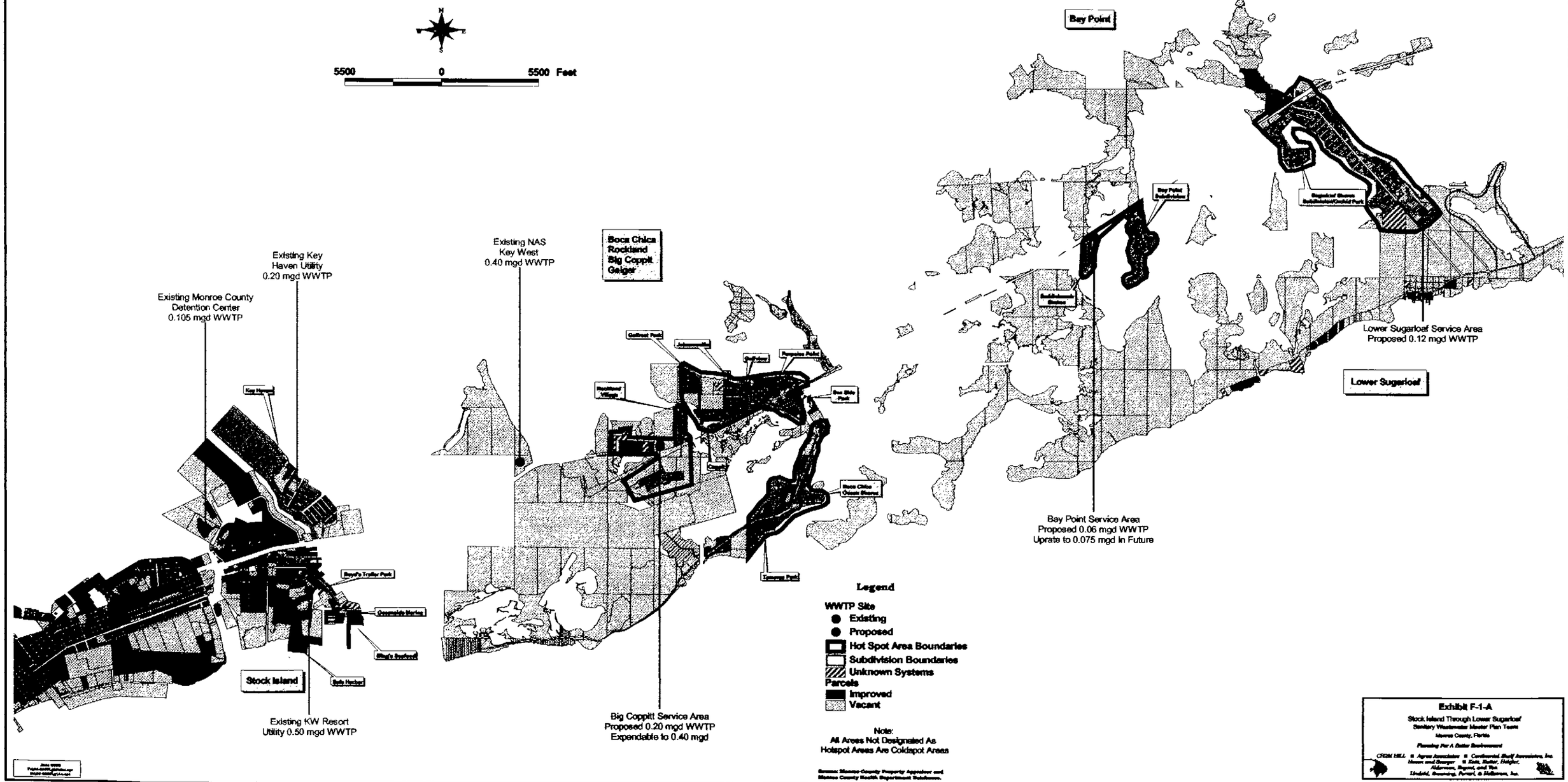
(1) Weighted study area monthly cost per EDU is calculated as the sum of products of the monthly cost per EDU for the study area times the EDUs for the study area, divided by the sum of the EDUs for all study areas being combined.

(2) For purposes of comparing alternatives, costs are considered significantly different if they differ by more than 10 percent. If costs are within 10 percent, they are considered the same.

(3) (-) denotes savings by combining
(+) denotes additional cost by combining

Appendix F

Hot Spot Areas and Community Wastewater Collection and Treatment System Service Areas



Hot Spot Areas and Community Wastewater Collection and Treatment System Service Areas

Summerland/Cudjoe/Upper Sugarloaf Regional Wastewater Management District

Big Pine Regional Wastewater Management District

Proposed 0.22 mgd Regional WWTP
Expandable to 0.66 mgd

Cudjoe Key

Upper Sugarloaf

Big Torch Key

Middle Torch Key

Ramrod Key

Little Torch Key

Summerland Key

Proposed 0.30 mgd Regional WWTP
Expandable to 0.90 mgd

Legend

WWTP Sites
- Existing
- Proposed

Hot Spot Area Boundaries
Subdivision Boundaries
Unknown Systems

Parcels
- Improved
- Vacant

Note:
All Areas Not Designated As Hotspot Areas Are Coldspot Areas

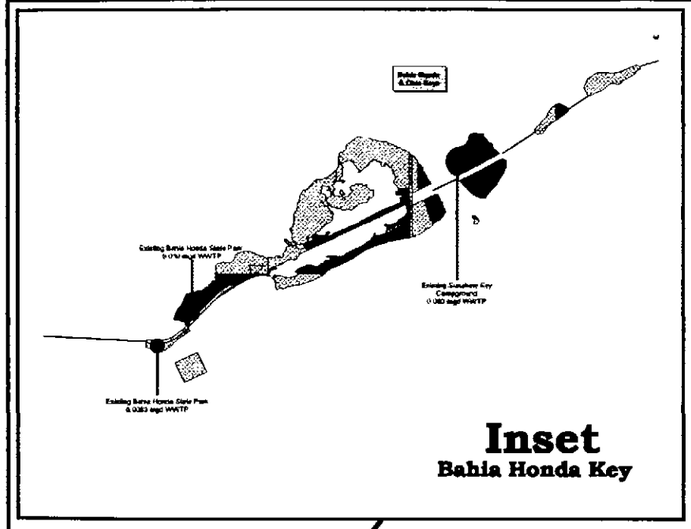
Source: Monroe County Property Appraiser and Monroe County Health Department Databases.

N W E S

5500 0 5500 Feet

Exhibit F-1-B
Upper Sugarloaf Through Big Pine
Sanitary Wastewater Master Plan Team
Monroe County, Florida
Planning For A Better Environment

Hot Spot Areas and Community Wastewater Collection and Treatment System Service Areas



Marathon Regional Wastewater Management District

Phase 3

Marathon Primary Service Area

Phase 2

Phase 3

Phase 3

Phase 1

Phase 3

Marathon Wastewater Management District
Proposed 1.0 mgd Regional WWTP
Expandable to 2.0 mgd

Existing Hawk's Cay Resort
0.196 mgd WWTP
Expand WWTP to 0.30 mgd
to Service Duck Key

Conch Key Service Area
Proposed 0.03 mgd WWTP

Marathon Primary & Secondary

5500 0 5500 Feet

Legend

WWTP Site
- Existing
- Proposed

Hot Spot Area Boundaries
Subdivision Boundaries
Unknown Systems

Parcels
- Improved
- Vacant

Note:
All Areas Not Designated As
Hotspot Areas Are Coldspot Areas

Source: Monroe County Property Appraiser and Monroe County Health Department Databases.

Exhibit F-1-C
Bahia Honda Through Marathon Secondary
Sanitary Wastewater Master Plan Team
Monroe County, Florida
Planning For A Better Environment
CH2M HILL & Agnoli Associates & Continental Shelf Associates, Inc.
Steven and Bouquet & Katz, Bakker, Halpern, Alderman, Bryant, and Yon
Lochtefeld, Hemmeling, Pierrot, & Hallstrom, Inc.

Hot Spot Areas and Community Wastewater Collection and Treatment System Service Areas

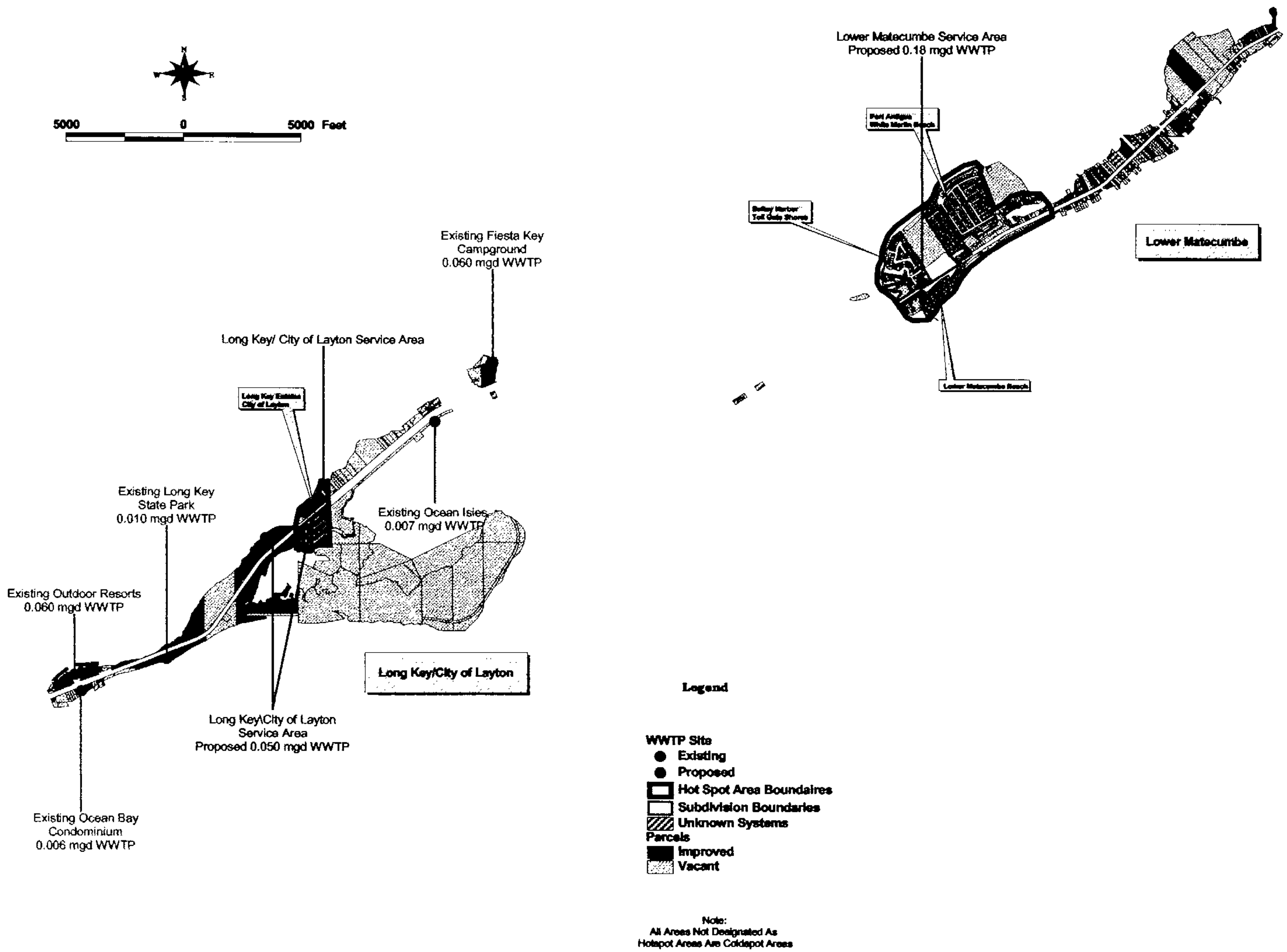


Exhibit F-1-D

Long Key/Layton Through Lowe Matecumbe

Hot Spot Areas and Community Wastewater Collection and Treatment System Service Areas

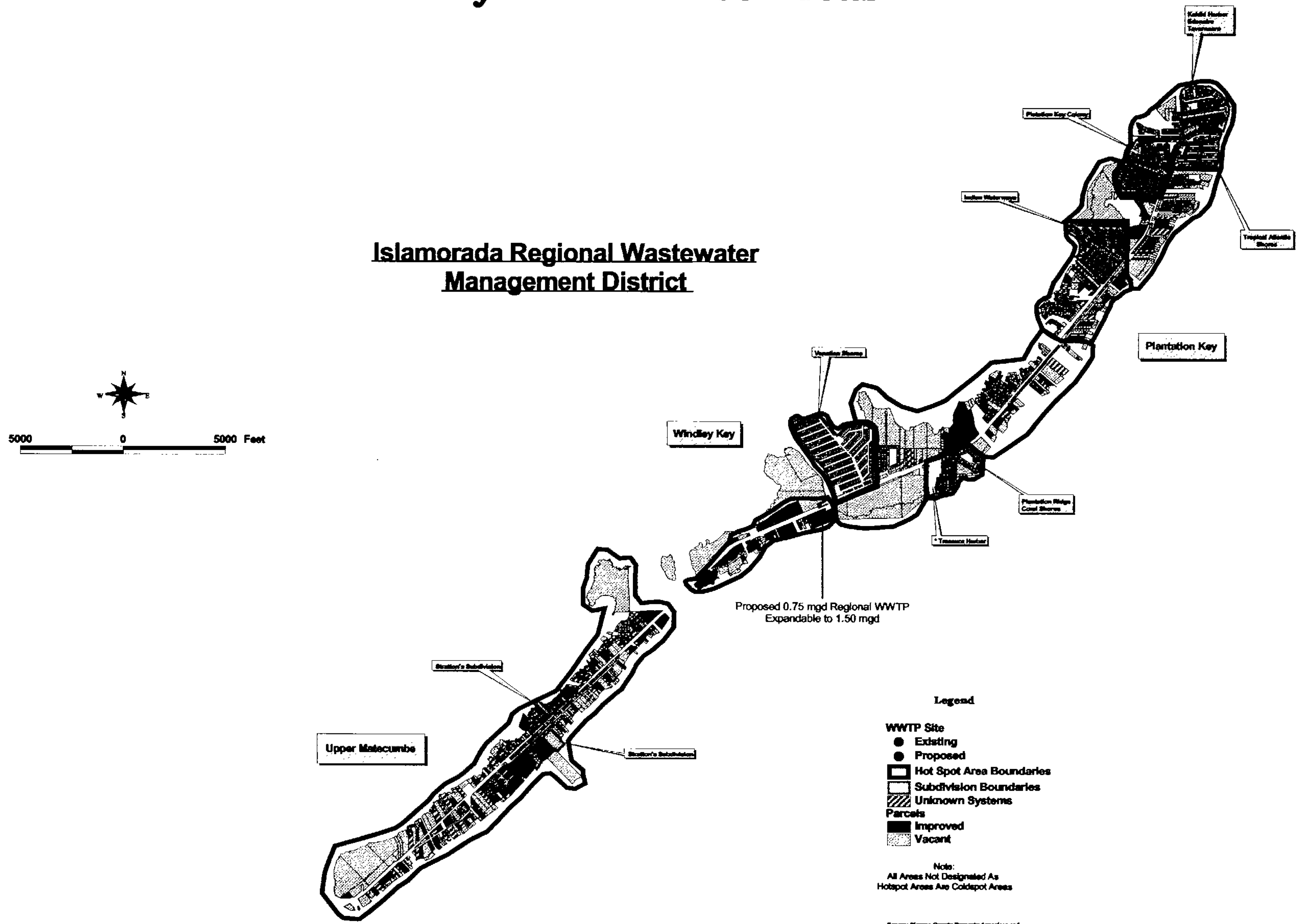
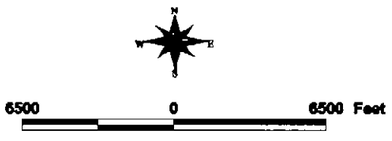


Exhibit F-1-E

Upper Matecumbe Through Plantation Key

Hot Spot Areas and Community Wastewater Collection and Treatment System Service Areas

Tavernier\Key Largo Regional Wastewater Management District



* Note: GIS parcel data missing for portions of Buttonwood Acres, Key Largo Park and Point Pleasant Subdivisions.

Legend

WWTP Site
- Existing
- Proposed

Hot Spot Area Boundaries
Subdivision Boundaries
Unknown Systems

Parcels
- Improved
- Vacant

Note:
All Areas Not Designated As Hotspot Areas Are Coldspot Areas

Source: Monroe County Property Appraiser and Monroe County Health Department Databases.

Exhibit F-1-F
PAED 16 Through PAED 20
Sanitary Wastewater Master Plan Team
Monroe County, Florida
Planning For A Better Environment

Hot Spot Areas and Community Wastewater Collection and Treatment System Service Areas

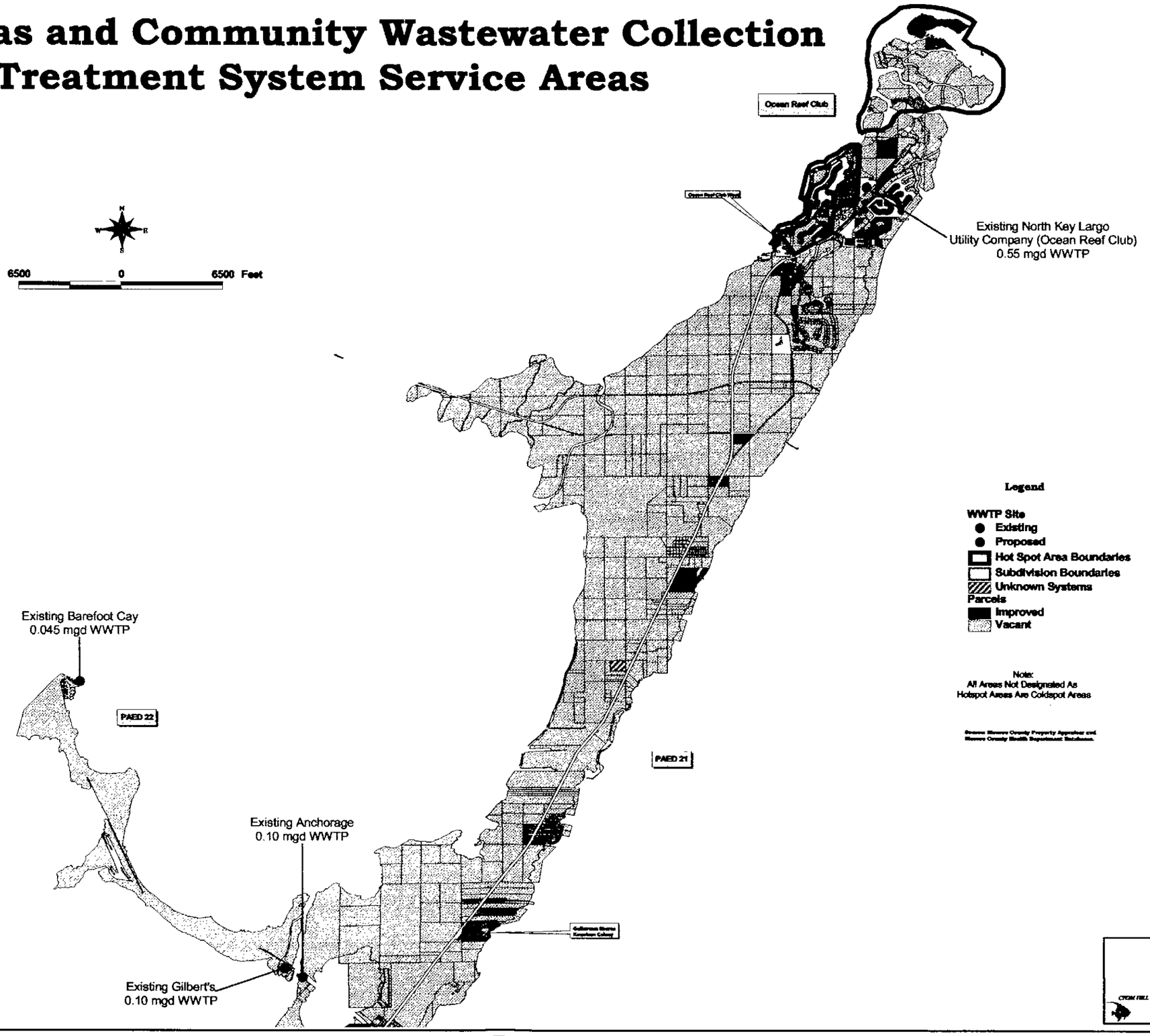


Exhibit F-1-G
PAED 21, 22, and Ocean Reef Club
Sanitary Wastewater Master Plan Team
Monroe County, Florida
Planning For A Better Environment

APPENDIX F
EXHIBIT F-2
Hot Spot Areas and Community Wastewater Collection and Treatment System Service Areas

Study Area No.	Study Area Name	Wastewater Service Area	Hot Spot Area Name	No. EDUs	Wastewater Flow (mgd) ADF	Wastewater Flow (mgd) WWTP Design Flow	Total Project Cost for Community Wastewater System(1)	Estimated Annual Cost for Community Wastewater System(1)	Monthly User Charge ($/EDU)(2)	Estimated No. of Unknown Systems	Hot Spot Area Rank Entire Keys	Hot Spot Area Rank By Region	Remarks
	LOWER KEYS												
1	Stock Island	KW Resort Utility	Unsewered K.W. Resort Utility Resort Area	988			$3,082,000 (3)	$415,000 (4)	$35 (5)	82	3	1	Extend wastewater service to unsewered areas of KW. Resort Utility franchise area.
2	Boca Chica	Boca Chica	Coppitt/Johnsonville/Gulfview Porpoise Point/Gulfrest Park and adjacent area along U.S. 1	983	0.15	0.20	$11,600,000	$1,262,000	$107	290	5	2	Construct 0.2 mgd WWTP expandable to o.40 mgd. See Exhibit F-3. Could negotiate with NAS Key West for capacity/ expansion of their WWTP. Could also negotiate with KW Resort Utilities and determine if more cost effective to transmit and discharge to their facility than to construct a new WWTP. These values represent a new WWTP.
2	Boca Chica		Rockland Key	237	0.04	0.06	$3,140,000	$336,000	$118	36	41	14	
2	Boca Chica		Boca Chica Ocean Shores, Tamarac Park	305	0.04	0.06	$4,040,000	$434,000	$119	10	43	16	
3	Bay Point	Bay Point	Bay Point Subdivision and Saddlebunch Shores	320	0.04	0.052	$4,000,000	$471,000	$123	105	6	3	Serve both Bay Point and Saddlebunch Shores. Provide 0.06 mgd WWTP, capable of uprating to 0.075 mgd, for this service area.
4	Lower Sugarloaf	Lower Sugarloaf	Sugarloaf Shores, Orchid Park, adjacent area along U.S. 1	599	0.11	0.15	$9,349,000	$1,070,000	$149	49	44	17	Provide 0.12 mgd WWTP for this service area.
5	Upper Sugarloaf	Summerland/Cudjoe/ Upper Sugarloaf Regional	Indian Mound Estates, Gulf Shores, Vacation Harbour	176	0.03	0.04	$2,890,000	$298,000	$141	52	31	11	Provide initial 0.22 mgd expandable to 0.66 mgd for this regional service area. See Exhibit F-4.
6	Cudjoe		Cutthroat Harbor Estates, Cudjoe Ocean Shores	660	0.08	0.11	$10,740,000	$1,107,000	$140	58	28	10	
6	Cudjoe		Cudjoe Gardens	250	0.03	0.04	$4,080,000	$424,000	$142	77	36	12	
7	Summerland		Summerland Key Cove/Summerland Cove Isle	772	0.12	0.16	$12,869,000	$1,327,000	$143	141	23	7	
9	Ramrod	Big Pine Regional	Breezeswept Beach Estates, Ramrod Shores, Ramrod Shores Marina, and area along U.S. 1	445	0.07	0.09	$6,690,000	$702,000	$131	56	39	13	Provide initial 0.30 mgd WWTP, expandable to 0.80 mgd for this reginal service area. See Exhibit F-5.
10	Little Torch		Coral Shores, Windward Beach Estates, Mates Beach, Jolly Roger Estates, and area east of Mate's Beach south to Jolly Roger Estates	633	0.10	0.13	$9,870,000	$1,022,000	$134	157	16	6	
11	Big Pine		Whispering Pines (s)/Sands/Grieser/Ross Haven/Pat&Mary/Big Pine Cove, and adacent adjacent area along U.S. 1	842	0.11	0.15	$11,000,000	$1,159,000	$115	365	8	4	
11	Big Pine		Doctor's Arm/Lambert/Tropical Bay, Palma Villa, Whispering Pines (N)	496	0.07	0.09	$6,490,000	$688,000	$116	164	11	5	
11	Big Pine		Big Pine Key, Inc., Tropical Key Colony, Pine Channel Estates, Cahill Pines & Palms, and adjacent area along U.S. 1	665	0.09	0.12	$9,400,000	$971,000	$122	70	26	9	
11	Big Pine		Eden Pines Colony	478	0.06	0.09	$6,980,000	$724,000	$126	67	25	8	
11	Big Pine		Port Pine Heights	283	0.04	0.05	$4,010,000	$419,000	$123	42	42	15	
	MIDDLE KEYS												
12	Marathon Primary	Marathon	Little Venice (Phase I)	574	0.10	0.14	$8,600,000	$750,000	$109	330	1	1	Provide community wastewater collection system with interim 0.14 mgd WWTP.
		Marathon	Remainder of Regional System (Phase III)	4,210	0.70	0.85	$30,202,000	$3,613,000	$72	118	34	4	Expand regional WWTP to 2.0 mgd.
		Marathon	Phased Regional System (Phase II)	3,440	0.55	0.70	$35,480,000	$4,229,000	$102	1,500	13	3	Provide initial 1.0 mgd WWTP, expandable to 2.0 mgd, for this regional service area.
			...ein's Subdivision and area adjacent to U.S. 1	639	0.12	0.15	$5,200,000	$713,000	$93	93	35	5	Wastewater treatment provided by Marathon Regional System.
			...er Island, Yacht Club Island, Plantation Island (Duck Key)	312	0.07	0.10	$5,500,000	$894,000	$185	60	40	6	Wastewater treatment provided by Hawk's Cay WWTP. Expand Hawk's Cay WWTP from 0.196 mgd to 0.30 mgd and upgrade to AWT.
			...ch Key	102	0.02	0.03	$1,750,000	$241,000	$197	45	10	2	Provide 0.03 mgd WWTP for this service area.
			...g Key Estates, City of Layton, ...a adjacent to U.S. 1	296	0.03	0.05	$3,540,000	$429,000	$121	4	45	7	Provide 0.05 mgd WWTP for this service area.
			...afety Harbor, Toll Gate Shore, Port ...ntigua, White Marlin Beach, Matecumbe ...Sandy Beach, Lower Matecumbe Beach	726	0.11	0.15	$8,900,000	$1,020,000	$117	118	18	9	Provide 0.18 mgd WWTP for this service area.
			Entire Study Area	2,169	0.36	0.49	$16,313,000	$1,936,000	$74	213	22	13	Provide initial 0.75 mgd WWTP, expandable to 1.50 mgd, for this regional service area. Connect all package plants in this Hot Spot area.
			Entire Study Area	842	0.13	0.17	$4,402,000	$560,000	$55	4	33	18	Connect all package plants in this Hot Spot area.
			Area A - Eastern end of Plantation Key including Plantation Key Colony/Kahiki Harbor/ Edemaire/Tavernaero/Tropical Atlantic Shores	940	0.15	0.20	$12,279,000	$1,322,000	$117	305	14	6	Connect package plants once all Hot Spot areas on Plantation Key are served.
			Venetian Shores	342	0.05	0.07	$5,050,000	$580,000	$141	63	30	17	Connect package plants once all Hot Spot areas on Plantation Key are served.
			Indian Waterways, Indian Harbor, Plantation Key, Lysiloma, Key Heights, Vacation Village, Aargood Heights, Pearl City	788	0.12	0.17	$9,340,000	$1,040,000	$110	59	37	20	Connect package plants once all Hot Spot areas on Plantation Key are served.
			Treasure Harbor, Plantation Ridge Coral Shores	122	0.02	0.03	$2,600,000	$313,000	$214	45	34	19	Connect package plants once all Hot Spot areas on Plantation Key are served.
			Remainder of Plantation Key	1,815	0.29	0.33	$16,790,000	$2,110,000	$97	87	38	21	Connect all package plants on Plantation Key.
		...po	Old Tavernier	1,187	0.15	0.17	$14,000,000	$1,395,000	$98	110	24	14	See Exhibit F-6.
			Harris Ocean Park, Palma Sola, Sherrill Park, Hammer Point Park, and along U.S. 1	661	0.08	0.11	$8,600,000	$930,000	$117	212	12	5	Provide community wastewater collection system with interim 0.12 mgd WWTP. See Exhibit F-6.
			Area A, Wynken, Blyken & Nod	109	0.012	0.017	$1,673,000	$217,800	$166	62	9	4	Connect to one of two adjacent existing WWTPs, each of which appears to have adequate excess capacity to serve this Hot Spot.
			Bay Haven, Lime Grove Estates, Sunrise Point, Abode Casa Court, Seven Acres, Sunset Gardens, Dove Creek	505	0.06	0.07	$6,050,000	$611,000	$101	129	21	12	
			Port Largo, Key Largo Beach, Key Largo Ocean Shores, Silver Lake Park, Holiday Homesites, Buttonwood Shores, Buttonwood Cover, Lazy Lagoon, Point Pleasant Sunset Cove	1,210	0.19	0.22	$15,200,000	$1,550,000	$107	191	17	8	
			Pirate's Cove, Rock Harbor Estates, Marion Park, Rock Harbor Manor, Harbor Shores, El Dorado	890	0.14	0.16	$10,490,000	$1,064,000	$100	120	20	11	
			Sunset Waterways, Key Largo Park	367	0.09	0.12	$4,410,000	$438,000	$99	40	27	15	
			Bahia Mar Estates/Pamela Villa/Winston Waterways	314	0.04	0.05	$3,920,000	$398,000	$106	63	19	10	

APPENDIX F
EXHIBIT F-2
Hot Spot Areas and Community Wastewater Collection and Treatment System Service Areas

Study Area No.	Study Area Name	Wastewater Service Area	Hot Spot Area Name	No. EDUs	Wastewater Flow (mgd) ADF	Wastewater Flow (mgd) WWTP Design Flow	Total Project Cost for Community Wastewater System(1)	Estimated Annual Cost for Community Wastewater System(1)	Monthly User Charge ($/EDU)(2)	Estimated No. of Unknown Systems	Hot Spot Area Rank Entire Keys	Hot Spot Area Rank By Region	Remarks
22	PAED 17		Sunset Waterways, Key Largo Park	367	0.09	0.12	$4,410,000	$438,000	$99	40	27	15	
23	PAED 18		Bahia Mar Estates/Pamela Villa/Winston Waterways	314	0.04	0.05	$3,920,000	$398,000	$106	63	19	10	
23	PAED 18		Key Largo Trailer Village, Largo Gardens, Gardens, Hibiscus Park and area adjacent to U.S. 1	904	0.12	0.16	$10,270,000	$1,107,000	$102	520	4	2	Provide community wastewater collection system with interim 0.165 mgd WWTP. See Exhibit F-6.
23	PAED 18		Cross Key Waterway Estates & Largo Sound Park/Anglers Park Shores/South Creek Village and area along U.S. 1	775	0.10	0.14	$9,700,000	$1,030,000	$111	285	7	3	Provide community wastewater collection system with interim 0.140 mgd WWTP. See Exhibit F-6.
23	PAED 18		Bermuda Shores, Twin Lakes	296	0.04	0.05	$3,530,000	$350,000	$98	54	29	16	
24	PAED 19/20		Lake Surprise/Sexton Cove, Ocean Isle Estates, and adjacent area on U.S. 1	858	0.12	0.17	$11,000,000	$1,163,000	$113	389	2	1	Provide community wastewater collection system with interim 0.165 mgd WWTP. See Exhibit F-6.
24	PAED 19/20		Remainder of PAED 19/20 - Stillwright Point/ Paradise Point Cove, Riviera Village, Key Largo Mobile Home Sites, Largo City	1,722	0.31	0.36	$23,290,000	$2,395,000	$116	292	15	7	Initiate regional AWT WWTP. Construct 1.50 mgd facility expandable to 2.25 mgd. See Exhibit F-6.

(1) For wastewater service areas serving two or more Hot Spot areas, the Total Project Cost and The Estimated Annual Cost for a given Hot Spot area are prorated amounts (based on EDUs) of the costs incurred for the entire service area at the time the Hot Spot area is served.

(2) For wastewater service areas serving two or more Hot Spot areas, the user charge shown for a given Hot Spot area is the user charge calculated for the entire service area at the time the Hot Spot area is served.

(3) Net after connection fees of $2,668,000 (988 EDU x $2,700/EDU = $2,667,600) deducted.

(4) Equals product of monthly user charge and No. EDUs = $35 x 12 x 988 = $414,960.

(5) Monthly user charge for franchise area.

(6) Service area expanded to adjacent areas.

(7) Provide a small community wastewater collection and treatment system to serve thisHot Spot area intially. When regional WWTP becomes available to serve this area, connect to the regional treatment facility, decommission the small WWTP, and relocate it elsewhere.

(8) This community wastewater collection sysem with interim WWTP will remain as an operating small community wastewater treatement system after the regional WWTP becomes operational, until such time as additional Hot Spot aeas to the west of the regional WWTP are served.

APPENDIX F
EXHIBIT F-3
Boca Chica Community System Service Area Phasing

Service Area Phase	Project Description	Hot Spot Rank Within Region	Project Contribution								WWTP Capacity (mgd)		Total Project Cost Collection, Transmission & Treatment			Annual O & M			Total Annual Cost ($)	Cost Per EDU	
			ADF (mgd)		WWTP Design Capacity (mgd)		EDU		Unknown Systems							Vacuum Stat		WWTP			
			Project	Cumul	Project	Cumul	Project	Cumul	Project	Cumul	Phase Design Capacity	Cumul	Project	Cumul	Cumul Costs Annualized	Project	Cumul			Annual ($)	Monthly ($/EDU)
1	Coppitt, Johnsonville, Gulfview, Porpoise Point, Gulfrest Park, and adjacent area along U.S. 1	2	0.146	0.146	0.20	0.20	983	983	290	290	0.2	0.2	$11,600,000	$11,600,000	$1,011,000	41,000	41,000	210,000	$1,262,000	$1,284	$107
2	Rockland Key, including Rockland Village	14	0.035	0.181	0.05	0.25	237	1,220	36	326	0.2	0.4	$4,570,000	$16,170,000	$1,410,000	29,000	70,000	250,000	$1,730,000	$1,418	$118
3	Boca Chica Ocean Shores,	16	0.045	0.226	0.06	0.31	305	1,525	10	336	-	0.4	$4,100,000	$20,270,000	$1,767,000	33,000	93,000	311,000	$2,171,000	$1,424	$119
4	Connect all Existing WWTPs to	--	0.025	0.251 [1]	0.04	0.35 [1]	168	1,693	0	336	-	0.4	$200,000	$20,470,000	$1,784,000	1,000	94,000	354,000	$2,232,000	$1,319	$110

[1] Flow contributions maintained at 1998 levels as the rate of implementation over the 20-year planning period is unknown.
Wastewater flows in this service area are projected to increase about 15% over the 20-year planning period 1998 - 2018.
Thus, the 0.251 mgd ADF would be about 0.29 mgd in 2018, and the 0.35 mgd WWTP flow would be about 0.40 mgd in 2018.

APPENDIX F
EXHIBIT F-4
Sumerland, Cudjoe, Upper Sugarloaf Regional Wastewater Management District Phasing

Service Area Phase	Project Description	Hot Spot Rank Within Region	Project Contribution								WWTP Capacity (mgd)		Total Project Cost Collection, Transmission & Treatment			Annual O & M			Total Annual Cost ($)	Cost Per EDU	
			ADF (mgd)		WWTP Design Capacity (mgd)		EDU		Unknown Systems							Vacuum Stat		WWTP			
			Project	Cumul	Project	Cumul	Project	Cumul	Project	Cumul	Phase Design Capacity	Cumul	Project	Cumul	Cumul Costs Annualized	Project	Cumul			Annual ($)	Monthly ($/EDU)
1	Provide WW Collection Servic to Summerland Key, including Summerland Key Fisheries, Summerland Cove Isle, Summerland Key Cove. Summerland Land Estates, Summerland Beach, Summerland Key Gardens, Snug Harbor, and Construct Phase 1 WWTP	7	0.12	0.12	0.16	0.16	772	772	141	141	0.22	0.22	$12,860,000	$12,860,000	$1,121,000	46,000	46,000	160,000	$1,327,000	$1,719	$143
2	Provide WW Collection Servic to Cutthroat Harbor, Cudjoe Ocean Shores and Construct Phase 2 WWTP	10	0.08	0.20	0.11	0.27	660	1,432	62	203	0.22	0.44	$10,420,000	$23,280,000	$2,030,000	50,000	96,000	276,000	$2,402,000	$1,677	$140
3	Provide WW Collection Service to Vacation Harbor, Indian Mount Estates, Gulf Shores	11	0.03	0.23	0.04	0.31	176	1,608	52	255	-	0.44	$3,125,000	$26,405,000	$2,303,000	27,000	123,000	300,000	$2,726,000	$1,695	$141
4	Provide WW Collection Service to Cudjoe Gardens	12	0.03	0.26	0.04	0.35	250	1,858	30	285	-	0.44	$3,925,000	$30,330,000	$2,645,000	35,000	158,000	356,000	$3,154,000	$1,700	$142
5	Connect all Existing WWTPs t System and Construct Phase 5 WWTP	--	0.075	0.335 (1)	0.10 (1)	0.46	615	2,473	--	285	0.22	0.66	$4,000,000	$34,330,000	$2,994,000	10,000	168,000	463,000	$3,625,000	$1,466	$122

[1]Flow contributions maintained at 1998 levels as the rate of implementation over the 20-year planning period is unknown.
Wastewater flows in this regional service area are projected to increase about 43% over the 20-year planning period 1998 - 2018.
Thus, the 0.335 mgd ADF would be about 0.48 mgd in 2018, and the 0.46 mgd WWTP flow would be about 0.66 mgd in 2018.

APPENDIX F
EXHIBIT F-5
Big Pine Key Regional Wastewater Management District Phasing

Service Area Phase	Project Description	Hot Spot Rank Within Region	Project Contribution								WWTP Capacity (mgd)		Total Project Cost Collection, Transmission & Treatment			Annual O & M			Total Annual Cost ($)	Cost Per EDU	
			ADF (mgd)		WWTP Design Capacity (mgd)		EDU		Unknown Systems							Vacuum Stat					
			Project	Cumul	Project	Cumul	Project	Cumul	Project	Cumul	Phase Design Capacity	Cumul	Project	Cumul	Cumul Costs Annualized	Project	Cumul	WWTP		Annual ($)	Monthly ($/EDU)
1	Provide WW Collection Service to Sands, Whispering Pines (S) Grieser Ross Haven, Pat & Mary, Big Pine Cove and adjacent U. S. 1 and Construct Phase 1 WWTP	4	0.11	0.11	0.15	0.15	842	842	365	365	0.30	0.30	$11,000,000	$11,000,000	$959,000	40,000	40,000	160,000	$1,159,000	$1,376	$115
2	Provide WW Collection Service to Doctor's Arm, Lambert Tropical Bay, Palma Villa, Whispering Pines (N) and Construct Phase 2 WWTP	5	0.065	0.175	0.09	0.24	496	1,338	164	529	-	0.30	$6,500,000	$17,500,000	$1,526,000	38,000	78,000	251,000	$1,855,000	$1,386	$116
3	Provide WW Collection Service to Little Torch - Coral Shores Estates, Torch Wood, Gato Farm, Windward Beach Estates, The Ladies Acre, Mate's Beach, Barry Beach, Jolly Roger Estates - and Construct Phase 3 WWTP	6	0.097	0.272	0.130	0.37	633	1,971	157	686	0.30	0.60	$13,240,000	$30,740,000	$268,000	45,000	123,000	379,000	$3,182,000	$1,614	$134
4	Provide WW Collection Service to Eden Pines Colony	8	0.063	0.335	0.085	0.45	478	2,449	67	753	-	0.60	$5,000,000	$35,740,000	$3,116,000	54,000	139,000 (1)	453,000	$3,708,000	$1,514	$126
5	Provide WW Collection Service to Big Pine Key, Inc., Tropical Key Colony, Pine Channel Estates, Cahill Pines & Palms and adjacent area along U.S. 1 and Construct Phase 5 WWTP	9	0.088	0.423	0.118	0.57	665	3,114	70	823	0.30	0.90	$8,300,000	$44,040,000	$3,839,000	43,000	182,000	525,000	$4,546,000	$1,460	$122
6	Provide WW Collection contract Service to Ramrod - Breezeswept Beach Estates, Ramrod Shores, Ramrod Shores Marina	13	0.067	0.490	0.090	0.66	445	3,559	56	879	-	0.90	$6,690,000	$50,730,000	$4,423,000	39,000	221,000	583,000	$5,227,000	$1,469	$123
7	Provide WW Collection Service to Port Pine Heights	15	0.04	0.53	0.05	0.72	283	3,842	24	903	-	0.90	$4,750,000	$55,480,000	$4,837,000	35,000	256,000	592,000	$5,685,000	$1,480	$123
8	Connect all existing WWTPs to system	--	0.055	0.585 (2)	0.07	0.79 (2)	418	4,260	--	903	-	0.90	$400,000	$55,880,000	$4,872,000	25,000	281,000	622,000	$5,775,000	$1,356	$113

[1]O&M for Doctor's Arm Vacuum Station Deleted as same station serves both project areas.

[2]Flow contributions maintained at 1998 levels as the rate of implementation over the 20-year planning period is unknown.
Wastewater flows in this regional service area are projected to increase about 13% over the 20-year planning period 1998 - 2018.
Thus, the 0.585 mgd ADF would be about 0.66 mgd in 2018, and the 0.79 mgd WWTP flow would be about 0.90 mgd in 2018.

APPENDIX F
EXHIBIT F-6
Tavernier/Key Largo Regional Wastewater Management District Phasing

Service Area Phase	Project Description	Hot Spot Rank Within Region	Project Contribution								WWTP Capacity (mgd)		Total Project Cost Collection, Transmission & Treatment			Annual O & M			Total Annual Cost ($)	Cost Per EDU	
			ADF (mgd)		WWTP Design Capacity (mgd)		EDU		Unknown Systems							Vacuum Stat		WWTP			
			Project	Cumul	Project	Cumul	Project	Cumul	Project	Cumul	Phase Design Capacity	Cumul	Project	Cumul	Cumul Costs Annualized	Project	Cumul			Annual ($)	Monthly ($/EDU)
1	Lake Surprise/Sexton Cove, Ocean Isle Estates, and area adjacent to U.S. 1[1]	1	0.123		0.165		858		389	389			$11,000,000			40,000					
2	Key Largo Trailer Village, Largo Gardens, Hibiscus Park, and area adjacent ot U.S. 1[1]	2	0.121		0.164		904		520	909			$10,270,000			40,000					
3	Cross Key Waterway Estates, Largo Sound Park, Anglers Park Shores, south Creek Village, and area adjacent to U.S. 1[1]	3	0.104		0.140		775		285	1,194			$9,700,000			40,000					
6	Remainder of PAED 19/20 - Stillwright Point, Paradise Point Cove, Riviera Village, Key Largo Mobile Home Sites, Largo City Also includes the construction of the first phase of the regional wastewater transmission and treatment facility	7	0.314	0.662	0.050	0.810	1,722	4,259	292	1,486	1.50	1.50	$9,778,000 $16,867,000	$40,748 $57,615,000	$5,023,000	50,000 --	170,000 --	730,000	$5,923,000	$1,391	$116
7	Port Largo, Key Largo Beach, Key Largo Ocean Shores, Silver Lake Park, Holiday Homesites, Buttonwood Shores, Buttonwood Cove, Lazy Lagoon, Point Pleasant Sunset Cove	8	0.188	0.85		0.98	1,210	5,469	191	1,677		1.50	$11,100,000	$68,715,000	$5,990,000	50,000	220,000	800,000	$7,010,000	$1,282	$107
8	Bahia Mar Estates, Pamela Villa, Winston Waterways	10	0.042	0.892		1.02	314	5,783	63	1,740		1.50	$3,500,000	$72,215,000	$6,296,000	5,000	225,000	820,000	$7,341,000	$1,269	$106
9	Pirate's Cove, Rock Harbor Estates, Marion Park, Rock Harbor Manor Harbor Shores, Eldorado	11	0.138	1.03		1.18	890	6,673	120	1,860		1.50	$6,440,000	$78,655,000	$6,857,000	42,000	267,000	850,000	$7,974,000	$1,195	$100
10	Bay Haven, Lime Grove Estates, Sunrise Point, Abode Casa Court, Seven Acres, Sunset Gardens, Dove Creek	12	0.058	1.088		1.25	505	7,178	129	1,989		1.50	$7,290,000	$85,945,000	$7,493,000	46,000	313,000	880,000	$8,686,000	$1,210	$101
5A	Deactivate Harris Ocean Park, Palma Sola, Sherrill Park, Hammer Point Park Community WWTP and connect into Regional System[1]	5	0.083	1.171		1.35	661	7,839	212	2,201		1.50	$8,600,000	$94,545,000	$8,242,000	40,000	353,000	900,000	$9,495,000	$1,211	$101
11	Old Tavernier	14	0.148	1.319		1.52	1,187	9,026	110	2,311	0.75	2.25	$11,950,000	$106,495,000	$9,284,000	43,000	396,000	925,000	$10,605,000	$1,175	$98
12	Sunset Waterways, Key Largo Park	15	0.088	1.376		1.58	367	9,393	40	2,351		2.25	$6,400,000	$112,895,000	$9,842,000	42,000	438,000	935,000	$11,215,000	$1,194	$99
13	Bermuda Shores, Twin Lakes	16	0.040	1.416		1.63	296	9,680	54	2,405		2.25	$2,500,000	$115,395,000	$10,060,000	5,000	443,000	950,000	$11,453,000	$1,183	$98
14	Existing WWTPs	--	0.374	1.79 [2]		2.06 [2]	2,746	12,435	--	2,405		2.25	$2,300,000	$117,695,000	$10,261,000	57,000	500,000	1,100,000	$11,861,000	$954	$79

[1]Community wastewater collection and treatment system will serve this Hot Spot area initally, until regional system becomes available to serve this area.

[2]Flow contributions maintained at 1998 levels as the rate of implementation over the 20-year planning period is unknown.
Wastewater flows in this regional service area are projected to increase about 9-1/2% over the 20-year planning period 1998 - 2018.
Thus, the 1.79 mgd ADF would be about 1.96 mgd in 2018, and the 1.99 mgd WWTP flow would be about 2.25 mgd in 2018.