RUTLEDGE, ECENIA & PURNELL
PROFESSIONAL ASSOCIATION
ATTORNEYS AND COUNSELORS AT LAW

STEPHEN A. ECENIA
RICHARD M. ELLIS
JOHN M. LOCKWOOD
MARTIN P. McDONNELL
J. STEPHEN MENTON

POST OFFICE BOX 551, 32302-0551
119 SOUTH MONROE STREET, SUITE 202
TALLAHASSEE, FLORIDA 32301-1841

TELEPHONE (850) 681-6788
TELECOPIER (850) 681-6515

R. DAVID PRESCOTT
HAROLD F. X. PURNELL
MARSHA E. RULE
GARY R. RUTLEDGE
MAGGIE M. SCHULTZ

GOVERNMENTAL CONSULTANTS
JONATHAN M. COSTELLO
MARGARET A. MENDUNI

RECEIVED-FPSC
09 DEC 17 AM 11: 33
COMMISSION CLERK

December 17, 2009

Ms. Ann Cole, Director
Commission Clerk and Administrative Services
Florida Public Service Commission
2540 Shumard Oak Boulevard
Betty Easley Conference Center
Room 110
Tallahassee, FL 32399-0850

HAND DELIVERY

Re: Docket No. 090189-SU

Dear Ms. Cole:

Enclosed for filing on behalf of Water Management Services, Inc. ("WMSI") are the original and five copies of a Notice of Dismissal.

Please acknowledge receipt of these documents by stamping the extra copy of this letter "filed" and returning the copy to me.

Thank you for your assistance with this filing.

Sincerely,

Marsha E. Rule

MER/rl
Enclosures
F:\USERS\ROXANNE\wmsi\Cole.dec 17 09.wpd

COM ___
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FPSC-COMMISSION CLERK

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Application for Original Certificate for a Proposed Wastewater System and Request for Bifurcation by Water Management Services, Inc.	))))))	Docket No. 090189-SU Filed: December 17, 2009

NOTICE OF DISMISSAL

Water Management Services, Inc. ("WMSI"), by and through its undersigned counsel, hereby withdraws and dismisses the above-referenced application for an original certificate to provide wastewater service on St. George Island, Florida, and states as follows:

1. On April 15, 2009, WMSI filed its application to provide wastewater treatment service to the commercial section of St. George Island, Florida. Although the Franklin County Board of County Commissioners had requested proposals to provide wastewater service to St. George Island, and although many potential customers requested WMSI to provide wastewater service to the commercial area of the Island, and although a majority of the private wastewater treatment systems in WMSI's proposed service territory that were reviewed by the Department of Health in the first half of this year failed to pass inspection, Franklin County has announced its opposition to WMSI's proposed wastewater treatment system project and requested WMSI to withdraw its application. A copy of the County's request is attached hereto as Exhibit "A."

2. As more fully set forth in WMSI's letter to the Franklin County Board of County Commissioners dated November 17, 2009, a copy of which is attached hereto as Exhibit "B", WMSI continues to believe that the need for central wastewater treatment for the commercial area of St. George Island is critically needed. However, WMSI cannot fund protracted litigation

over this matter, and therefore is withdrawing its application solely as a result of Franklin County's opposition.

Respectfully submitted this 17th day of December, 2009.

Marsha E. Rule, Esq.
Rutledge, Ecenia & Purnell, P.A.
P. O. Box 551
Tallahassee, Florida 32302
marsha@reuphlaw.com
(850) 681-6788 (Telephone)
(850) 681-6515 (Telecopier)

Attorneys for Water Management Services, Inc.

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a copy of the foregoing was furnished by U.S. Mail and where indicated, by email (without attachments), to the following persons this 17th day of December, 2009:

Anna Williams, Esq.
Jennifer Brubaker, Esq.
Florida Public Service Commission
2540 Shumard Oak Blvd.
Tallahassee, FL 32399-0850
Email: anwillia@psc.state.fl.us
jbrubake@psc.state.fl.us

Stephen C. Reilly, Esq.
Office of Public Counsel
c/o The Florida Legislature
111 West Madison Street
Room 812
Tallahassee, FL 32399-1400
Email: reilly.steve@leg.state.fl.us

Apalachicola Bay and River Keeper, Inc.
Randall E. Denker
7600 Bradfordville Road
Tallahassee, FL 32309
Email: randiedenker@gmail.com

Apalachicola Bay and River Keeper, Inc.
Andrew Jubal Smith
P.O. Box 8
Apalachicola, FL 32320
Email: smithlaw@mindspring.com

Franklin County Board of Commissioners
Brian P. Armstrong
Nabors Giblin & Nickerson, P.A.
1500 Mahan Dr., Suite 200
Tallahassee, FL 32308
Email: barmstrong@ngnlaw.com

Franklin County Board of Commissioners
c/oThomas M. Shuler, County Attorney
P.O. Box 850
Apalachicola, FL 32329
Email: mshuler@fairpoint.net

Walter J. Armistead
224 Franklin Boulevard
St. George Island, FL 32328
Email: samuelgilbert@yahoo.com

Barbara Sanders
215 West 12th Street
St. George Island, FL 32328
Email: bsanders@fairpoint.net

Franklin County Oyster & Seafood Task Force, Inc.
Ottice Amison, President
P.O. Box 404
Apalachicola, FL 32329
Email: director@seafoodtaskforce.org

St. George Plantation Owners Association
Robert W. McMillan
P.O. Box 516
Apalachicola, FL 32329
Email: r.mcmillan@ieee.org

Mel Kelly
P.O. Box 913
Carrabelle, FL 32322

Marsha E. Rule

Exhibit "A"

LAW OFFICES
SHULER AND SHULER
34 FOURTH STREET
POST OFFICE DRAWER 850
APALACHICOLA, FLORIDA 32329

J. GORDON SHULER
THOMAS M. SHULER

OF COUNSEL
ALFRED O. SHULER

TELEPHONE: (850) 653-9226
FACSIMILE: (850) 653-3382

November 5, 2009

Marsha Rule, Esquire
119 South Monroe Street, Suite 202
Tallahassee, Florida 32303

By Facsimile and U.S. Mail
850-681-6515

re: Water Management Services
PSC Application For Original
Certificate For A Proposed Wastewater
System/St. George Island, Florida

Ms. Rule:

I represent Franklin County, a political subdivision of the State of Florida.

On or about July 10, 2009, our clients agreed to hold this matter in abeyance until December 10, 2009. Prior to entering into this agreement, your client offered to withdraw the above referenced application at the request of Franklin County.

At its November 3, 2009 meeting, my client unanimously voted to accept your client's prior offer to withdraw his above referenced application. However, they intend to proceed forward with the funding request for a water study.

Please communicate this to your client, along with Franklin County's appreciation of his courtesy in this regard.

Please contact me if you have any questions. I will be out of the office beginning this afternoon until the afternoon of November 17, 2009.

Sincerely,

Thomas M. Shuler
Franklin County Attorney

xc: M. Johnson, Clerk

Exhibit “B”

WATER MANAGEMENT SERVICES, INC.
250 John Knox Rd. # 4
Tallahassee, FL 32303
(850) 668-0440 Fax (850) 577-0441

November 17, 2009

HAND DELIVERY

Franklin County Commission
33 Market Street
Suite 305
Apalachicola, FL 32320

Dear Commissioners:

Earlier this year, you asked me and others to present proposals for providing sewer to St. George Island. During my presentation, I stated that I wanted to work with the Franklin County Commission and that I would abandon my efforts if a majority of the Commissioners decided that they were opposed to my plan for an advanced wastewater treatment plant to serve the commercial area of the island. My PSC attorney said that she received a letter from your attorney stating that you voted unanimously to ask me to abandon my sewer plans by withdrawing my PSC application. Regrettably, I will acquiesce to your request.

Accordingly, by copy of this letter, I am asking my attorney, Marsha Rule, to prepare a joint motion for dismissal to be signed by both of our attorneys of record in this case. The motion should make it clear that I am asking that my application be dismissed solely because of Franklin County's opposition. In fact, I continue to believe that central wastewater treatment for the commercial area of the island is critically needed now. This problem is not going away, and will only get worse if something is not done. The Gulf and the Bay can only take so much, and it will be too late if you wait until the Bay totally collapses from the weight of so much untreated wastewater.

During 14 of the 15 weeks between June 24, 2008 and September 29, 2008, "no swimming" warnings were issued on the Island based upon data collected at a site on Franklin Boulevard adjacent to the commercial area. Similar warnings were issued for 13 of the weeks between June 25, 2007 and October 1, 2007. These were based upon high levels of

The inconvenient truth is that many, if not most, of the on-site wastewater treatment systems in the commercial area of St. George Island simply cannot meet current State health standards because the high water table is too high and the soils are inadequate for disposal. The most comprehensive study of the septic-sewerage issue was done by the Florida Department of Community Affairs in 1986. That study concluded that approximately 88% of the lots on St. George Island are located in soils that are unsuited for septic tanks. (pp. 1 & 2). The major findings of this report are summarized on page 2 of the study as follows:

1. A central sewage system for the island is the only safe option for ensuring that the resources of Apalachicola Bay will be protected as development occurs.
2. Although evidence to date does not clearly indicate that septic tanks on St. George Island are currently contaminating the Bay with disease-causing organisms, evidence does indicate that nutrient pollution of the island's canals and boat basin is occurring, that this is most likely being caused by septic tank leachates and stormwater runoff, and that this could threaten the Bay's ecological integrity.
3. Based upon population projections and septic tank densities, as well as the similarity of the island's poor soils and high water table to other coastal areas that have experienced septic tank pollution, the probability that septic tank effluent will significantly contribute to the Bay's eventual degradation creates unacceptable risks to the commercial and recreational industries dependent upon the Bay.

Nothing has happened on St. George Island since 1986 that would change any of these findings. Indeed, the population of the Island has more than doubled since 1986, and the problem is only going to get worse as long as almost unlimited commercial and multi-family zoning is allowed in the commercial area. My personal opinion is that this is an environmental disaster waiting to happen. At some point, a serious illness or death is likely to occur. And, as I said at the beginning of this letter, our stipulation of dismissal needs to make it clear that my dismissal is based solely upon your opposition to my plans.

Mr. Shuler's letter states that you are going forward with a funding request for a water study on this issue. As a starting point for any such study, and to save the County time and money, I am enclosing copies of both the PBS&J study and the DCA study.

Water Management Services and I look forward to working with you on any study you may undertake. And we are ready to resume our efforts to provide sewer in the commercial area when and if you decide it is needed.

Sincerely,

Gene D. Brown

GDB:smc

cc: Marsha Rule, Esq.
Joseph "Smokey" Parrish
Noah Lockley, Jr.
Pinki Jackel
Cheryl K. Sanders
Bevin Putnal

Enclosures: FDCA September 1986 Study
PBS&J July 2008 Study (summary only without appendix)

St. George Island
Commercial District
Summary of Recent Septic System Issues

Prepared by:

PBSJ®

July 28, 2009

St. George Island
Commercial District
Summary of Recent Septic System Issues

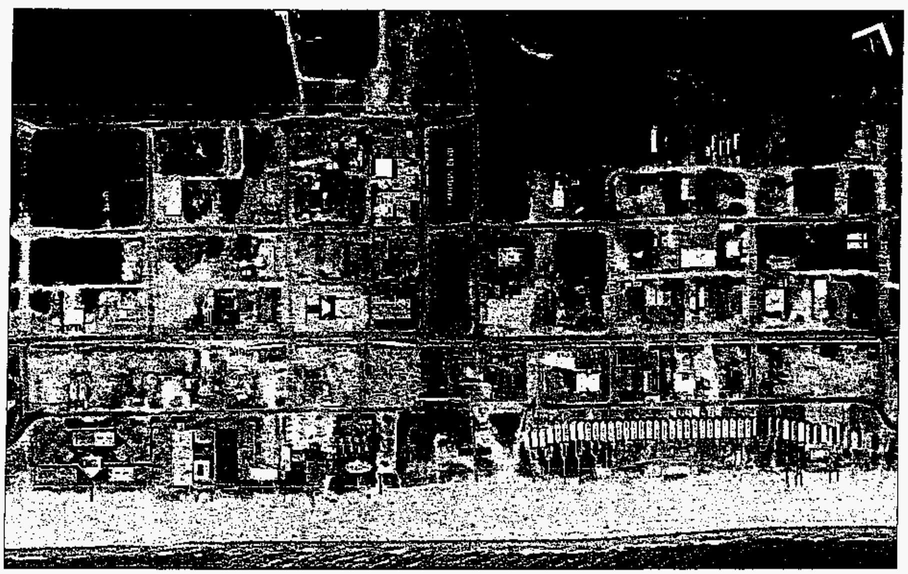
Table of Contents

Purpose

The objective of this report is to show that the planning and construction of a Central Sanitary Sewer System is necessary for the St. George Island Commercial District.

Introduction

St. George Island is a 22 mile long, moderately inhabited, barrier island. It is located in southern Franklin County, approximately 10 miles southeast of Apalachicola, Florida. The island is reached via The Bryant Patton Bridge (SR 300) from Eastpoint. Once entering the island, SR 300 is named Franklin Boulevard, and this road divides the center of what is referred to as the "St. George Island Commercial District". The commercial district is the focus of this report.

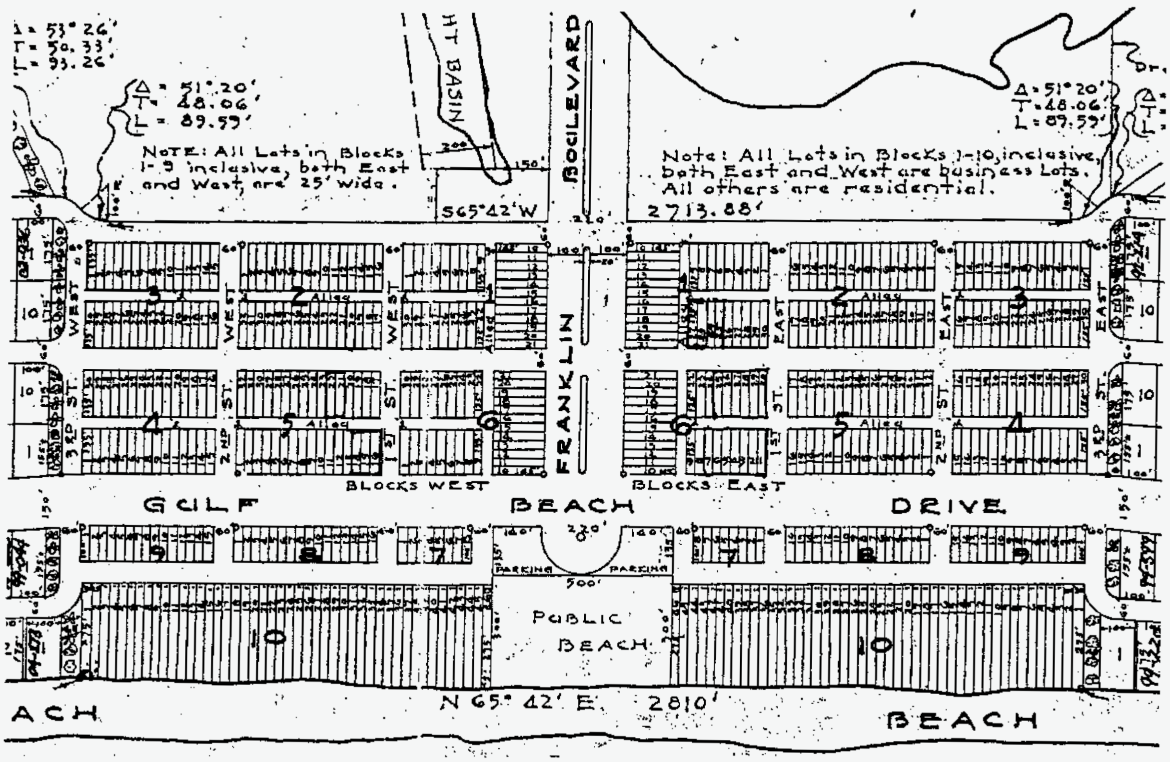


St. George Island Commercial District

The commercial district is 6 blocks by 4 blocks, comprised of 538 parcels. Parcels are 25-foot wide and range from 3,375 SF (0.07 AC) to 7,500 SF (0.17 AC) in area.

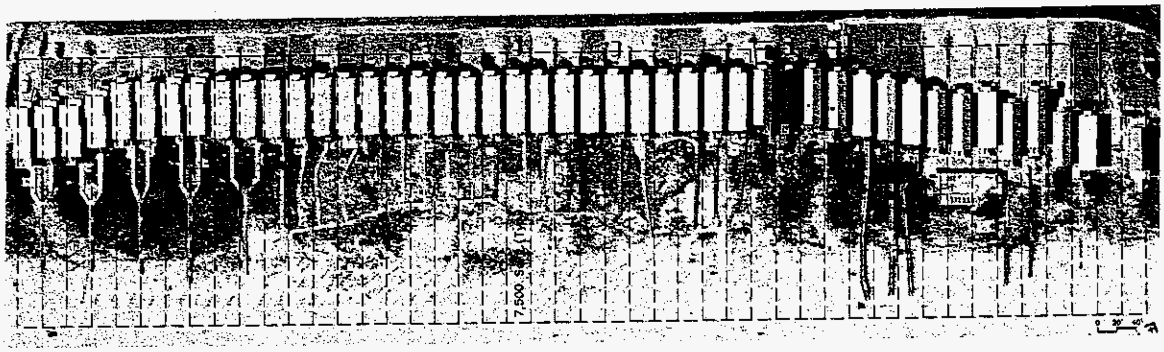
St. George Island separates the Gulf of Mexico and Apalachicola Bay - an area known for its oyster and shrimp harvest. The island's beaches and parks have attracted visitors for generations. According to the Apalachicola Bay Area Chamber of Commerce Economic Profile for Franklin County in 2009, the island's 930 fulltime residents can be potentially joined by of an estimated 5,500 visitors during the peak tourist season which is from late May to early September (see Appendix G).

These economic pillars, fishing and tourism have a common requirement: clean water. This report documents that the current status of onsite sewage systems in the commercial district, the potential health hazards, and the potential environmental impacts. This report cites known current issues associated with Onsite Sewage Treatment and Disposal Systems (OSTDS). Local restaurants have additional challenges with the current OSTDS standard.



Commercial portion of the St. George Island
Gulf Beaches Unit 1 Plat, circa 1952
(Entire plat included in Appendix I)

To be eligible for an OSTDS under current standards, the minimum required lot size is 0.25 acres (See ss.381.0065(4)(b), Appendix E). The commercial district's platted lot sizes are 0.07 and 0.17 acres, failing this requirement. The Density section of this report will show that several locations fail the permitting requirements for lots platted before 1972, which does not have lot size requirements.



45 (3-Story) Luxury Condominiums on 7,500 SF Lots

Density

For the purposes of density comparison, this report refers to The State of Florida Department of Health Chapter 64E-6, Florida Administrative Code Standards for Onsite Sewage Treatment and Disposal Systems (see Appendix E):

s. 381.0065(4)(g)(2) Lots platted before 1972 are subject to a 50-foot minimum surface water setback and are not subject to lot size requirements. The projected daily flow[1] for onsite sewage treatment and disposal systems for lots platted before 1972 may not exceed:

a. Two thousand five hundred gallons per acre per day for lots served by public water systems as defined in s. 403.852.

b. One thousand five hundred gallons per acre per day for lots served by water systems regulated under s. 381.0062.

The Commercial District's public water system meets the criteria of subsection (a), permitting a maximum 2,500gpd water usage per lot. Water meter readings from between July 2008 and June 2009 have been retrieved and are included in Appendix H. By compiling this data with recorded parcel information, the ability to permit lots for OSTDS can be decided. The following pages of this report show several of the Commercial District's businesses are would not be eligible for OSTDS permits, even with the above statute's more relaxed requirements.

[1] In the case of restaurants, projected daily flow is based on maximum occupancy.

Fig. 1
10,125 SF (1/4 Acre) Commercial Lot
28 West Bayshore Drive

Water Usage: 3,083gpd (June 2009)

Maximum Allowable Water Usage: 625gpd

4.9 times the maximum allowable water usage to be eligible for OSTDS

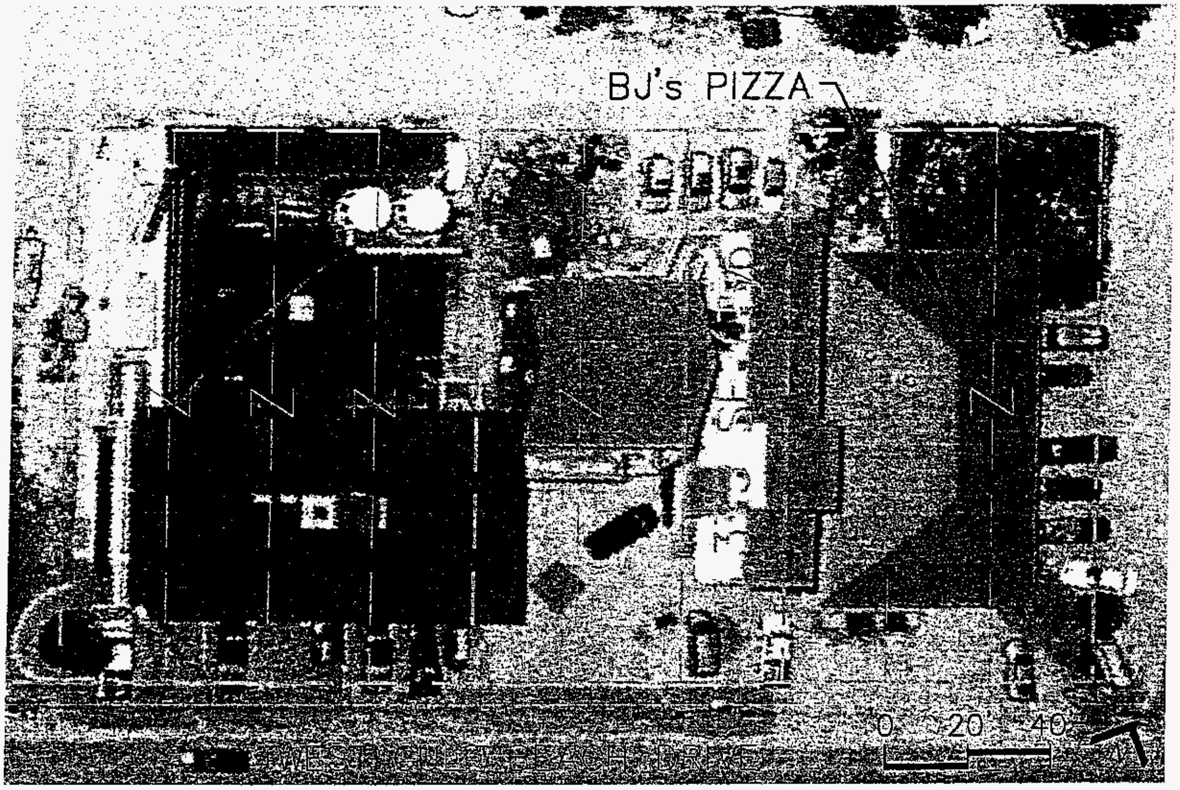


Fig. 2
10,125 SF (1/4 Acre) Commercial Lot
105 West Gulf Beach Drive

Water Usage: 1,513gpd (June 2009)

Maximum Allowable Water Usage: 625gpd

2.4 times the maximum allowable water usage to be eligible for OSTDS

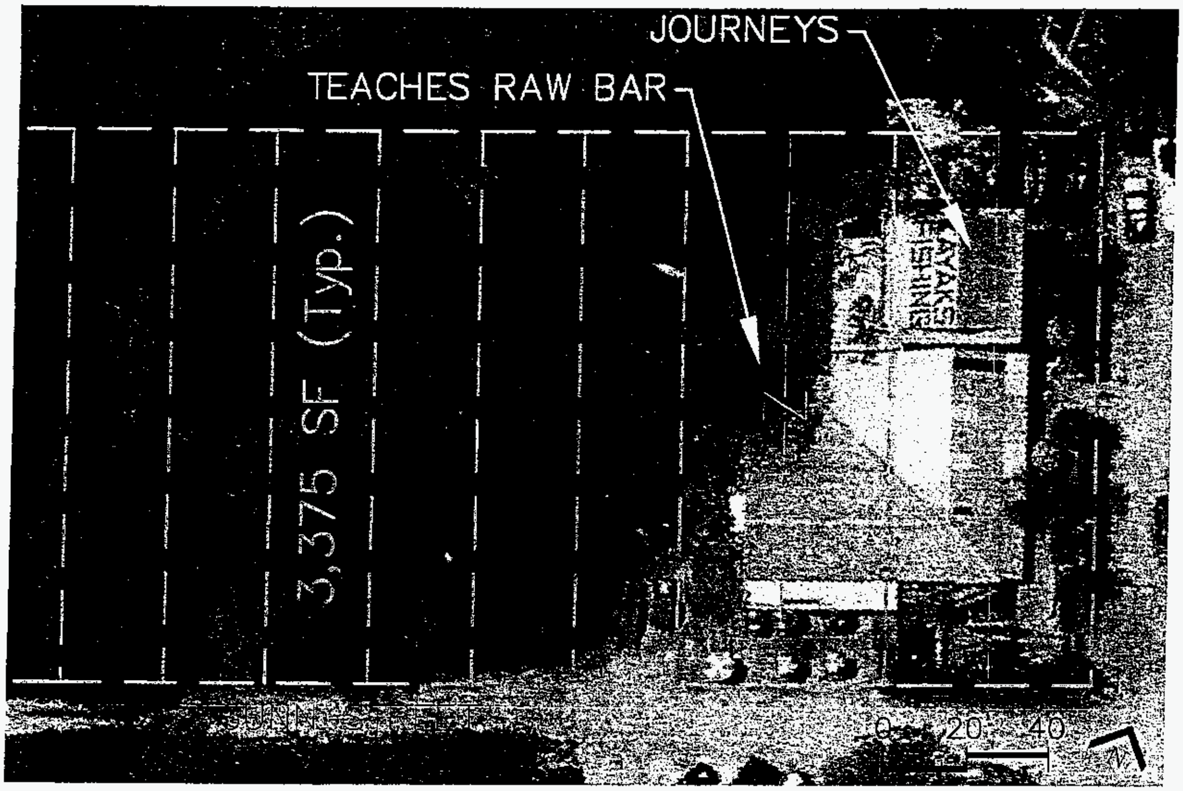


Fig. 3
13,500 SF (.31 Acre) Commercial Lot
240 East 3rd Street

Water Usage: 1,106gpd (May 2009)

Maximum Allowable Water Usage: 775gpd

1.4 times the maximum allowable water usage to be eligible for OSTDS

Recorded Violations

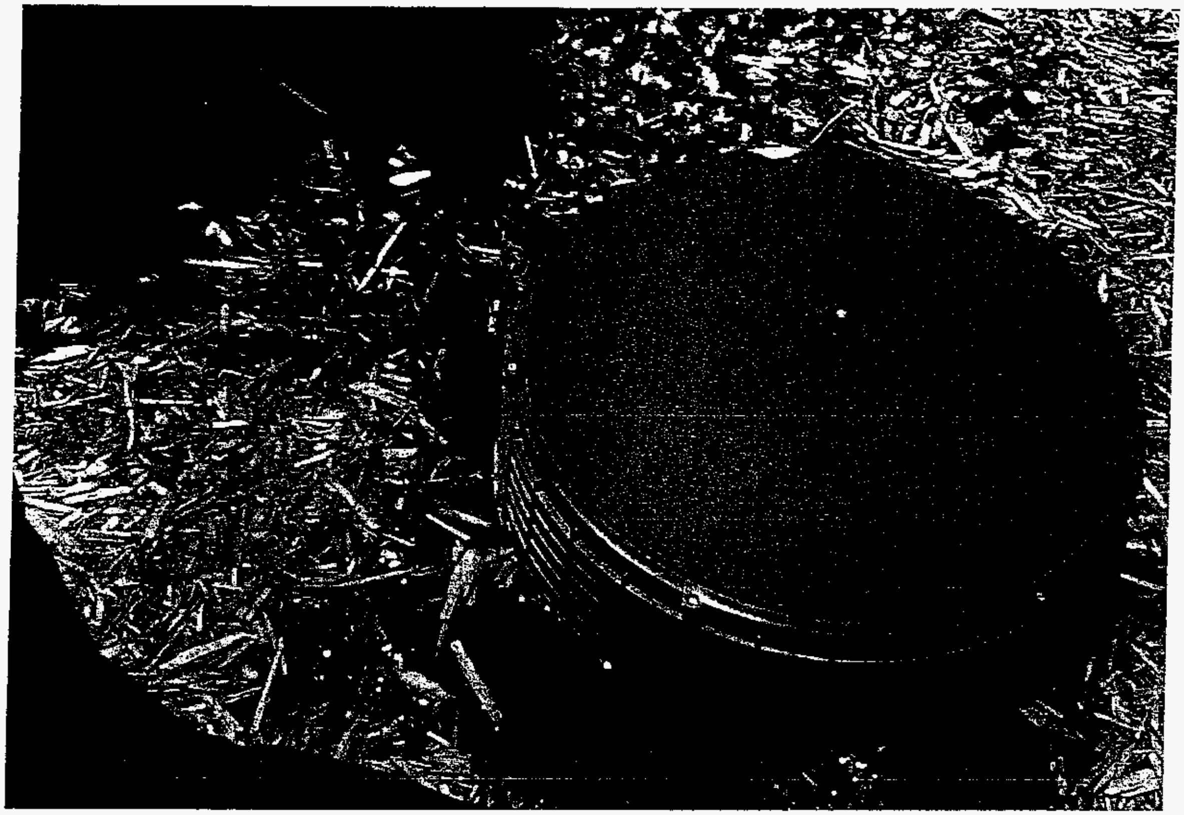
In 2008, 5 Department of Health Official Notice to Abate a Sanitary Nuisance notices issued to owners of restaurants and bars in St. George Island's Commercial District were on file at the Franklin County Department of Health (FCDOH).

Records on file at the Franklin County Department of Health:
On July 12, 2008 - The State of Florida Department of Health Official Notice to Abate a Sanitary Nuisance was issued to Ms. Jeanine McMillan, owner of Journeys of St George Island and Eddy Teachs Raw Bar (see Appendix A).
On August 20, 2008 - The State of Florida Department of Health Official Notice to Abate a Sanitary Nuisance was issued to Mr. Steve Rash, owner of The Blue Parrot Oceanfront Café; Mr. Kourkolis, owner of Harry A's Restaurant; Mr. Billy Blackburn, owner of B.J.'s Pizza; Hunter Investments L.L.C., owner of Subway (see Appendix A).

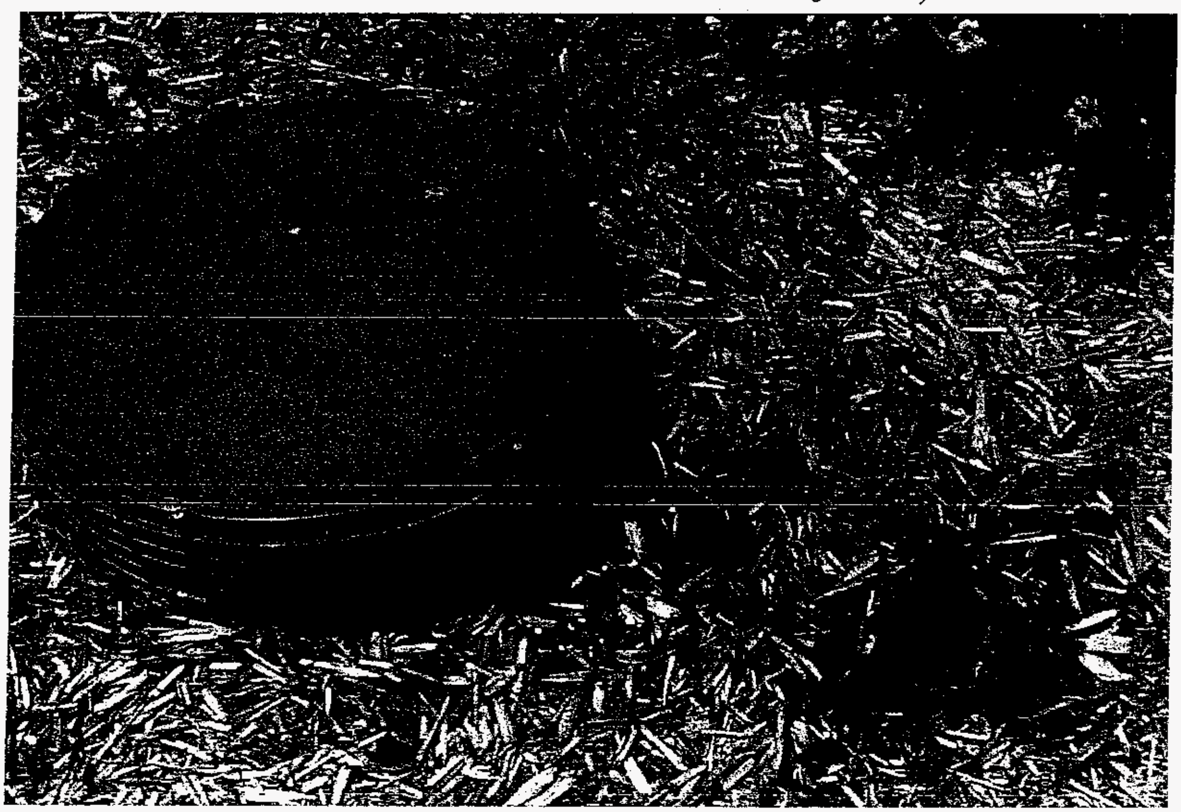
On June 12, 2009, copies of these notices and relative documentation were retrieved from the FCDOH in Apalachicola, and have been included in Appendix A of this report.

On June 15, 2009, a written request for notices issued prior to 2008 was sent to FCDOH Environmental Health Manager, Jason Flowers. At the publication of this report, an official written confirmation to this request has not been responded to (see Appendix A).

On June 12, 2009 the Subway sandwich shop listed above was closed until repairs to their OSTDS were complete. The Blue Parrot Oceanfront Café was open for business. However, this establishment's OSTDS needed attention as well. As shown in photos taken (shown on next page), 2 of their aerobic tanks were overflowing unobstructed to the ground.



Blue Parrot Oceanfront Café – Site Photos – June 12, 2009



The1995 FDOH study "The Determination of Several Effluent Properties from Food Service Establishments that Employ On Site Sewage Treatment Systems," claims food service establishments that employ OSTDS place a greater strain on their systems. The report states, "Results showed high levels of BOD[2], Oils and Grease, and Total Suspended solids in nearly all the samples. . .Phase I of this project clearly identified on-site sewage treatment at restaurants as a serious problem" (see Appendix D-1; p. 2, 3). The report continues:

> The failure of any septic tank system represents a serious threat to the public health. A study by Marylynn Yates entitled "Septic Tank Density and Ground-Water Contamination," reports, "Septic tanks contribute the largest volume of wastewater, 800 billion gallons per year to the subsurface, and are the most frequently reported cause of ground-water contamination associated with disease outbreaks." The study went on to say, "Overflow or seepage of sewage from septic tanks or cesspools was responsible for 43% of the outbreaks and 63% of the cases of illness caused by the use of untreated, contaminated ground water. Thus, septic tanks represent a significant threat not only to preserving the potability of ground water, but also to human health." Such problem occurs when a septic system fails and seepage occurs. Restaurants are known to have much higher strength wastewater and consequently fail at an increased rate (see Appendix D-1; p. 4).

OSTD violations in the Commercial District are not limited to restaurants and bars. On June 18, 2009 the FDOH internet resource "SepticSearch" was used to compile data on county and state inspection results.

Of 67 accounts reviewed, 36 had failed either county or state inspection. The following page if this report lists those accounts by name, address, and state sanitary permit number. Complete documentation including inspection details is included in Appendix B.

---

[2] Biochemical Oxygen Demand

St George Island Commercial District
Septic Tank Inspection Failures

1. Express Lane Inc. #89, 136 Franklin Blvd., 19-S1-01461
2. First Baptist Church-SGI, 501 East Bayshore Drive, 19-S1-01511
3. Jeff or Yvondia Beasley (Collins), 204 East Gorrie Drive, 90-159
4. Jamie & Louis Potyondy (American Pie), 260 East Gorrie Drive, 91-052
5. Clint Kadel, 252 East Gorrie Drive, 91-0278
6. Michael Townson, 248 East Gorrie Drive, 91-279
7. George Plymel (Suncoast), 224 East Gorrie-My Fair Lady, 19-S1-01641
8. George Plymel (Suncoast), 220 East Gorrie Drive, 94-0109
9. Rob & Brenda Carrino, 216 East Gorrie Drive, 94-0110
10. Laura Murrey, 212 East Gorrie Drive, 93-003
11. Jeff Galloway (Gulf coast Realty), 45 East 1st Street, 94-0030
12. Ann Glendinning, 172 East Gorrie Drive, 93-0201
13. Matt or Paula Prather, 164 East Gorrie Drive, 93-0199
14. Greg Branch (Easy St.), 136 East Gorrie Drive, n/a
15. Linda R. Thurman, 132 East Gorrie Drive, 93-0202
16. Norbert Kaminski, 128 East Gorrie Drive, 95-0101
17. Dean Cambron, 124 East Gorrie Drive, 95-0100
18. Matt & Paula Prather, 120 East Gorrie Drive, 95-0099
19. Betty or Rodger Hopper, 100 East Gorrie Drive, 94-0269
20. Karen Bass (NA, CVR), 72 East Gorrie Drive, 95-0183
21. Fickling Vacation Rentals (Eagle's Watch), 136 Gunn Street, 95-0066
22. James Codwallader (Dry Tortugas), 135 Gunn Street, 96-0162
23. Katie Aquiar, 160 East Gorrie Drive, 94-0271
24. Wade Hopping, 144 East Gorrie Drive, 95-0177
25. Robert or Armen Epperson, 140 East Gorrie Drive, 95-0178
26. Lewis Harris (Bird's Nest), 239 West Gorrie Drive, 19-S1-01259
27. Tommy Pritchette, 48 East Gorrie Drive, 19-S1-01164
28. Greg Branch (Above The Wave), 44 East Gorrie Drive, 19-S1-01291
29. Greg Branch, 36 East Gorrie Drive, 19-S1-01293
30. Steve Macchiarella, 32 East Gorrie Drive, 19-S1-01294
31. George Plymel (Suncoast), 224 East Gorrie-My Fair lady, 19-S1-01641
32. James T. Roddenberry, 48 West Gorrie Drive, 19-S1-01656
33. Vernon L. Wells III, 151 Gunn Street, 19-S1-01875
34. Tommy or Annie Lewis (Annie's Inn), 104 West Gorrie Drive, 19-S1-01538
35. Steve or Merrie Segar, 159 Gunn Street, 19-S1-01837
36. Turner Brock, 256 Pine Avenue, 19-S1-02592

Data Retrieved June 18, 2009 from SepticSearch.com (see Appendix B)

Public Health and Private Onsite Sewer Treatment Systems

Together, these records for the County and the state document conditions in the Commercial District that could expose the public to otherwise preventable health risks. They could also be contributing to the closure of the adjacent public bathing beach.

The Florida Department of Health, Healthy Beaches Program website has documented a significant number of swimming advisories based on data collected at a site on Franklin Boulevard, adjacent to the Commercial District and the public swimming beach. A summary of the advisories is as follows:

Between June 24, 2008 and September 29, 2008, Swimming Advisories were issued for every week except September 2, 2008. For 14 of 15 weeks, the area beaches were under Swim Advisories for high levels of enterococcus.

Between June 25, 2007 and October 1, 2007, 13 Swimming Advisories were issued because of high levels of enterococcus.

Franklin County
SAINT GEORGE ISLAND FRANKLIN BLVD

Sampling Results History
Viewing page 3 of 21

Sample Period Start	Enterococcus	Enterococcus Geometric Mean	Fecal Coliform	Advisory / Warning Issued
9/2/2008	Good	Good	Good	No
8/25/2008	Poor	Poor	Good	Yes
8/18/2008	Good	Poor	Good	Yes
8/11/2008	Poor	Poor	Good	Yes
8/4/2008	Good	Poor	Good	Yes
7/28/2008	Poor	Poor	Good	Yes
7/21/2008	Poor	Poor	Good	Yes
7/14/2008	Poor	Poor	Good	Yes
7/7/2008	Good	Poor	Good	Yes
6/30/2008	Poor	Poor	Good	Yes
6/24/2008	Poor	Good	Good	Yes

Example from FDOH Healthy Beaches Program Website
Retrieved June 22, 2009
Additional Pages Included in Appendix C

The Northwest Florida Water Management District published their Surface Water Improvement (SWIM) Program Priority List in January, 2006. The report ranks The Apalachicola River and Bay Watershed as 1st in the state, stating:

> The Apalachicola River and Bay System has been recognized as a resource of state, federal, and international importance. The bay has been designated an Outstanding Florida Water, a State Aquatic Preserve, and an International Biosphere Reserve. It includes the Apalachicola Bay National Estuarine Research Reserve and the St. Vincent National Wildlife Refuge. Additionally, state and federal agencies, as well as the NWFWMD, have made extensive investments in acquiring and protecting lands along both the river and the bay and in implementing retrofit and restoration activities (see Appendix F; p. 2, 3).

In the 1999 "Groundwater and Nutrient Dynamics on a Strip Barrier Island Served by On-Site Sewage Treatment and Disposal Systems in the Northeastern Gulf of Mexico" report prepared by D. Reide Corbett and Rich Iverson for the Florida Department of Health, the authors submit the following:

> In order to prevent the possible deterioration of Apalachicola Bay and other estuarine systems, including economic zones (oyster beds and areas of dense shrimp populations), contaminants of any type must be monitored closely. Groundwater may be an important pathway of harmful bacteria and nutrients to local nearshore areas of the bay. Although the Apalachicola River provides the majority of the nutrients to the bay, those supplied by the groundwaters of St. George Island may be important to small local embayments. Without knowledge of the groundwater contribution, interpretation and management decisions on the treatment of sewage may be faulty and lead to future environmental threats. Thus, monitoring of OSTDS in an area of increasing development and density is necessary to help in future wastewater treatment decisions (see Appendix D-2; p.36).

Conclusion:

The St. George Island Commercial District is a densely arranged mixed-use development. The majority of the 538 lots are platted at 12.9 lots per acre. To be eligible for a septic tank system under current state guidelines, a maximum of 4 units per acre are allowed[3].Another major factor in eligibility is average water usage, which several properties in the Commercial District have been found to exceed. Numerous locations in the district have failed either state or county septic tank inspections. There is also a significant occurrence of swim advisories issued for area beaches during the peak tourist season.

Given the density and intensity of the zoning and land use in the Commercial District, it is apparent that a central sewer collection system is needed to eliminate noted and future problems associated with septic tanks. A central sewer collection system would address the associated public health and environmental concerns associated with repeated septic system failures.

[3] Florida Statute 381.0065(4)(b)

Bibliography

Apalachicola Bay Chamber of Commerce (n.d). Economic Profile for Franklin County 2009. Retrieved June 17, 2009 from Apalachicola Bay Chamber of Commerce: http://www.apalachicolabay.org/index.cfm/m/44/mt/Info/locationSectionId/0/

Florida Department of Health (n.d.). Beach Sampling History. Retrieved June 22, 2009 from: http://esetappsdoh.doh.state.fl.us/irm00beachwater/reshistory.aspx?SPID=108

Florida Department of Health (n.d.). *Final Report Phase I: The Determination of Several Effluent Properties from Food Service Establishments that Employ On Site Sewage Treatment Systems*. Retrieved June 14, 2008, from: http://www.doh.state.fl.us/environment/ostds/research/researchreports.htm

Northwest Florida Water Management District (2006, January). *Surface Water Improvement and Management Program Priority List*. Retrieved June 14, 2008, from: http://www.nwfwmd.state.fl.us/pubsdata/techpubs.html

Reide, D., Iverson, R. (1999, September 30). *Groundwater and Nutrient Dynamics on a Strip Barrier Island Served by On-Site Sewage Treatment and Disposal Systems in the Northeastern Gulf of Mexico*. Retrieved June 17, 2008, from Florida Department of Health: http://www.doh.state.fl.us/environment/ostds/research/researchreports.htm

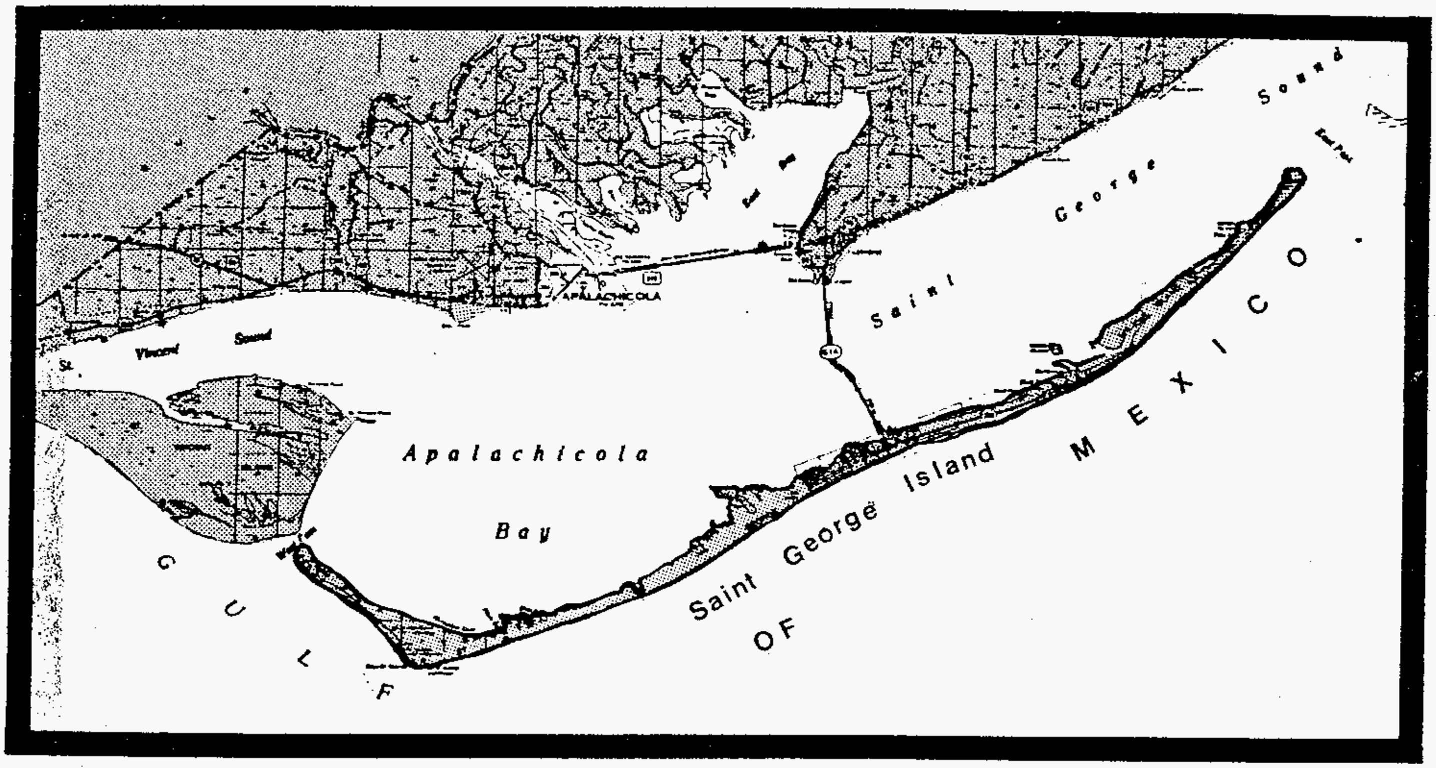
Septic Search – Property Information (n.d.) Retrieved June 18, 2009 from Septic Search: http://www.septicsearch.com/index.asp

Gene Brown Copy

ST. GEORGE ISLAND

Sewerage Study

APALACHICOLA BAY AREA
AREA OF CRITICAL STATE CONCERN



FLORIDA DEPARTMENT of COMMUNITY AFFAIRS

Tom Lewis, Jr., Architect, Secretary

September 1986

EXECUTIVE SUMMARY

On June 17, 1986, the Governor and Cabinet requested the Department of Community Affairs to review current and planned sewage treatment facilities on St. George Island to determine whether they are adequate to preserve the ecological integrity of Apalachicola Bay. If the facilities were found to be inadequate, the Department was asked to recommend the type of treatment that would provide sufficient protection.

This report was prepared by the Department of Community Affairs in response to the Cabinet's request. In addition, it provides the Apalachicola Bay Area Resource Planning and Management Committee with information they need to fulfill their responsibilities under Chapter 380.0555. Section 380.0555(7)(e) requires the Committee to "study the economic and environmental advisibility of providing sewerage facilities to the residents of St. George Island and make a recommendation to the state land planning agency."

The report is based upon an analysis of population and land use, recently completed soil and septic tank surveys, a preliminary feasibility study of central sewage treatment for the island, and a review of the literature linking septic tank effluent to estuarine pollution. When completely developed, it is projected that from 14,000 to 17,000 people could be residing on the island. If the day visitors to the park and public beach, and temporary hotel guests are included, the number of people on the island at any one time could swell to 20,000 to 25,000 persons. That population will be housed in 4,048 dwelling units. An analysis of the suitability of the island's soils for septic tanks indicates that 88.4% have either severe limitations for septic tank use or are part of the coastal beach and dune system upon which the state limits development. Even so, without a central sewage system, the Department of Community Affairs estimates that 2,602, or 64.3%, of all future housing units will use septic tanks, and of those, 2,298, or 88.3%, will be located in soils unsuited for septic tank use. If all septic tank users are included (businesses and the state park), there will be 2,765 future septic tanks, of which it is estimated that 2,418, or 87.5%, will be located in unsuitable soils.

The major findings of this report are as follows:

1. A central sewage system for the island is the only safe option for ensuring that the resources of Apalachicola Bay will be protected as development occurs.

2. Although evidence to date does not clearly indicate that septic tanks on on St. George Island are currently contaminating the Bay with disease-causing organisms, evidence does indicate that nutrient pollution of the island's canals and boat basin is occurring, that this is most likely being caused by septic tank leachates and stormwater runoff, and that this could threaten the Bay's ecological integrity.

3. Based upon population projections and septic tank densities, as well as the similarity of the island's poor soils and high water table to other coastal areas that have experienced septic tank pollution, the probability that septic tank effluent will significantly contribute to the Bay's eventual degradation creates unacceptable risks to the commercial and recreational industries dependent upon the Bay.

Although the problems are not severe now, the likelihood that they will become severe in the future calls for a series of actions that provide in the short term maximum protection against further environmental degradation, but at the same time, ensure in the long term that bay waters will remain clean. Therefore, the Department submits the following recommendations:

1. A planning study should begin at once to determine the economic and environmental feasibility of providing a central sewage system to St. George Island. Within six months, a planning feasibility study should be completed and involve a determination as to the type and location of central sewage treatment system that is most appropriate for the island. Within six months from the completion of the planning feasibility study, funding sources should be identified and implementation actions established to have the island fully sewered within two years. If a central wastewater treatment system is not operational within this three-year planning and implementation time frame, additional septic tank permits north of Gulf Beach Drive and Leisure Lane should only be issued for Class I Aerobic Treatment Units. The planning process should be accomplished within the context of Chapter 380.0555, F.S., and should consider the feasibility of alternative wastewater treatment systems and their financial, environmental, and aesthetic impacts on the island, its residents, and Apalachicola Bay. To allow progress to be monitored, the plan should specify interim steps that must be accomplished and establish milestone dates for their accomplishment. Funding for preparation of the plan will come from the Area of Critical State Concern Trust Fund.

2. Because densities on the island are the key, not only for septic tank pollution, but also for stormwater runoff, recreational demand, and potable water, they should not be permitted to rise beyond current levels specified in the Franklin County Comprehensive Plan and the Critical Area legislation, Section 380.0555 (9)(a)1, either before or after a central sewage system is in place. The Department of Community Affairs should investigate additional safeguards to ensure the densities are kept constant.

3. Franklin County should immediately begin to require all new users on the island to connect to the central potable water system. In addition, when the new sewage system is available, Franklin County should require all users on the island to be connected to the central potable water system. The requirement of any additional connections to the central potable water system should be contingent on the availability of capacity of that system for such connections.

4. In the interim, between now and when a central sewage system is operational, the following safeguards regarding cumulative monitoring, location, type, and density of additonal septic tanks should be followed:

a. The issuance of all individual on-site sewage disposal permits should be temporary, and when centralized wastewater treatment becomes available to individual property owners, Franklin County should require all users of existing sanitary treatment systems to connect to it within 90 days.

b. The ordinance designating the Pollution Sensitive Segment and Critical Habitat Zone now under consideration by Franklin County should be adopted by the County in January, 1987, and approved by the Administration Commission and implemented by the County in March, 1987. If this is not done, the further issuance of septic tank permits should be closely monitored by the Department of Community Affairs pursuant to Chapter 380.05, F.S., and where necessary to protect the Bay, the Department should seek administrative or judicial remedies as provided by Chapter 380.11, F.S. The effectiveness of the ordinance in protecting the Bay from septic tank pollution will be monitored by the Department of Community Affairs through the DNR/DER water quality monitoring program recommended below. If it is determined that the ordinance is not providing adequate protection, additional measures will be proposed.

c. All wastewater disposal systems within the Critical Habitat Zone and Pollution Sensitive Segment of St. George Island, should be visually inspected by the Department of Health and Rehabilitative Services on an annual basis for proper operation. The Department of Environmental Regulation should conduct quarterly inspections of the septic tanks and package plants it has permitted for proper operation.

d. No individual on-site sewage disposal system should be approved within 75 feet of the mean high water line, or where wetlands exist, within 75' of the inland wetland boundary, as defined by the Department of Environmental Regulation at F.A.C. 17-4.022.

5. DER and DNR should establish a water quality monitoring program in the Apalachicola Bay. If signs of degradation appear, the Resource Planning and Management Committee should be notified and it should undertake a review of the causes of the pollution. The Committee should submit its findings to the State Land Planning Agency, which will make recommendations to the Administrative Commission regarding actions needed to abate the problem.

6. Franklin County and responsible agencies should take the appropriate actions to implement these recommendations pursuant to statutory authority as soon as possible. The Department of Community Affairs and other responsible agencies should provide technical assistance to property owners on the island to assist them in complying with the recommendations of this report.

ST. GEORGE ISLAND SEWERAGE STUDY

Tom Lewis, Jr., Architect, Secretary

Department of Community Affairs
Division of Resource Planning and Management
2571 Executive Center Circle, East
Tallahassee, Florida 32399

September 1986

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INTRODUCTION

On June 17, 1986, the Board of Trustees of the Internal Improvement Trust Fund passed a motion requesting

> "...the Department of Community Affairs to work with the Apalachicola Bay Area Resource Planning and Management Committee, the Department of Natural Resources, the Department of Environmental Regulation, and the Department of Health and Rehabilitative Services to determine the type of sewage treatment facilities on St. George Island which will preserve the ecological integrity of Apalachicola Bay, to develop recommendations for action to require those facilities on St. George Island, and to report its findings to the Governor and Cabinet at the second meeting in September."

This report has been prepared in response to that motion. It is based upon an analysis of population and land use, recently completed soil and septic tank surveys, a preliminary feasibility study of central sewage treatment for the island, and a review of the literature linking septic tank effluent to estuarine pollution. In the process of preparing this report, the Department of Community Affairs has consulted with many agencies, including the Franklin County Planning Department, the Franklin County Health Department, the Apalachicola Bay Area Resource Planning and Management Committee, the Departments of Natural Resources, Environmental Regulation, and Health and Rehabilitative Services, and the U.S. Soil Conservation Service. The Department extends its appreciation to all for their assistance.

LAND USE AND POPULATION

ON

ST. GEORGE ISLAND

How land on St. George Island is currently used reflects the number of people who either live on or visit the island. How land use is planned will determine the number of people who could come to the island in the future. Estimating the current and projecting the future population of St. George Island is essential for an evaluation of the effects of septic tank effluent on Apalachicola Bay. Today, the majority of uses on the island are served by septic tanks; and, if current planning remains unchanged, that will continue to hold true when the island is completely developed. Thus, any problems in the Bay that are today attributable to septic tanks can only get worse, and any problems that are now undetected may become more apparent as growth continues. Therefore, it is paramount that we obtain as clear a picture as possible of existing and future conditions.

General Description

St. George Island is a barrier island off the coast of Franklin County in the Florida Panhandle (see figure 1). It shelters the Apalachicola Bay estuary from the Gulf of Mexico, and helps to create the conditions making the Bay Florida's most important source of oysters. Continuing growth on St. George Island, as well as along the coastal areas of the mainland, have aroused fears regarding the effects of septic tank effluent on the Bay's productivity. While this report focuses on one segment of the Apalachicola River and Bay system, the methods of sewage disposal on all of the system's coastal and riparian lands deserve scrutiny.

St. George Island originally extended a distance of 29 miles from the West Pass to the East Pass of Apalachicola Bay. In 1957, the Army Corps of Engineers dredged the Bob Sikes Cut to improve access to Gulf Waters for the fishing industry. The Cut created what is

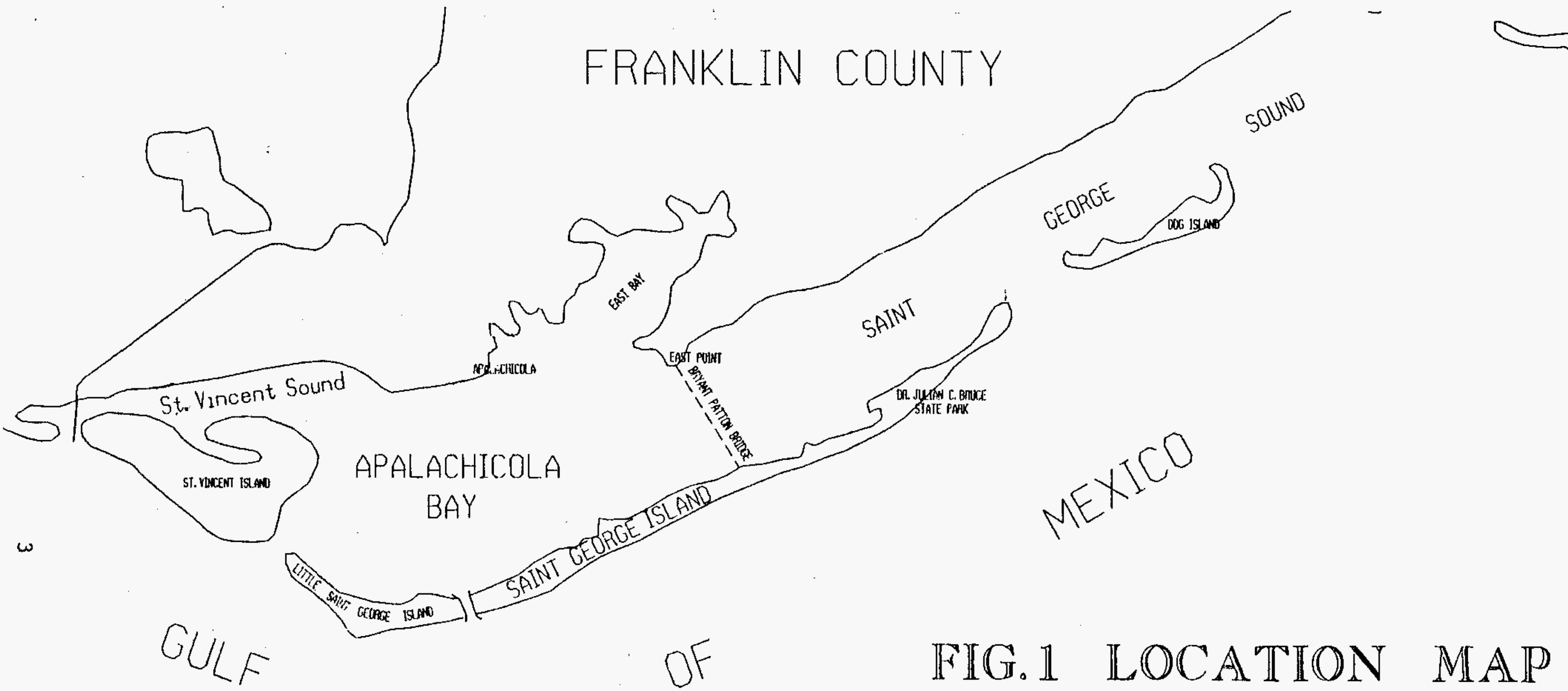

FIG.1 LOCATION MAP

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now known as Little St. George Island in the west and St. George Island proper in the east. Throughout the remainder of this report references to St. George Island will be to that portion extending from the Cut to East Pass. Little St. George Island contains 2,193 acres and is zoned by Franklin County for Preservation Recreation; it is now owned and managed by the State and is uninhabited and inaccessible to the automobile. St. George Island is 20 miles long and contains approximately 4,824 acres. In 1973, the State purchased 1,883 acres at the eastern end of the island and created the Dr. Julian G. Bruce State Park which opened to the public in 1978.

Thus, the area that is subject to continuing residential and commercial development composes the center portion of the island. It extends roughly 11 miles from Sikes Cut to the state park and contains 2,941 acres (see figure 2). Common reference further subdivides this central section into three parts:

(1) The Plantation - located at the west end of the island adjacent to Sikes Cut, it runs five miles from the Cut to 12th Street West and contains approximately 984 acres.

(2) St. George Island Gulf Beaches - comprising the center portion of the island and connecting the island to the mainland via the Bryant-Patton Bridge, it runs four miles from 12th Street West to 11th Street East and contains, 1,563 acres.

(3) East End - located at the eastern end and adjacent to the state park, it runs two miles from 11th Street East to the park boundary and contains 394 acres.

Developments of Regional Impact

(1) St. George's Plantation

On September 20, 1977, the Franklin County Board of County Commissioners approved the St. George's Plantation development of regional impact in accordance with Chapter 380 of the Florida

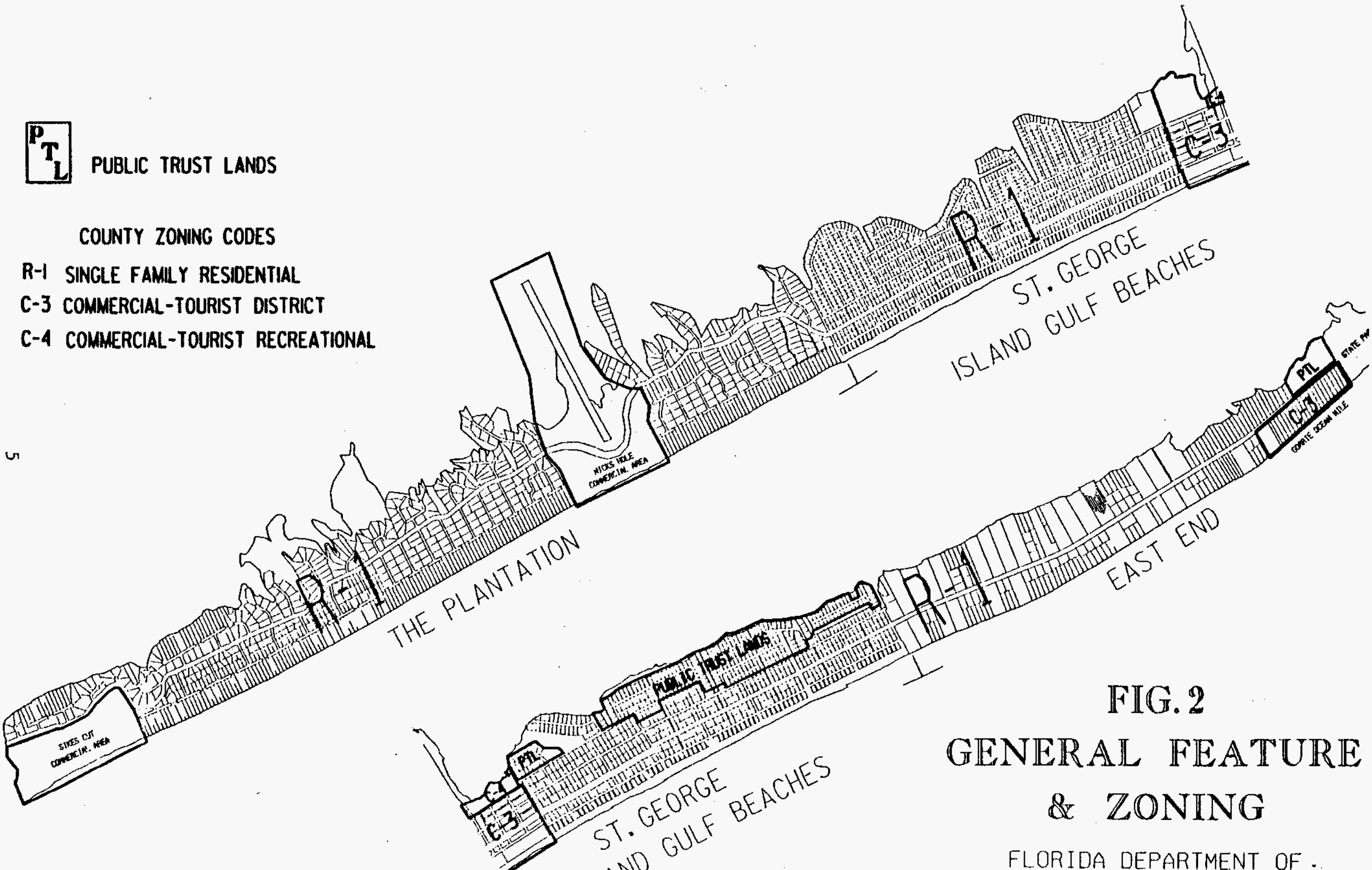

FIG. 2
GENERAL FEATURE & ZONING

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Statutes. The project contains 1200 acres in two discrete sections separated from one another by St. George Island Gulf Beaches. The western section extends from Sikes Cut to 12th Street West and contains approximately 984 acres. This section is referred to as The Plantation. The eastern section runs from 11th Street East to the state park but includes only 216 acres of the total 394 available. The project consists of a variety of uses: single family, multiple family, beach club, commercial, and marina.

The development order gave preliminary approval to those areas proposed for single family residential use in both the eastern and western sections, requiring only that subdivisions not then platted be submitted for preliminary and final platting prior to construction. All single family lots were required to be at least one acre in size and to conform as closely as possible to the configuration shown on the master plan. However, on August 26, 1982, an amendment to the lot layout within the Plantation was approved, which (1), resulted in an exchange of properties between the developer, Leisure Properties, and the County, and (2), allowed lots in nine of the Plantation's subdivisions to be less than one acre through transfer of density from the Bay side to the Gulf side of the island. That created 147 half acre lots, and, according to the 1982 amendment, resulted in a reduction within the Plantation of the number of total units possible. Today, within the Plantation, there are 793 single family lots: 66 have homes and 727 are vacant. Within the eastern portion of the project, 146 single family lots were approved; of these 13 have homes.

The 1977 development order also gave conceptual approval to three separate commercial areas. Two of these were located within the Plantation and are known as the Sikes Cut commercial area and the Nicks Hole commercial area. The third area was located in the eastern section and was called the Sunset Beach Commercial Area. Approval of these commercial areas was conceptual only and the Commission required that detailed plans be submitted and approved before development could actually proceed in any one of them. Although the Sunset Beach area was apparently already zoned commercial, and in fact is zoned C-3 commercial district today, the other two commercial areas were not rezoned. The Commission stated that rezoning of those areas would be granted upon final approval of their detailed plans. The order limited the total area that could be developed commercially in the Plantation and the East End combined to no more than 200 acres, and provided that for each acre not developed commercially, the developer would have the option of substituting a one acre single family lot. Additionally, the development order prohibited condominium or multiple family development in any part of the Plantation, including the commercial areas, without the prior consent of the County Commission.

(2) Gorrie Ocean Mile

On September 2, 1981, the Franklin County Commission approved a conceptual master development plan for the Sunset Beach commercial area, pursuant to the 1977 development order. The project was named Gorrie Ocean Mile and consisted of 252 multiple family units, a 150 room hotel, and an 8,000 sq. ft. commercial building on 33.3 acres. The project was to be served by a package treatment plant. Because of concern regarding the impact of effluent upon the groundwater, and discharge and runoff upon the Apalachicola Bay, the order initially allowed only 100 units to be built. The one hundred units were permitted to be constructed in fifty unit increments and groundwater quality tests were required before and after each phase. If, after all 100 units were built, significant damage to the waters of Apalachicola Bay was detected, no additional units would be allowed until an alternate method for treating the sewage was devised which would not damage the Bay.

Regardless of the effectiveness of the package treatment plant, if a central sewage system is developed whereby sewage generated on the island can be pumped to the mainland for treatment, the Gorrie Ocean Mile project is required to discontinue use of the package plant and connect to the central sewage system. If a central sewage treatment system is not available, and if the monitoring wells disclose no significant damage to the waters of Apalachicola Bay, then the developer is permitted to submit detailed plans for subsequent phases of the Gorrie Ocean Mile project, expanding the package plant as needed. Because the 8,000 square foot commercial building was not expected to generate significant levels of waste, the order permitted detailed plans for its construction and connection to the package plant to be submitted at any time.

Within the development order for Gorrie Ocean Mile the Commission adopted as a goal, subject to feasibility and environmental impact studies, the construction of a central sewage system for treatment of St. George Island sewage on the mainland. To date, 99 units and the package sewage plant have been constructed; however, only 42 units are actually being used -- the remaining units are not connected to the package plant. The multiple family units have been marketed as "300 Ocean Mile."

(3) Sikes Cut Commericial Area

On July 16, 1985, the Franklin County Commission approved a development order for the Sikes Cut commercial area, pursuant to the 1977 development order. Although the 1977 order stated that multiple family or condominium units would not be approved in the Plantation's commercial areas without the Commission's prior consent, in this development order 352 multiple family units were approved as well as a 386 room hotel on 87.5 acres. Although the application for development approval had also contained a proposed marina, a ship's store, and public access to Bob Sikes Cut, the Commission deferred further consideration of these uses until the application for approval of a marina at Nick's Hole, as designated in the 1977 development order, is resolved. These issues remain pending; however, the Commission will resume consideration of them no later than July 31, 1987. Rezoning of this commercial area has not occurred; it remains within an R-1 Single Family Residential district.

The Sikes Cut commercial area will be served by an advanced, tertiary sewage treatment facility. In addition, 44 single family units in adjoining subdivisions will also be connected to it. Although nine lots at the western tip of the island are proposed as part of the marina, if the marina is not approved it is presumed that they will remain single family lots and will be connected to the treatment plant. That would bring the total number of lots on the system to 53. Effluent disposal is proposed by means of spray irrigation in the median of Leisure Lane. A monitoring program of groundwater and offshore waters is required to measure any adverse impacts on environmental quality. If the monitoring program discloses that the spray irrigation of effluent is causing significant degradation of groundwater or offshore waters, the developer must submit revised plans for spray irrigation, or another disposal method, as soon as possible. The County may direct the developer to curtail operation of the sewage treatment plant until an acceptable alternative is implemented. If a central wastewater collection and treatment system is constructed to serve all of St. George Island, and that system would provide a substantial environmental benefit, as compared to the more limited Sikes Cut system, then the development order provides that the entire Sikes Cut commercial area would be required to connect to the larger system.

(4) Nicks Hole Commercial Area

The only commercial area covered by the 1977 development order for which detailed plans have not been submitted is Nicks Hole. The uses within the Nicks Hole commercial area conceptually approved by the 1977 development order are an airstrip, hotel, marina, beach club, and such other affiliated uses as may be appropriate or desirable, such as tourist shops, restaurant, recreational amenities and similar activities. To date only the airstrip has been constructed. The entire commercial area contains 152 acres and the airstrip occupies 27 acres. It is zoned R-1 Single Family Residential district.

Although the development order lists the types of uses that may be located at Nicks Hole, it, as well as the application for development approval, is silent as to the number of hotel rooms, boat slips, or commercial square feet that could eventually be approved. Moreover, the developer has maintained that the development order doesn't prohibit multiple family units outright but only requires that detailed plans be submitted to and consent obtained from the Commission prior to their construction. Since the Sikes Cut commercial area was subject to the same restrictions as the Nicks Hole commercial area, but that nevertheless, the Sikes Cut area received approval for 352 multiple family units plus a 386 room hotel, for planning purposes it seems reasonable to attempt to take into account what uses may actually be built at Nicks Hole.

Of course the entire area could be converted into one acre single family lots as specified in the 1977 development order. If this were done, approximately 125 units could be built. However, based upon the proposals and counter-proposals that have been suggested since the original order was approved, it is likely that the area will be used more intensively. Various numbers of multiple family units, hotel rooms, and boat slips have been talked about. The most recent figures appear in an annual report submitted on December 3, 1985, by the developer to the Department of Community Affairs pursuant to Section 380.06(16), F.S. This report describes conceptual plans for clusters of 1,220 multiple family residential units, a 250 room hotel/convention center, a central wastewater treatment plant, a recreation park, and retail stores. No figures are given for the retail stores although 15,000 square feet total appears to be a fair estimate. In addition, a dredge and fill permit application was filed on August 14, 1985, for a 132 slip marina, although DER has preliminarily notified the developer that the application cannot be recommended for approval due to concerns about adverse impacts on water quality and shellfish harvesting areas. Nevertheless, it does indicate the size marina the developer has in mind.

For the purposes of this report, then, the figures given for the boat slips and hotel will be used to project future usage. The number of multiple family units, however, appears high. The Franklin County Comprehensive Plan allows multiple family development at a maximum of 4.356

units per acre. The Zoning Ordinance likewise permits multiple family at a maximum density of 4.356 units per acre. The Sike Cut development order approved multiple family based upon a calculation of 4.3 units per acre. The area used to perform the Sikes Cut calculation was not the entire commercial area, but only that area proposed to be devoted to multiple family usage. An additional 23 units was granted by the Commission as a bonus, bringing the total to 352 units, in consideration of the developers commitment to build a tertiary sewage treatment plant for the development and connect 44 adjacent single family units to it. Using the same methodology for Nicks Hole and reducing the 125 acres by 4 acres for the treatment plant and 10 acres for the hotel, 111 acres remains available for multiple family development. Multiplying 4.356 units per acre by 111 acres yields 483 possible units. Because it is unknown whether the Commission will choose to grant any bonus units, 483 is the figure that will be used in this report.

Existing Land Uses

In response to Section 380.0555(11)(c)1., F.S. the Franklin County Health Department has recently completed a survey of all septic tank soil-absorption systems on St. George Island. With the exception of the Villas of St. George (42 units), 300 Ocean Mile (42 units), and the Buccaneer Inn (90 rooms), all other uses on the island use septic tanks to dispose of their wastewater. With the exception of the commercial uses in the middle section of the island, the hotel and multiple family uses just mentioned, and the state park, all other septic tank users are single family dwellings. Hence, the septic tank survey conducted by the Health Department can also serve as a land use survey which can be supplemented with those uses we have separate knowledge of. Figure 5 shows where existing septic tanks and package treatment plants are located, and it also shows where existing single family, multiple family, motel, and businesses uses are located. Wherever a symbol for a septic tank appears outside the island's central commercial district, but not within the state park, a single family dwelling exists. Septic tank symbols within the central commercial district indicate businesses. The symbols for package plants indicate the location of multiple family projects and the motel. Table 1 provides a detailed breakdown and summary of existing land uses.

Lot sizes on the island range from less than a fourth of an acre within the commercial district of the St. George Island Gulf Beaches to ten acres or more in the East End. Table 2 gives a breakdown of the number of lots by class sizes and Figure 3 shows the distribution of these densities.

Future Land Uses

Future land uses were determined using the approved development of regional impact orders, the Franklin County Comprehensive Plan and Zoning Map, the existing platted areas, and a court case involving two properties in the central commercial district. In the court case (Leisure Properties, et.al., vs. Franklin County), the First District Court of Appeal on March 9, 1983, ruled that two tracts totaling approximately 43.5 acres in the central commercial district could be developed for multiple family, as permitted before the County amended the Zoning Code. This would permit 48 units on the tract next to the Gulf. The other tract is adjacent to the bridge and contains 40.9 acres. However, according to the Franklin County Planning Director, it is estimated to be only 25% developable because much of it is wetland. Therefore, approximately 225 units could be constructed on it.

There is no simple method to determine the number of businesses that could locate within the central commercial district which would be meaningful in determining the future number of septic tanks. For the purposes of this report, total number of future businesses was estimated by assuming that the ratio of businesses to area occupied would be roughly the same in the future as it is today. This assumption yields a build-out figure of approximately 150 businesses. It is assumed that the tracts previously discussed that could be developed for multiple family use would in fact be developed that way. Table 3 provides a detailed summary

TABLE 1: Existing Land Use On St. George Island (July 1986)

A. Summary

1. Total Land Area	4,824 acres
2. Total Publicly Owned Land	1,992 acres
3. Developable Area	2,832 acres
4. Area Developed	339 acres
5. Area Undeveloped	2,493 acres
6. Percent Developed (of developable area)	9.7 %
7. Existing Units	722 units
8. Existing Multiple Family (package)	84 units
9. Total Single Family Lots (platted and unplatted)	2,652 lots
10. Total Single Family Developed (Septic)	638 units
11. Total Single Family Undeveloped	2,014 lots
12. Percent of Single Family Developed	24.1 %
13. Total Commercial Area	362.3 acres
14. Commercial Area Approved for or Developed as Multiple Family	136.5 acres
15. Commercial Area Developed Commercially	35.2 acres
16. Commercial Area Undeveloped and Not Approved for or Developed as Multiple Family	190.6 acres

B. The Plantation

1. Total Area	984 acres
2. Single Family Area	
a. Total Area	744.5 acres
b. Lots Developed (septic tanks)	66 units
c. Lots Undeveloped	727 lots
d. Total lots	793 lots
e. Percentage of lots developed	8.3 %
3. Sikes Cut	
a. Vacant	87.5 acres
4. Nicks Hole	
a. Total	152 acres
b. Vacant	125 acres
c. Airstrip	27 acres

C. St. George Island Gulf Beaches

1. Total Area	1,563 acres
2. Single Family Area	
a. Total Area	1387.7 acres
b. Lots Developed (septic tanks)	531 units
c. Lots Undeveloped	997 lots
d. Total lots	1,528 lots
e. Percentage of Lots Developed	34.8 %
3. Commercial Area	
a. Total Area	89.3 acres
b. Area Developed	8.2 acres
c. Recreation and Parking	5.0 acres
d. Area Undeveloped	81.1 acres
e. Percent Developed	9.2 %
f. Number of businesses	29
g. Multiple family units (package treatment plant)	42 units
h. Motel (package plant)	90 rooms
4. Trust for Public Land	86 acres

D. East End of Island

1. Total Area	394 acres
2. Existing Single Family (52.5 acres) (septic tanks)	41 units
3. Vacant Single Family	290 acres
4. Gorrie Ocean Mile	
a. Existing multiple family (5.5 acres)(package plant)	42 units
b. Vacant commercial	28 acres
5. Public Trust Lands	18 acres

E. State Park

1. Total Area	1,883 acres
2. Number of septic tanks	13

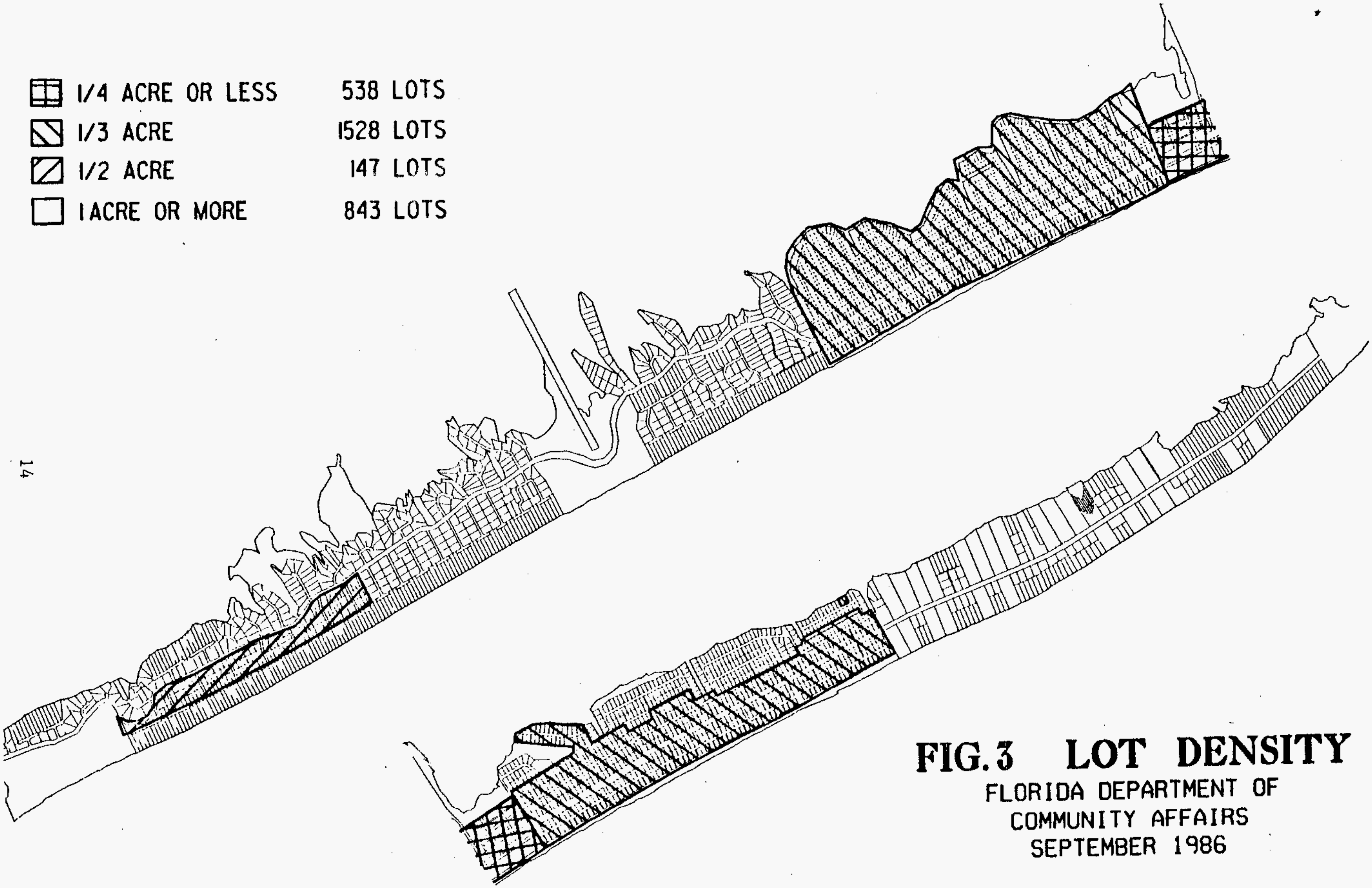

FIG. 3 LOT DENSITY

FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS
SEPTEMBER 1986

and breakdown of future land use conditions when the island is completely developed. As was done with existing land uses, the symbols for the location of future sewage systems can also be used to determine future land use patterns. Figure 7 provides this information.

TABLE 2: Lot Sizes On St. George Island

≤1/4 acre	538	lots
1/3 acre	1,528	lots
1/2 acre	147	lots
1 + acre	843	lots

TABLE 3: Future Land Uses On St. George Island (Build-Out)

A. Summary	
1. Number of Units	4,048
2. Single Family Units (septic tanks)	2,602
3. Single Family Units (tertiary treatment plant)	44
4. Multiple Family (package treatment plant)	1,402
5. Hotel (package plant)	876
6. Businesses (septic tanks)	150
7. Businesses (package plant)	23
B. St. George Plantation	
1. Single Family	
a. single family (septic tanks)	740 units
b. single family on tertiary plant	44 units
c. total	784 units
d. single family lots proposed to become part of marina	9 lots
2. Sikes Cut Development of Regional Impact (DRI) (Tertiary Treatment Plant)	
a. Multiple family	352 units
b. Hotel	386 units
c. Marina (unapproved)	
3. Nick's Hole DRI (central treatment plant)	
a. Airstrip	27 acres
b. Hotel (unapproved)	250 units
c. Commercial (unapproved)	15,000 sq. ft.
d. Marina (unapproved)	132 slips
e. Multiple family (unapproved)	483 units
C. St. George Island Gulf Beaches	
1. Single family on septic tank	1,528 units
2. Multiple family	
a. Villas of St. George (package plant)	42 units
b. Musgrave Tract (package plant)	48 units
c. Tract adjacent to bridge on Bay side (estimated at 25% developable at 22 units per acre) (package plant)	225 units
d. Total	315 units
3. Hotel	
a. Buccanner Inn	90 units
4. Commercial	150 businesses
5. Public Trust Lands	86 acres
D. East End of Island	
1. Single family on septic tank	334 units
2. Gorrie Ocean Mile	
a. Multiple family units (package plant)	252 units
b. Hotel (package plant)	150 units
c. Commercial (package plant)	8,000 sq. ft.
E. State Park	
1. Number of Septic Tanks	13

Population

Currently, there are 722 dwelling units on the island: 638 are single family units on septic tanks and 84 are multiple family units on package plants. Of the 722 total units, 187 are occupied on a year round basis by 448 residents. There are 90 motel units. It is estimated that at any one time, a maximum of 2,527 to 3,032 people could be living on the island either on a temporary or year round basis. Additionally, during the summer a significant number of people visit the public beaches during the day; although the number of people using the Franklin County Public Beach is unknown, recent figures from the St. George Island State Park indicate that approximately 20,000 people per month use the park during the summer. While figures in tables 1 and 3 give a detailed breakdown of existing and future land uses, they don't give a complete picture of the way in which the island is used. They don't reflect the seasonal use of the island; nor do they reflect the heavy day use of the island during the summer.

Table 4 was prepared using figures provided by the Florida Department of Transportation and indicates the monthly, one way toll traffic on the Bryant-Patton Bridge going to the island. It should be stressed that the figures in Table 4 are counts of vehicles, not people. If some average number of people per car were assumed, say 2.5, then in July of 1985, 66,677 people crossed the bridge to St. George Island. It is estimated that on the most recent fourth of July week-end (1986), 4,583 people per day crossed the bridge. Moreover, the number of vehicles crossing the bridge in the month of July has increased since 1980 an average of 12.6% per year. If this trend were to continue over the next five years, by 1990, 52,531 vehicles would be visiting the island during July, carrying 131,327 people. These numbers are not intended to be absolute predictions, but rather indications of just how heavily the island could be used. When it is considered that over half the residential units will use septic

TABLE 4: Monthly One-way Revenue Traffic on the Bryant-Patton Bridge: 1980-1985

Month	Year 1980	Year 1981	Year 1982	Year 1983	Year 1984	Year 1985
January	7,347	9,189	7,803	8,829	11,062	11,556
February	7,840	9,637	9,259	9,363	13,384	12,999
March	10,929	14,349	14,384	13,775	18,265	22,256
April	13,349	18,408	16,127	18,364	21,442	23,663
May	17,426	20,833	21,220	22,700	25,132	26,671
June	15,884	18,612	19,193	22,406	25,854	25,092
July	16,377	19,473	20,609	26,434	25,957	29,022
August	17,041	16,455	18,077	20,266	24,658	22,749
September	12,268	13,554	13,269	16,603	19,760	4,129 (hurricane)
October	12,624	11,516	12,240	14,996	16,604	16,964
November	11,190	10,504	11,484	13,574	15,559	10,237 (hurricane)
December	9,127	7,807	9,335	10,413	13,449	10,752
Total	151,402	170,337	173,000	197,723	231,126	216,090

tanks, it becomes apparent that careful consideration should be given to this manner of providing wastewater treatment for this many people.

Table 4 also shows the extreme seasonalness of the island's usage which has persisted year after year. In 1985, the number of vehicles crossing to the island increased by 151% from January to July, and then by December, declined again to nearly the same level from which they had started.

Park attendance shown at Table 5 since 1980 also exhibits the dual characteristics evinced by the toll figures: steadily increasing numbers of people on an annual basis and pronounced seasonal usage during the year.

Population Projections

Projecting the future population of the island is complicated by characteristics of its usage which have already been noted: a low year-round population, a high number of rental units that are inhabited by different sets of people from week to week, extreme seasonalness from winter to summer, and a substantial number of people visiting the island for the day only. Furthermore, there is a lack of historical population from which a trend can be established. Prior to 1980, the Bureau of the Census does not report separate figures for the island. Needless to say, the projections presented here are only rough approximations. They are intended merely to indicate the magnitude of growth as opposed to absolute predictions.

From a previous section, the total number of units possible under current zoning and development orders is 4,048, not counting the 876 hotel units. To calculate number of persons per household, interviews with the principal rental agents on the island were conducted and it was determined that the average rental unit is occupied by six people. The average number of persons per year-round dwelling unit was calculated at 2.4. The units on the island can be roughly divided into thirds: one third year-round units, one third rental units controlled by

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TABLE 5: Monthly Attendance at the Dr. Julian G. Bruce State Park: 1980 - 1986

Month	Year 1980	Year 1981	Year 1982	Year 1983	Year 1984	Year 1985	Year 1986
January		1,635	1,270	1,317	1,784	1,711	Closed Hurricane Kate
February		2,235	3,119	2,402	4,153	2,988	Closed Hurricane Kate
March		5,019	6,115	4,981	8,321	13,592	Closed Hurricane Kate
April		9,076	8,220	9,605	13,732	14,389	6,509 Reopened 4/15
May		11,190	14,148	14,711	16,949	20,690	18,689
June	11,179	10,628	10,974	13,926	17,499	17,984	18,258
July	10,754	10,926	16,543	18,428	17,658	23,657	21,320
August	10,272	8,888	14,442	11,855	14,018	15,170	
September	4,191	5,143	5,533	6,876	10,533	Closed Hurricane Elena	
October	2,400	2,885	3,676	4,056	4,224	Closed Hurricane Elena	
November	2,158	2,522	2,711	2,774	3,174	Closed Hurricane Elena	
December	1,166	1,167	1,406	1,205	2,946	Closed Hurricane Elena	

agents, and one third unknown (week-end cottages or private rentals). Because of this unit mix, an average between year-round units and rental units was calculated, yielding 4.2 persons per unit. Because 4.2 is an approximation, and because it is a figure higher than normally found in population studies, it was balanced with another taken from the Department of Environmental Regulation. The number used by that agency for the island is 3.5 persons per unit (Sarvis, 1986). Applying both figures, a range of projections is produced, from 14,168 to 17,001 persons. If motel units are included at the same number of persons per unit, the maximum number of people that could be staying on the island at any one time ranges from 17,234 to 20,680 persons. The number of people that the state park can physically accommodate on a monthly basis far exceeds the actual number of people likely to visit it. Since the park opened in 1978 it has experienced a doubling of the number of people visiting it during the summer. Although visitors are not anticipated to again double over the next 5 years, usage will undoubtedly increase. It is projected that eventually the park will host some 30,000 to 40,000 people per month during the summer.

It should be mentioned here that we are not asserting that this number of people will be living on the island all at one time. Seasonal rental units stand vacant a significant percentage of the year, cottages are occupied on only a periodic basis, and there is even a percentage of year-round units that are vacant at any one time. Nevertheless, for planning purposes, we assume maximum occupancy to demonstrate the worst-case and to build in a safety margin.

Projecting the rate of growth is more difficult because of the lack of historical population data. Water consumption rates were no help because central water facilities were only recently installed and people have only gradually connected. In fact, there are still approximately 200 units on the island that rely on private wells. Although Florida Power Corporation reported that the number of active electrical meters for early summer of 1986 was 925, they were not able to provide year by year counts in time for this report. In any event, the figure reported includes a large number of non-residential uses (businesses, recreational uses, and miscellaneous) and would be only obliquely helpful.

The number of building permits issued by the Franklin County Building Department is the best indication of the rate of growth that is available. Beginning in 1973 through 1985, these figures are presented in Table 6 below.

TABLE 6: Residential Building Permits Issued for St. George Island - 1973-1985

1973	31	single family	
1974	34	single family	
1975	18	single family	
1976	13	single family	
1977	22	single family	
1978	24	single family	48 multiple family
1979	40	single family	
1980	35	single family	
1981	46	single family	
1982	52	single family	
1983	71	single family	99 multiple family
1984	63	single family	
1985	50	single family	

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These data allow no real trend to be established, other than to note that more permits were being issued on an annual basis from 1979 through 1985 than from 1973 through 1978. On average, since 1979 between 50 to 60 single family permits have been issued per year. Multiple family units are excluded from this analysis because there are only five or six projects that can be built and there is no reliable way to project when they will be. Subtracting out multiple family units and using 50 to 60 units per year as the growth rate, it is projected that the island will reach buildout in the next 30 to 40 years. It can be assumed that the remaining multiple family projects will be constructed sometime during this timeframe, depending on such outside factors as financing, marketing, general economic conditions, tax laws, etc.

SOILS AND GROUNDWATER

Soils

The U.S. Soil Conservation Service has recently updated its soil survey of St. George Island. The Service has analyzed the soils in terms of composition and suitability for septic tank use. In evaluating suitability, the depth of the water table, susceptibility to flooding, and texture and permeability was considered. Table 7 summarizes the characteristics of the soils found on the island and Figure 4 depict the soil pattern.

Approximately 70.5% of the soils in the developable areas of the island are rated as having severe limitations for septic tank use. That is due to the shallow depth to the water table, flood hazard, and susceptibility to tidal action. In addition, 17.9% of the soils are located in zones classified as part of the coastal beach and dune system in which the State restricts development. Altogether, they render 88.4% of the island unsuited for either septic tanks or building construction. The remaining soils which are rated as having slight limitations for septic use have a very rapid permeability rate which may allow contamination of ground water because the sandy soils act as a poor filter.

In a study prepared by the Department of Natural Resources in December 1985, the soil data generated by the Soil Conservation Service was digitized on a Summagraphics Datagrid II to determine the area of each soil type. The results are also presented in Table 7. Below is a more detailed discussion of the island's soils.

Construction on coastal beach (84), coastal dunes (86), or Kershaw sand (6C) is restricted, subject to provisions of Chapter 161, F.S., and Chapter 16B-33, FAC. Permit review is performed on a site-specific basis. These three soil types comprise 7.0%, 12.5%, and 5.4% of the Island's area, respectively.

Tidal marsh covers 16.9% of the Island. The water table occurs at less than six inches. Department of Health and Rehabilitative Service Rule 10D-6, FAC, does not allow septic system

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TABLE 7: Soil Characteristics of St. George Island (Porter, 1985)

SCS Code	Soil Type	Drainfield Limitation	Water Table Inches	Acres	Square Feet	Square Miles	Percent
58	Osier sand	Severe	<12	940	40,948,842	1.4688376	31.3
92	Tidal marsh	Severe	< 6	499	21,725,657	0.7793007	16.9
34	Pomello sand	Severe	30-40	383	16,686,723	0.5985538	12.7
86	Coastal dune*	Slight	>72	377	16,421,498	0.5890402	12.5
27B	St. Lucie sand	Slight	>72	351	15,291,602	0.5485107	11.6
84	Coastal beach*	Severe	<10	209	9,115,040	0.3269571	7.0
6C	Kershaw sand*	Slight	>72	164	7,147,835	0.2563933	5.4
58A	Osier sand fill	Severe	<12	44	1,907,349	0.0684167	1.4
40	Leon sand	Severe	6-18	38	1,636,415	0.0586983	1.2
Total				3005	130,880,961	4.6952481	100.0

*Note: Development is prohibited on beaches and dune lines.

CODE	SOIL TYPE	ACRES	PERCENT
58	OSIER SAND	940	31.1
92	TIDAL MARSH	499	16.9
34	POMELLO SAND	383	12.7
86	COASTAL DUNE	377	12.5
27B	ST. LUCIE SAND	351	11.6
84	COASTAL BEACH	209	7.0
6C	KERSHAW SAND	164	5.4
58A	OSIER SAND FILL	44	1.4
40	LEON SAND	38	1.2

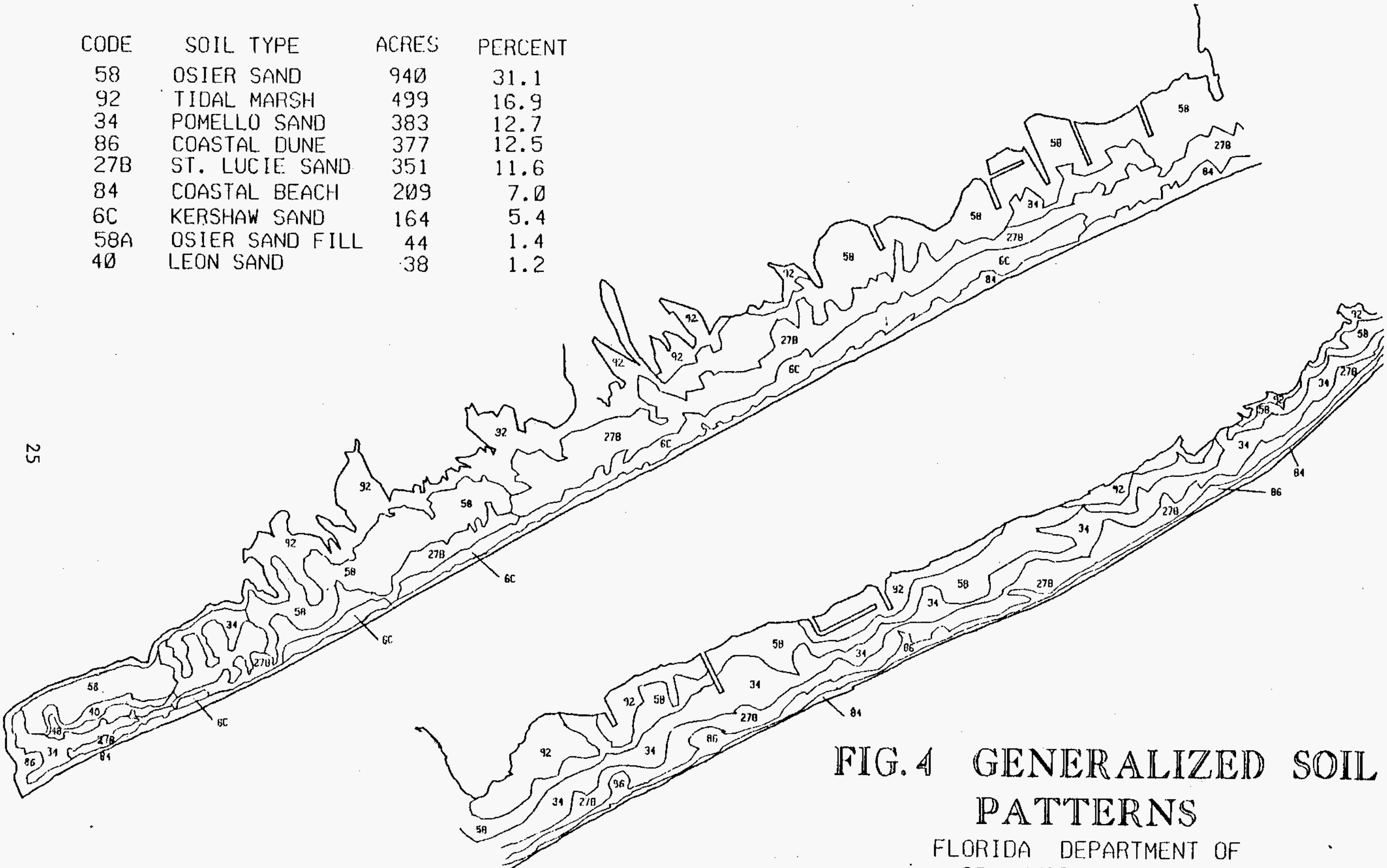

FIG. 4 GENERALIZED SOIL PATTERNS

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installation in organic marsh soil. In addition, the Department of Environmental Regulation would have to issue a variance and permit for construction and fill in tidal marshland. Because Apalachicola Bay is a class II water, DER discourages construction, and will not issue a variance or permit if construction may adversely affect water quality. This authority is based on Chapter 403, F.S., and Chapters 17-3, 17-4, and 17-12, FAC.

Osier sand (58) and osier sand fill (58A) cover a total of 32.7% of the Island. These soils also have a severe limitation, although 10D-6, FAC, would allow septic tank installation in 36 inches or more of fill.

Leon sand covers 1.2% of the Island, and has a water table from six to eighteen inches below ground surface. This soil also has a severe limitation, although 10D-6, FAC, would allow installation of septic systems in 24 to 36 inches of fill.

Pomello sand covers 12.7% of the Island. Although it is classified as severely limited by the SCS, Rule 10D-6, FAC, would allow septic tank installation in 12 inches or less of fill.

St. Lucie sand (27B) covers 11.6% of the island, and is the only soil type which allows septic system installation without extensive fill.

In summary, 88.4% of St. George Island is either classified as severely limited for septic system operation, or is part of the beach and dune system, on which building is restricted.

Groundwater

The largest source of groundwater, under most conditions, is rainfall. Under unsaturated conditions rainwater will percolate down through the spaces between the grains of the soil until it reaches groundwater. These spaces, called pore spaces, may constitute up to 25% of the volume of the soil. Hence, under saturated conditions, one inch of rain can cause the water table (i.e. the top of the groundwater) to rise by 4 inches. Not all water that falls, however, reaches the groundwater; it may be removed from the soil before reaching the groundwater by surface runoff, evaporation, and evapo-transpiration (i.e. water taken up from the soil by plants and released to the atmosphere from their leaves). Even when reaching the groundwater, it may still be removed artificially by surficial wells for drinking water or irrigation. Water reaching the groundwater and not removed by wells, flows laterally, generally following surface contours by moving from higher to lower elevations. If surface water bodies are nearby, then the groundwater will enter them. It is easy to see, therefore, that, if not first filtered out by the soil, whatever contaminants accompanying the water percolating through the soil will enter the groundwater and eventually seep into adjacent surface waters. Septic tank effluent is the most significant non-natural source of groundwater recharge. It is extremely important, therefore, that the contaminants it carries be filtered out before it enters the groundwater.

Filtration of contaminants from water occurs most readily in unsaturated soils having fine particle sizes (not so fine as to constitute clay, however, for then the water won't percolate at all, or only very slowly). Under these conditions, water doesn't move straight down but fans out as a result of the capillary action of the soil particles (a process similar to the way in which water rises up a tree). This allows maximum opportunity for the removal of contaminants. Once the soils become saturated, however, the water tends to move more directly downward, as capillary action is no longer the dominant force, and tends to follow the larger pores and channels. Thus, the water moves more quickly and is filtered much less effectively before reaching the groundwater zone. For this reason, the distance between the bottom of the septic tank drainfield and the water table, that is, the depth of the unsaturated zone, is extremely important for effective filtering of contaminants. Also of consideration in determining the depth is the amount of flunctuation that will occur in the height of the water table. Although the height of the table always tends to some equilibrium, roughly following surface elevations, it does so more or less slowly. Therefore, during seasons of heavy rainfall, the water table may rise, and stay elevated, until dryer conditions prevail and the groundwater returns to normal levels. Likewise, during dry periods, the water table may become depressed below its normal level. It should be obvious that during periods when the water table is high, septic tanks, if not properly elevated, will function much less effectively. That is why a safety margin should be built in when locating septic tanks in areas where the water table is already close to the surface: not that the extra distance between the bottom of the drainfield and the top of the water table is needed under normal conditions, but that it may be needed during the rainy season.

The largest source of groundwater on St. George Island is rainfall. Mean annual rainfall, recorded over the last 42 years by the NOAA weather station in Apalachicola, is 57.21 inches. Assuming all rainfall enters the ground, and interstial pore size represents 25% of soil volume, the water table on St. George Island could rise 19.07 feet annually. Due to runoff, well drawdown and evapo-transpiration, the actual increase in water table may be significantly less, although well in excess of the volume the Island's surficial aquifer can hold. Groundwater not removed by artificial or natural means will then move laterally, into Apalachicola Bay or the Gulf. As indicated in Table 7 the water table on St. George Island is characteristically high. Seventy percent of the island has a water table that is within three feet or less of the ground surface; almost 60% has a water table within 18 inches or less.

SEWAGE DISPOSAL ON ST. GEORGE ISLAND

Existing Sewage Disposal Systems

Existing sewage disposal on the island is accomplished by septic tank systems and package sewage treatment plants.

The Department of Environmental Regulation has permitted three package sewage treatment plants which are described as follows:

(1) Villas of St. George (42 units) is permitted at 15,000 gallons per day (gpd) with effluent disposal to an absorption field. The existing flow is in the range of 5,000 gpd while the maximum recorded flow is 10,000 gpd.

(2) 300 Ocean Mile (42 units) is permitted to expand from 30,000 gpd with effluent disposal to an absorption field. The existing flow is in the range of 6,000 gpd and maximum recorded flow is 9,000 gpd.

(3) Buccaneer Inn (90 rooms) is permitted at 13,000 gpd with effluent disposal to an absorption field. The existing flow is in the range of 8,000 gpd with a maximum recorded flow of 10,000 gallons per day.

These plants are nearly new and minimal mechanical problems are anticipated. All are operating within their permitted limits, and all are located south of State Road 300. It could be expected that their effluent disposal plumes move south toward the Gulf. However, no actual piezometric data are available for the plants, and groundwater movement may not be as expected.

Weather, tides, and other site-specific conditions can have much influence on groundwater flows on low, narrow barrier islands such as St. George Island (Kriegel, 1986).

The Department of Environmental Regulation has also permitted septic tanks for the state park and the St. George Restaurant. The St. George Island State Park has five septic tank systems permitted ranging from 2,600 to 5,130 gpd and no problems have been reported to date. St. George Restaurant has a septic tank, sand filter to drainfield system permitted for 2,160 gpd and no problems have been permitted to date (Richards, 1986).

The island's remaining uses, which consist of 638 single family dwellings and 26 businesses, utilize septic tanks to dispose of their wastewater. There are eight more septic tanks at the state park in addition to the five systems permitted by DER reported above. That brings the total number of septic tank systems on the island to 677.

The location of all sewage disposal systems is shown at Figure 5. Figure 6 shows the distribution of existing septic tank systems with respect to soil types. Five hundred and twelve, or 75.6 percent, of existing septic tank systems are located within soils that are either rated by the Soil Conservation Service as having severe limitations for septic tank use, or are in soils upon which the state limits development.

The number and location of single family and business septic tank systems is based upon a survey of septic tanks conducted by the Franklin County Health Department, a County Public Health Unit under the Florida Department of Health and Rehabilitative Services (HRS). That survey was required by the Apalachicola Bay Area Protection Act of 1985. The Act designated the Apalachicola Bay system, including St. George Island, an Area of Critical State Concern and allocated $39,188 and two additional positions to HRS to conduct the survey. Section 380.0555(11)(c).1. states that "the Department of Health and Rehabilitative Services shall survey all septic tank soil-absorption systems in the Apalachicola Bay Area to determine their suitability as onsite sewage treatment systems." The survey of St. George Island was completed in August 1986. No malfunctioning septic tanks were discovered.

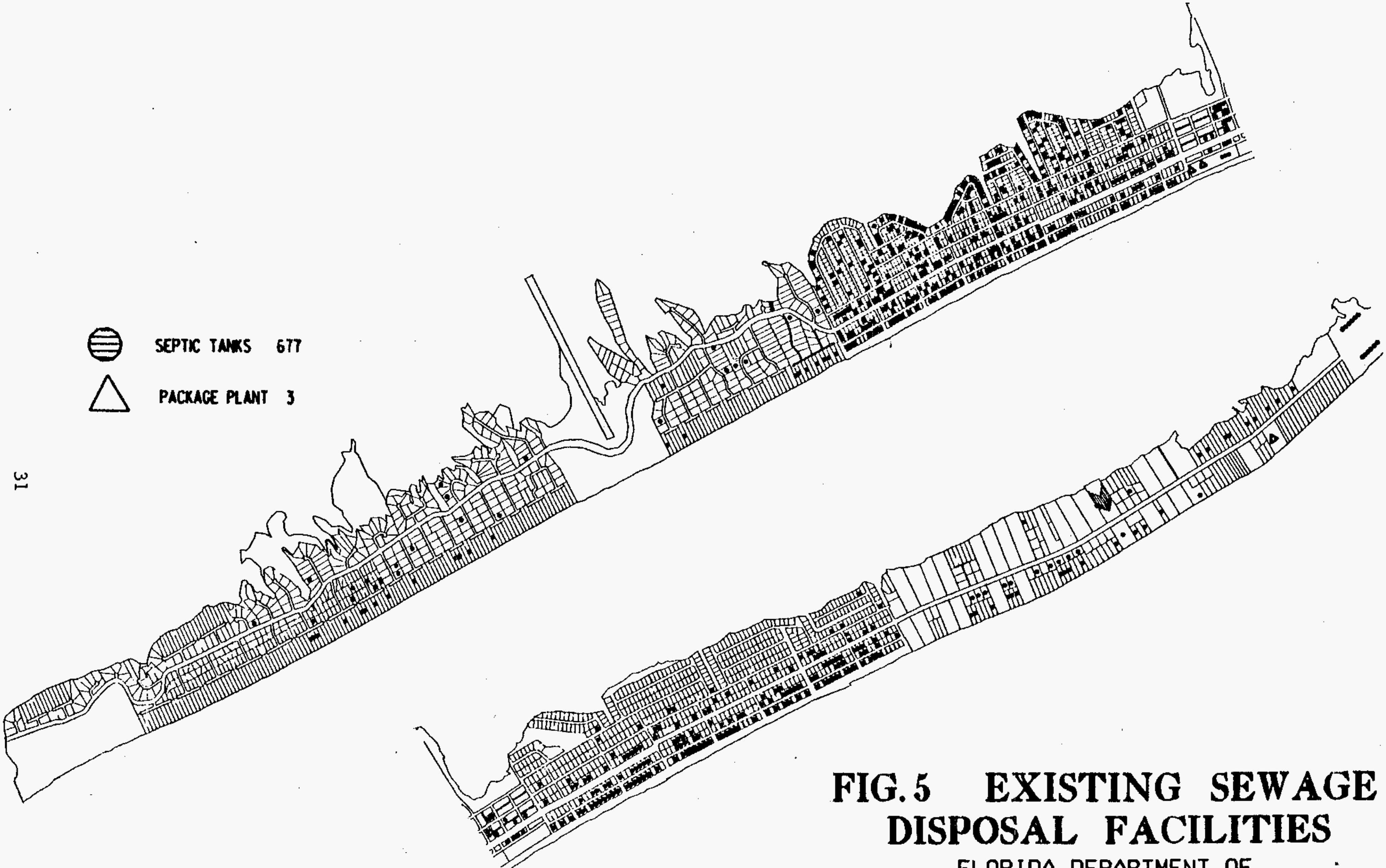

FIG. 5 EXISTING SEWAGE DISPOSAL FACILITIES

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CODE	SOIL TYPE	ACRES	PERCENT
58	OSIER SAND	940	31.1
92	TIDAL MARSH	499	16.9
34	POMELLO SAND	383	12.7
86	COASTAL DUNE	377	12.5
27B	ST. LUCIE SAND	351	11.6
84	COASTAL BEACH	209	7.0
6C	KERSHAW SAND	164	5.4
58A	OSIER SAND FILL	44	1.4
40	LEON SAND	38	1.2

SEPTIC TANKS 165 ON SOILS WITH SLIGHT LIMITATIONS

512 ON SOILS WITH SEVERE LIMITATIONS

PACKAGE PLANT

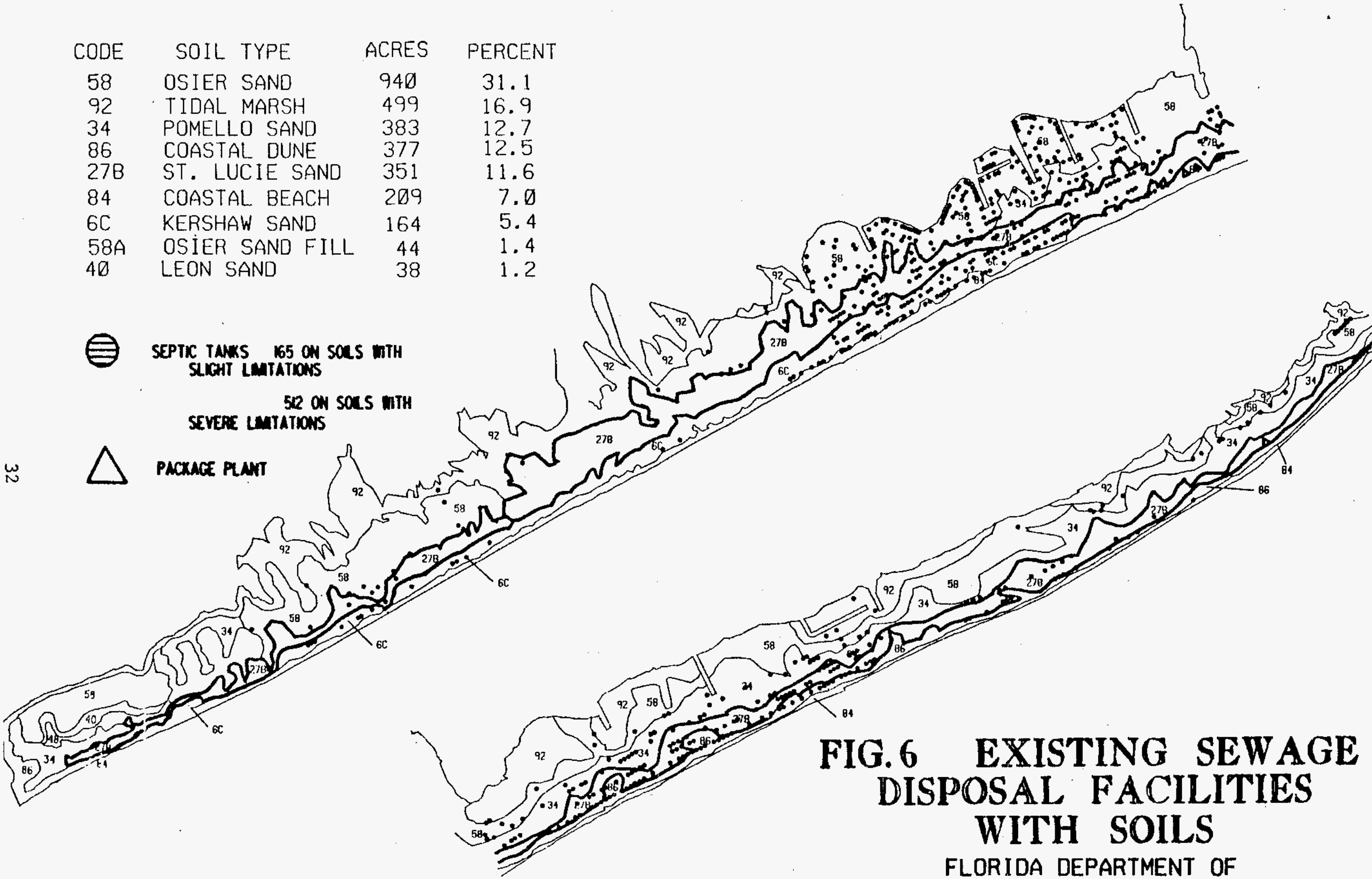

FIG.6 EXISTING SEWAGE DISPOSAL FACILITIES WITH SOILS

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Future Sewage Disposal Systems

Current planning for the island encompasses a variety of methods for future wastewater disposal. Of the 4,048 planned units, 2,602, or about two-thirds will be served by septic tanks (assuming a central sewage system is not installed). These will all be single family units located throughout the island. Additionally, the 150 projected businesses within the central commercial core will also use septic tanks. The park has no plans to expand its facilities, at least in terms of wastewater disposal, so it will continue to have 13 septic tank units. Thus, the total number of individual septic tanks that can be anticipated when the island is completely developed is 2,765. There will be six package treatment plants, and two central wastewater treatment plants, to accommodate the planned and proposed hotel and multiple family development within the four commercial areas. The location of these systems is shown at Figure 7. Figure 8 shows the distribution of future sewage disposal systems with respect to soil types. If development proceeds as it is currently planned, 2,418, or 87.5%, of all future septic tank systems will be located in soils rated severely limited for septic tank use, or upon which the state limits development.

Septic Tank Densities

Septic tank density (i.e., the number of septic tanks per unit of land area, usually an acre) is one of the most important parameters influencing local and regional contamination of groundwater. Increasing density of septic tank installations decreases the dilution of effluent constituents and increases potential contamination of groundwater.

Bicki (pp. 151-158) discusses a number of studies that have been done relating septic tank density to groundwater pollution, a few of which will be cited here.

Miller (1972) recommended that house lot size requirements in Delaware be increased from 0.5 acre to 2.0 acres after a water quality survey indicated that 25 percent of the water wells in the shallow water table aquifer had nitrate-nitrogen concentrations of 4.5 mg/liter (i.e., twice background levels).

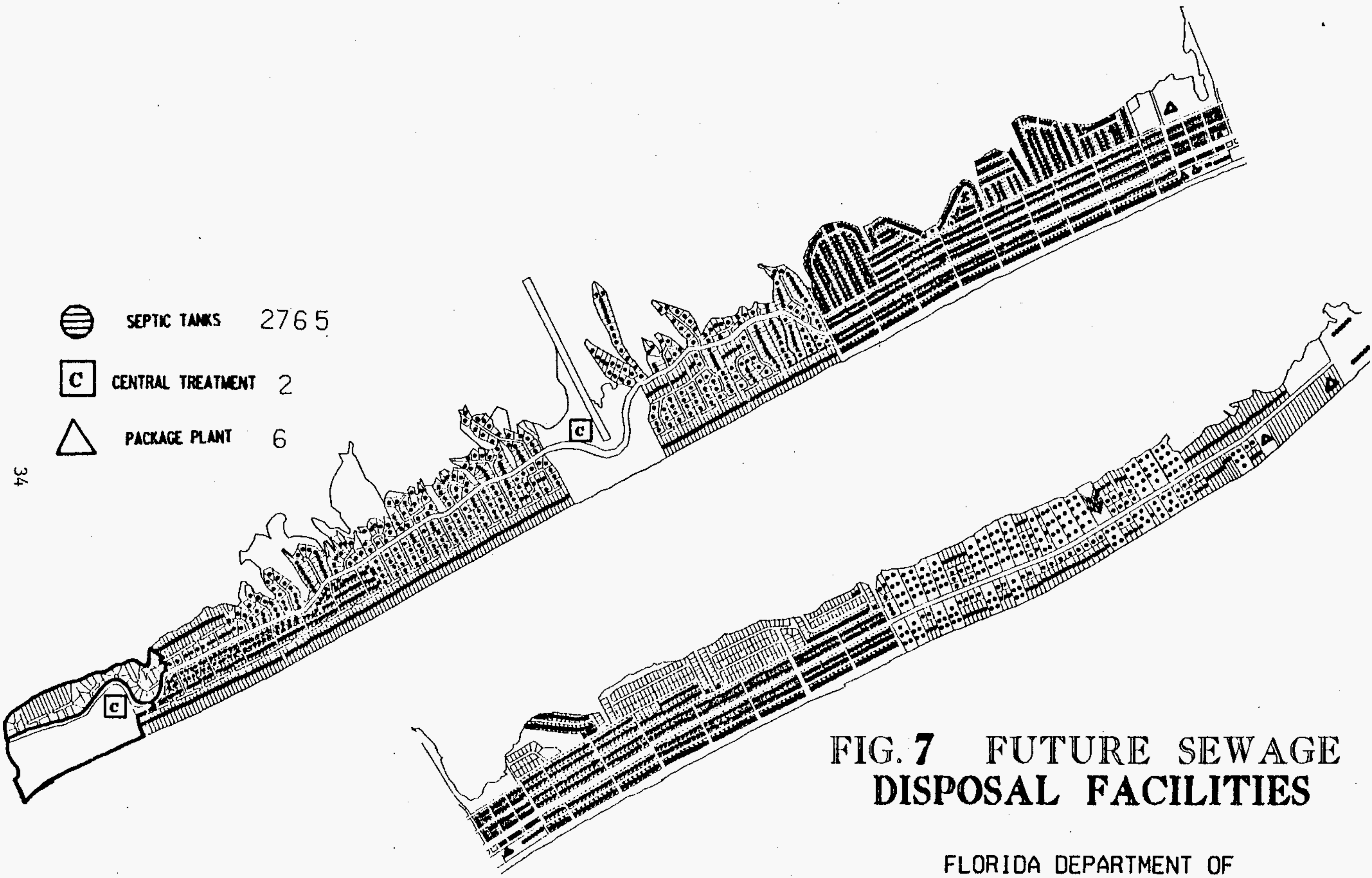

FIG. 7 FUTURE SEWAGE DISPOSAL FACILITIES

FLORIDA DEPARTMENT OF
COMMUNITY AFFAIRS
SEPTEMBER 1986

CODE	SOIL TYPE	ACRES	PERCENT
58	OSIER SAND	940	31.1
92	TIDAL MARSH	499	16.9
34	POMELLO SAND	383	12.7
86	COASTAL DUNE	377	12.5
27B	ST. LUCIE SAND	351	11.6
84	COASTAL BEACH	209	7.0
6C	KERSHAW SAND	164	5.4
58A	OSIER SAND FILL	44	1.4
40	LEON SAND	38	1.2

SEPTIC TANKS 347 ON SOILS WITH SLIGHT LIMITATIONS
2418 ON SOILS WITH SEVERE LIMITATIONS

C CENTRAL TREATMENT

△ PACKAGE PLANT

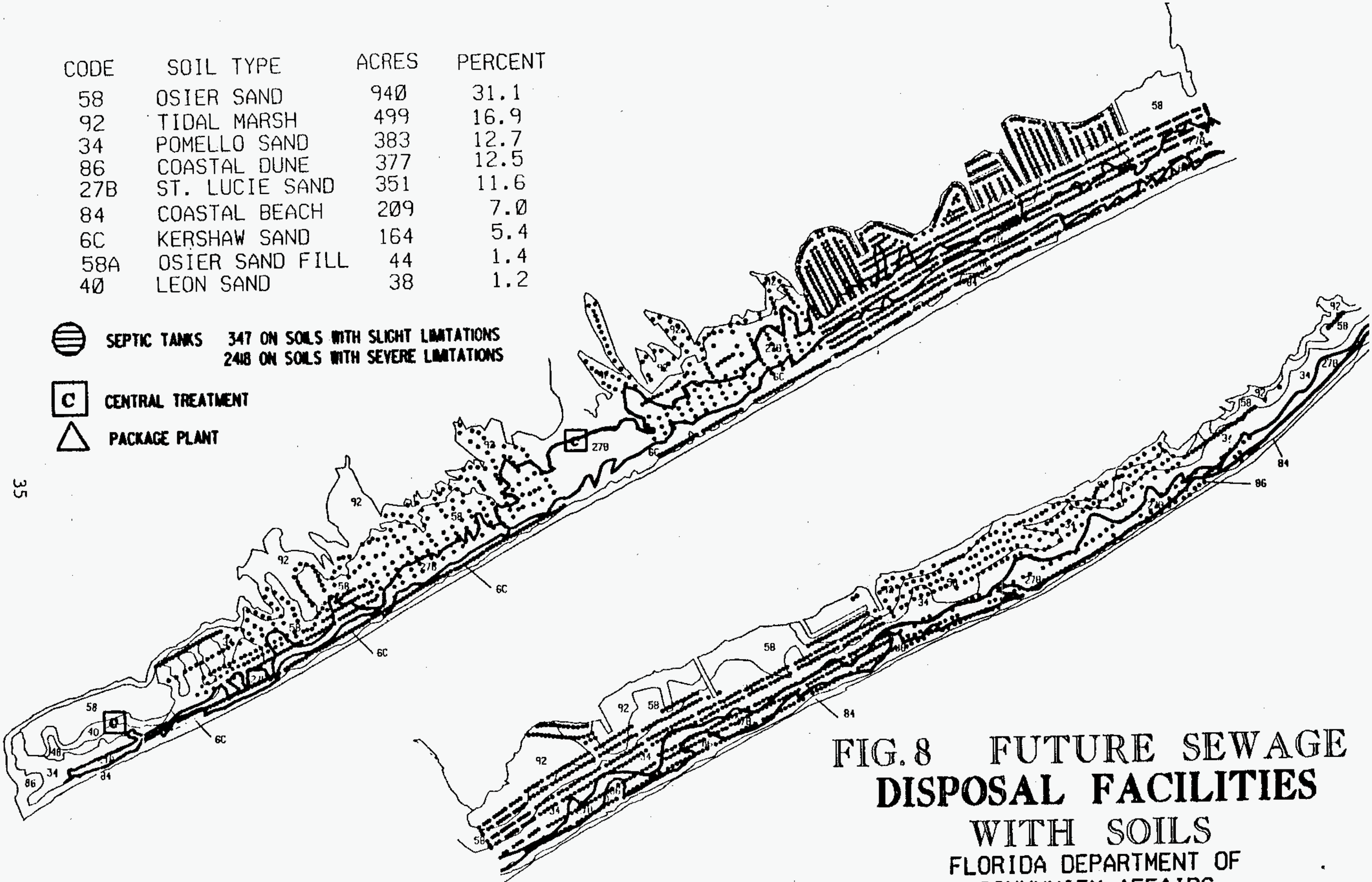

FIG. 8 FUTURE SEWAGE
DISPOSAL FACILITIES
WITH SOILS
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Pitt, et.al. (1974, 1975), monitored groundwater quality near Homestead, Florida in an area with septic tank densities of four per acre and one per acre. Slightly higher concentrations of sodium, total coliforms, fecal coliforms, and fecal streptococci were detected in the groundwater of the higher density area.

Geraghty and Miller (1978) collected 865 groundwater samples from 54 wells on Long Island, New York, and correlated nitrate concentration with septic tank density. A nitrate-nitrogen concentration in groundwater of 10 mg/liter or more was detected in 50 percent of the groundwater samples when septic tank density exceeded 2.8 tanks per acre. Areas where septic tanks were located on 1.25 acres or more resulted in less than ten percent of the groundwater samples containing nitrate-nitrogen concentrations of 10 mg/liter or more.

Duda and Cromartie (1982) and Everette (1982) related closure of shellfish harvesting beds to density of septic tanks along the coast of North Carolina. They examined the bacteriological quality of surface water from tidal estuaries and tributary freshwater creeks with different septic tank densities in four coastal watersheds. Septic tank densities ranged from 0.08 to 0.52 tanks per acre. A highly significant correlation was found between bacterial levels in surface water and increasing density of septic tanks. Septic tank densities greater than 0.17 tanks per acre resulted in closure of shellfish harvesting beds in the watersheds examined. Forty-five to 70 percent of the septic tanks were estimated to be located in soils with severe limitations for septic tank use.

Trela and Douglas (1978) developed a model to estimate septic tank density which would prevent nitrate-nitrogen concentration in groundwater from exceeding 10 mg/liter below sandy soils in the New Jersey Pine Barrens. The minimum land area was 0.2 acres per capita, or 0.8 acres per household, assuming a family of four.

Holzer (1975), Peavy and Brawner (1979), and Starr and Sawhney (1980) recommended that septic tank density not exceed an average of one system per acre on well-drained soils, and

<u>TABLE 8: Projected Septic Tank Densities for St. George Island</u>

No Septic Tanks Per Acre	Percentage of Developable Land	Acres
> 5/acres	1%	29 acres
3.3/acres	51%	1,444 acres
2/acres	3%	85 acres
< 1/acres	35%	991 acres
Package or Central	10%	283 acres
	100%	2,832 acres

Olivieri, et.al. (1981), suggested that maximum density should be one septic tank per 1.4 acres in order to maintain high-quality groundwater and to protect public health.

In 1977, the U.S. Environmental Protection Agency mapped the density of septic tanks on a county-by-county basis, using data obtained from the 1970 Census of Housing. Three density ranges were identified: low (less than 10 per square mile), intermediate (10 to 40 per square mile), and high (greater than 40 per square mile, or one septic tank for every 16 acres). The Agency designated areas with a septic tank density of greater than one for every 16 acres as regions of potential contamination.

Except for a few areas in the more heavily developed parts of St. George Island (within the St. George Island Gulf Beaches along the ocean and along the bay in unit 5), current septic tank densities average an acre or more. When the island is completely developed, however, densities will be higher. Table 8 shows projected septic tank densities and indicates the approximate percentage of the island's developable area within which those densities will occur.

SEPTIC TANK EFFLUENT

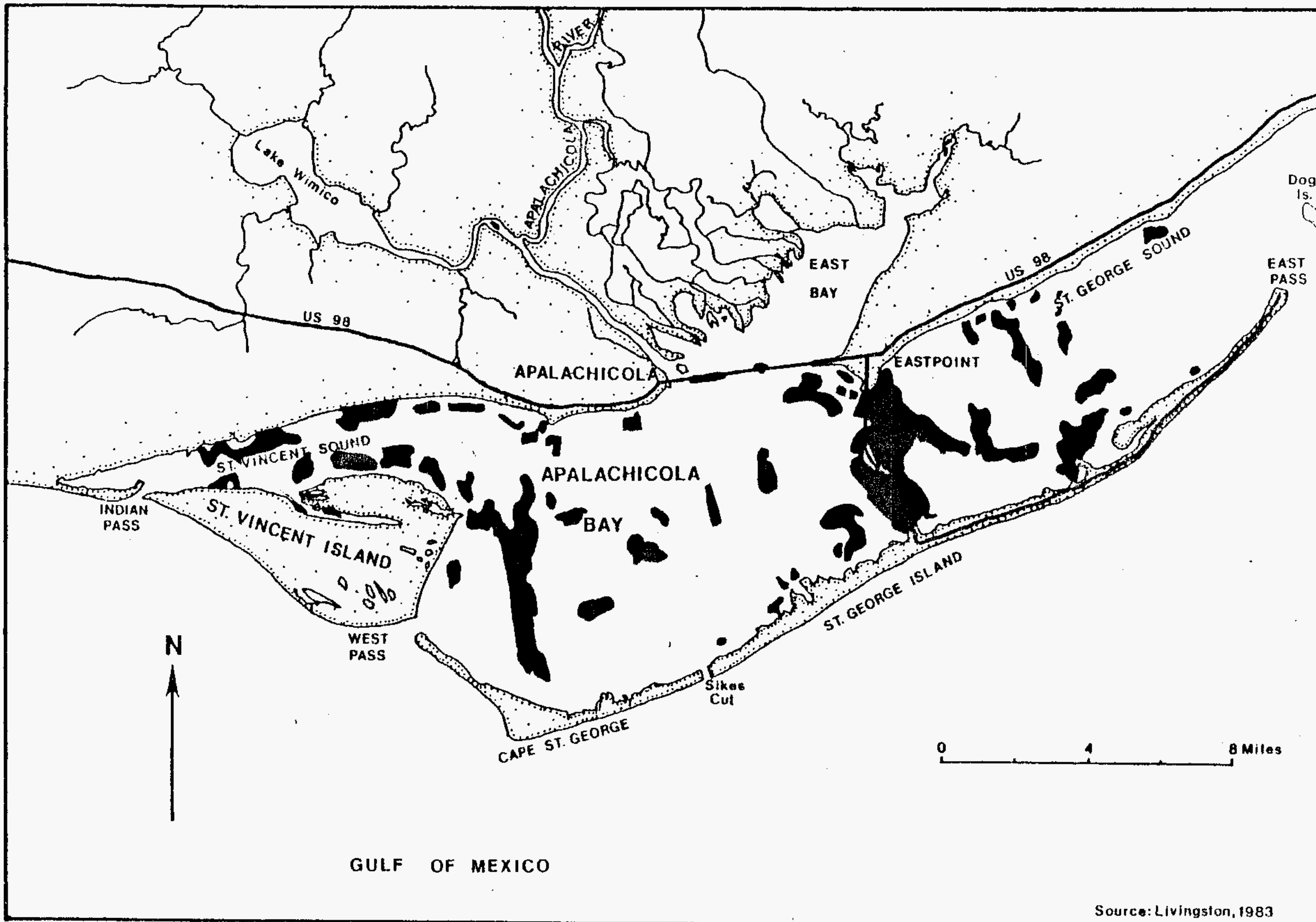
Septic tank effluent contains two types of pollutants which can adversely impact the Apalachicola Bay: disease causing organisms and nutrients. The concern is that these pollutants will not be adequately extracted from the effluent by the absorption fields, and instead, will find their way into the groundwater. Once in groundwater, they will be transported to the Bay. Because of the nearness of the Bay's major oyster bars (see Figure 9), it is feared that the pollutants will contaminant the oysters and thus threaten the oyster industry. That, in turn, would undermine the economic base of the County and threaten one of Florida's important export industries.

A thorough explication of septic tanks, how they function, their treatment efficiencies, and the pollutants they produce has been performed by Porter (1985) and Bicki (1984). Much of what follows has been taken from those sources.

A septic system consists of a water-tight tank that receives waste, and a drainfield, which receives effluent from the tank and disperses it into the soil. Little breakdown of waste occurs in the septic tank. Instead, the tank acts as a settling chamber, where contaminants are allowed to separate according to density. Denser solids settle, or precipitate, while buoyant particles (grease) float on the liquid surface. Effluent leaves the tank through an outlet fixture extending into the tank well below the liquid surface, as specified in Chapter 10D-6.45(F), Florida Administrative Code (FAC). This prevents excessive amounts of solids or grease from entering the drainfield.

Residential wastewater contains varying amounts of chemical and biological constituents. Data from several studies that determined the daily mass loading rate and concentration of various constituents in residential wastewater have been summarized by Clements and Otis (1980)

FIGURE 9 LOCATION OF MAJOR OYSTER BARS IN APALACHICOLA BAY



Source: Livingston, 1983

(Table 9). As Table 10 indicates, little removal of contaminants occurs within septic tanks (Lawrence, 1973). Hence, their removal must occur in the drainfield, or they are transported to the groundwater and/or adjacent surface waters.

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TABLE 9: Characteristics of Typical Residential Wastewater[a] (Clements and Otis, 1980

Parameter	Mass loading gpcd[c]	Concentration mg/l[d]
Total solids	115 - 170	680 - 1000
Volatile solids	65 - 85	380 - 500
Suspended solids	35 - 50	200 - 290
Volatile suspended solids	25 - 40	150 - 240
BOD	35 - 50	200 - 290
Chemical oxygen demand	115 - 125	680 - 730
Total nitrogen	6 - 17	35 - 100
Ammonia	1 - 3	6 - 24
Nitrites and nitrates	<1	<1
Total phosphorus	3 - 5	18 - 29
Phosphate	1 - 4	6 - 24
Total coliforms[b]	-	10^{10}-10^{12}
Fecal coliforms[b]	-	10^{8}-10^{10}

[a]For typical residential dwellings equipped with standard water-using fixtures and appliances (excluding garbage disposals) generating approximately 45 gpcd.

[b]Concentrations presented in organisms per liter.

[c]Grams per capita per day.

[d]Milligrams per liter.

Source: Clements & Otis, 1980.

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TABLE 10: Summary of Treatment Efficiencies of Two Septic Tanks (Lawrence, 1973).

Tank Number	Parameter	Influent*	Effluent*	Percentage Reduction
1	Total solids	1128	1038	8
	Volatile solids	483	420	13
	Suspended solids	200	130	35
	Volatile suspended solids	159	107	33
	BOD	241	224	7
	Settleable solids	4.4	0.2	95
	pH (no measurement units)	7.5	7.5	--
	Detergents	43	49	0
	Grease	21	26	0
2	Total solids	512	505	1
	Volatile solids	249	239	4
	Suspended solids	126	70	44
	Volatile suspended solids	108	73	32
	BOD	146	124	15
	Settleable solids	0.7	0.06	91
	pH (no measurement units)	7.2	7.2	--
	Detergents	3.7	5.0	0
	Grease	16	8.5	47

* All measurements are in milligrams per liter except where noted

Nutrients

Nutrient enrichment refers to the infusion of excessive amounts of nitrogen and phosphorous into surface waters. Nutrient enrichment can result in eutrophication, with adverse effects which include algal blooms, nuisance growths of aquatic macrophytes, fish kills, and reduced water quality. When a body of water becomes artificially enriched with nitrogen and/or phosphorus, phytoplankton productivity proceeds at an accelerated rate until the availability of another growth factor becomes limiting. If growth proceeds unchecked, an algal bloom may develop. When these bloom populations begin to die off, their decomposition (which may produce obnoxious odors) creates a high oxygen demand in the water, and fish kills may result. Additionally, blooms of algae, especially bluegreen forms, produce toxins which are known to inhibit growth of competing algal species and kill fish, fowl, and even cattle that ingest the water (Dye and Jones, pp 5 and 6).

Although nitrogen and phosphorous occur naturally in aquatic systems from sources such as atmospheric gases, precipitation, runoff from undisturbed land, sediment release, and biological recycling, and are needed by aquatic plants to maintain normal growth, recently, the activities of people have become increasingly important as sources of artificial enrichment and accelerated eutrophication. This "cultural eutrophication" is a result of pollution of waters with domestic, industrial, and agricultural wastes. In order of magnitude, rural runoff, domestic wastes, and industrial wastes have been cited as the major sources of excess nitrogen, while rural runoff, domestic waste, and urban runoff, respectively, are considered the principal sources of phosphorous (Dye and Jones, pp 4 and 5).

The nitrogen concentration of effluent ranges from 40 to 80 mg/liter, with an average family of four generating about 44 to 73 pounds of nitrogen per year. Groundwater monitoring studies and laboratory column studies indicate that 20 to 40 percent of the nitrogen in effluent may be absorbed or otherwise removed before the effluent reaches groundwater. Another way of looking at this is that 60 to 80 percent of the nitrogen reaches groundwater. Water quality surveys throughout the United States have identified local and regional contamination of groundwater and surface water by nitrate-nitrogen derived from septic tanks. Numerous groundwater monitoring studies have detected nitrate-nitrogen concentrations exceeding 10 mg/liter at considerable distances from absorption systems. However, the amount of nitrogen in an estuary that could produce eutrophication is quite small.

> "Water quality criteria recommend that a total nitrogen concentration of 0.360 mg/liter in a marine ecosystem is excessive. This value is based upon stoichiometric calculations which show that 0.360 mg/liter total nitrogen together with 0.05 mg/liter of total phosphorus would produce enough organic matter to exhaust the oxygen content of water at the warmest time of the year." (Environmental Protection Agency, p. 8-12)

Attenuation of nitrate by dilution is the only mechanism which significantly lowers nitrate-nitrogen concentration in the groundwater below conventional septic tanks in aerobic, water-unsaturated soils. The concentration of nitrate will decrease as the nitrate diffuses and is dispersed into surrounding ground water of lower nitrate content (Bicki, p. 65)

Nitrogen is also the only nutrient for which a drinking water standard exists, indicating its significance in terms of public health. Specifically nitrate-nitrogen concentrations may not exceed 10 mg/liter in potable water. That standard is based on the potential for infants to develop methemoglobinemia (Porter, p. 18).

The phosphorous concentrations of septic tank effluent range from 11 to 31 mg/liter, while the median concentration is 16 mg/liter. A family of four generates 1.75 to 6.6 pounds of phosphorous per year. Groundwater monitoring studies and laboratory column studies indicate that very limited phosphorus transport occurs in aerobic, water-unsaturated soils, and reduction in total phosphorus content of effluent in the soil ranges from 85 to 95 percent, or more. Under conditions of proper siting, design, construction, and operation of septic tanks, the likelihood of significant phosphorous transport to groundwater and surface water is small. Nevertheless, phosphorus transport is likely to occur in coarse-textured, non-calcareous, sandy soils that are low in organic matter with shallow depth to water table (Bicki, pp. 90-91).

Phosphorus derived from septic tanks has been detected above background levels in numerous studies of groundwater under conditions of saturated flow due to high water tables. Although phosphorus concentrations in groundwater are found to decrease with distance from septic tanks, nevertheless, very low concentrations of phosphorus in groundwater may be sufficient to cause contamination of surface water. Documented cases of contamination of surface water by phosphorus derived from septic tanks have been reported where septic tanks are located within proximity (i.e. less than 100 to 150 ft.) to surface water, or where drainage ditches or canals intercept groundwater before phosphorus removal is complete (Bicki, pp. 91 and 92).

Disease Causing Organisms

The fate of microorganisms in effluent as they contact the soil is an important consideration for septic tanks. How free the ground water is of human pathogens depends principally on the survival of the organisms in the soil and on the degree of retention by the soil. On-site sewage disposal system effluent may contain bacteria, viruses, protozoa, and helminths pathogenic to humans. The occurrence of these organisms in effluent reflects the combined infection and carrier status of residents utilizing septic systems (Bicki, p. 99).

Indicator organisms such as total coliforms, fecal coliforms, and fecal streptococci are enumerated most often in septic tank effluent, because the task of detecting all possible pathogens is complex and costly. It is assumed that the fecal bacteria in the septic effluent are the survivors of the intestinal flora and that counts of total coliforms, fecal coliforms, and fecal streptococci can be used to reflect the possible presence of human pathogens. While it is a useful method, the indicator organism approach may prove to be inaccurate in some instances. Since pathogens are not always present in feces, the presence of fecal organisms in water does not necessarily indicate the presence of pathogens (Bicki, pp. 99). Although there is no constant or linear correlation between pathogens and fecal coliform bacteria in sewage or receiving waters, studies conclude that "...the presence of viable sewage as determined by the indicator group is presumptive evidence of the presence of pathogens" (Hunt, pp. 127-128).

Fecal coliform is the indicator organism recognized by most public health agencies, including the Florida Department of Natural Resources' shellfish growing water program. Florida is a participant in the Interstate Shellfish Sanitation Program (ISSP), a tripartate association of the State, U.S. Food and Drug Administration, and the shellfish industry. Responsibilities of the State are to pass and enforce laws necessary to protect public health as related to harvesting and processing of raw shellfish products for consumption. Chapter 16B-28, Florida Administrative Code, details the Department of Natural Resources' authority to regulate harvesting, processing, and shipping of shellfish, i.e., edible species of oysters, clams, and mussels, according to ISSP standards and guidelines. Sections 16B-28.03 and 16B-28.09 of this Code specifically address bacteriological water quality standards and classifications of shellfish growing areas. Shellfish growing areas are classified as Approved, Conditionally Approved, or Prohibited on the basis of bacteriological and sanitary surveys. Harvesting of shellfish is only permitted in Approved or Conditionally Approved areas. The ISSP standard for fecal coliform bacteria (indicator group) is a median MPN (most probable number) of 14/100 ml of water and MPN values at specific locations should not exceed 43 MPN/100 ml more than 10% of the time (Thompson, et.al., pp. 1 - 2).

The basic concept of the ISSP is to control the sanitary quality of shellfish by preventing contamination of its environment, not to determine whether or not shellfish have become contaminated after the fact. Certifying shellfish safety by checking for pathogens would not afford the level of public health protection that the American consumer expects from control agencies. Shellfish are filter feeders and therefore are able to concentrate pathogens by a factor of 100 or more. Historically, sewage has been associated with shellfish borne diseases such as typhoid, hepatitis, salmonellosis, and other enteric diseases. Any single indicator group, however, has its limitations when applied to a variety of potential diseases. Zero pollution would be ideal; however, this is impractical since estuaries and inshore waters have many recreational and commercial uses, as well as being receiving areas for freshwater drainage. The ISSP microbiological standards and criteria for shellfish growing areas, when used in the context with other classification criteria, provide adequate consumer protection and protect the shellfish industry by maintaining consumer confidence in the product. (Thompson, et.al., pp. 2 - 3).

Bacterial concentrations in domestic wastewater are not greatly reduced between influent and effluent of a septic tank. Hence, it is evident that further cleansing of effluent must occur before it may be safely released into groundwater. In a properly installed and operating system, this treatment occurs in soil outside of the septic tank (Porter, pp. 20-21).

Fecal bacteria are removed from effluent in soil by the mechanisms of filtration, sedimentation, adsorption, and natural die-off. The biological clogging mat or crust that commonly forms within the first few inches of the soil below an absorption system has been found to be an effective barrier to bacterial transport (Bouma et al., 1982). The removal of indicator organisms from effluent is also a function of the soil water/effluent flow regime. Transport of indicator organisms under water-unsaturated flow conditions is generally restricted to about 3.3 feet (Bicki, p. 131).

However, under water-saturated flow conditions movement of indicator bacteria has been reported over much longer distances. Porter (pp. 21-24) cites several studies which have shown movement of fecal bacteria through water-saturated soils. Bicki (pp. 99-131) also reports numerous studies indicating that water-saturated soils allow bacteria to travel unacceptably large distances, posing a threat to both ground and surface water quality. Bacterial contamination of water wells by septic tanks is the second most common reason for well replacement in the southeastern United States (Bicki, p. 131).

Viruses are similar to bacteria in that many are human pathogens. Their occurence in effluent in varied concentrations reflect the combined infection and carrier status of the residents using septic tanks. Viruses are submicroscopic complex proteins generally an order of magnitude smaller than the smallest bacterial cells. Moreover, the public health hazard posed by intestinal viruses in effluent is difficult to assess due to the inapparent nature of many viral infections and the difficulty encountered in detecting them. The number of viruses that constitute a disease-producing dose varies, although it has been shown that one virus is capable of infecting humans, while bacterial infection implies the presence of hundreds or thousands of bacteria.

Viruses are removed from effluent by soil through mechanisms similar to those that remove bacteria, although the small size of viral particles allows them to travel greater distances. For that reason soil particle size is the primary factor determining the ability of the soil to remove virions, and hence, fine-grained clay and silt soils retain more virions than coarser sand. Soil permeability is the next most important factor; low permeability facilitates better viral binding.

Bicki cites several groundwater monitoring studies that have reported transport of viruses to groundwater from septic tanks under conditions of saturated or near-saturated flow due to high water tables or high effluent loading rates. Depending upon soil types and saturation levels, viruses have been found to have traveled up to 250 meters and to have persisted for periods up to five weeks. Even when viruses do bind to soil particles, this has been discovered not to be an irreversible process: under proper conditions, viruses may be flushed from their sorptive bonds (Bicki, pp. 132-144; Porter, pp. 24-28).

STUDIES OF SEPTIC TANK CONTAMINATION

This section provides a summary of studies that have investigated the link between septic tank effluent and pollution of estuaries in the form of either nutrient enrichment or bacterial contamination. Studies pertaining specifically to Apalachicola Bay and St. George Island will be considered first. Studies of other areas similar to the Apalachicola Bay system will be considered next. No attempt has been made to exhaustively review the literature in this field. That has already been accomplished by the Florida Department of Health and Rehabilitative Services through a contract with the Institute of Food and Agricultural Sciences at the University of Florida (Bicki, 1984). The Florida Department of Natural Resources has likewise conducted a similar survey (Porter, 1985).

Studies of the Apalachicola Bay System

1. Livingston, Robert J., Identification and Analysis of Sources of Pollution In the Apalachicola River and Bay System. Department of Biological Sciences, Florida State University, Tallahassee, Florida, December, 1983.

From July through October 1983, Robert Livingston conducted a comprehensive analysis of water and sediment quality and biological forms in the Apalachicola Bay using sample data from 55 water quality monitoring stations. Within the Bay system, the study showed that the highest levels of pollutants were associated with municipalities, dredged canals, boat basins, and agricultural lands.

On St. George Island, the dredged canals were found to be polluted, as was the boat basin next to the bridge. The boat basin was contaminated with organic input and heavy metals in the sediment; it also registered the lowest level of dissolved oxygen in the entire study area during periods of high summer rainfall and overland runoff. Signs of organic runoff from the Gorrie Ocean Mile construction site were detected in St. George Sound although further analysis is needed to confirm that observation. Significant levels of nitrogen and phosphorus were measured in the finger canals, the boat basin, and in the vicinity of the Gorrie Ocean Mile construction site; highest levels were recorded during periods of heavy rainfall. No significant concentrations of fecal coliform bacteria were detected in the Bay waters adjacent to the island.

Livingston concludes his study by noting that the Apalachicola River and Bay system remains relatively free of pollution, and that overall, it can be characterized as having a rich or otherwise normal plant and animal life. However, certain areas, including the dredged canals and boat basin on St. George Island, present a threat to the integrity of the Bay system and the oyster industry. Throughout the study, storm water runoff was referred to as one of the principal suspects in causing the pollution that was found; septic tanks are not mentioned. Nevertheless, in a personal interview, he has stated that his 15 years of studying the Bay has demonstrated to him that wherever a concentration of population occurs using septic tanks, the quality of nearby surface waters usually suffers.

2. U.S. Environmental Protection Agency, Water Quality and Sanitary Survey: Apalachicola, Florida--May - June 1981. Surveillance and Analysis Division, Athens, GA., June, 1981.

From May 28 to June 4, 1981, the U.S. Environmental Protection Agency conducted a water quality investigation of a 3.2 mile area along the northern shore of the Apalachicola Bay just west of the City of Apalachicola. Oyster shucking houses predominant in the developed area along the coast, though there were also several residences and restuarants. Residential development predominants north of U.S. Highway 98. The duration of the investigation was limited and no rain fell before or during the study period; these factors may curtail the degree to which the findings can be generalized.

The results of the investigation led the agency to conclude that various sources were contributing to the closure of the waters to oyster harvesting. The septic systems that contribute significant bacterial contamination via subsurface and surface drainage obviously contributed to the problem. Septic tank systems along the shoreline indirectly discharge into the Bay via groundwater flow, as demonstrated by dye tests, while septic tank systems north of U.S. Highway 98 have their groundwater flow cut off by a system of ditches which then convey these waters directly to the Bay. In addition to septic tank systems, the shell fish processing houses were identified as having a number of possible direct discharges associated with their operations. These are runoff waters from the shucked oyster piles, the surface shellfish washers, and the oyster steeping operations. The accumulative results of all of the above sources were high average fecal coliform levels in the near shore waters. Mean fecal coliform bacterial levels exceeded water quality criteria for shellfish propagation and harvesting at all near shore surface water quality sampling stations. Additionally, although the objectives of the study were focused on the parameters used to open or close Bay waters to oyster harvesting, groundwater nutrient levels as measured at well points indicated a significant increase in concentrations above background levels.

3. Porter, William, The Relationship Between Apalachicola Bay Water Quality and Septic System Installations in the Coastal Zone, with Applications to Other Estuaries. Florida Department of Natural Resources, Tallahassee, Florida, December, 1985.

In 1985, Porter compiled a report which investigated the relationship between soil type, water table, septic tank performance, and quality of Apalachicola Bay waters for oyster harvesting. The soils of St. George Island were used as representative of those found within the coastal zone. Porter concluded that those soils are sandy with a high water table which reduce the ability of septic tank systems to cleanse wastewater thoroughly before it enters the groundwater. Additionally, the high pH and sandy texture of coastal soils, combined with ability of viruses to travel hundreds of feet, place both the groundwater and adjacent surface waters at risk from viral pollution. Moreover, he argues that the minimum 24 inch distance allowed by Florida's septic tank regulations between the bottom of the drainfield and the top of the water table, combined with fluctuating tidal waters, further increases the chances of contamination. Porter concludes by noting the advantages and disadvantages of a central wastewater collection and treatment system. Chief among the disadvantages is the increase in housing density a central system would make possible, and the highly polluted urban/suburban runoff that would entail. He suggests, therefore, that reasonable housing density limits be established to mitigate those consequences.

4. Thompson, Robert L., et.al., Bacteriological Data Analysis for Apalachicola Bay, Franklin County, Florida. Florida Department of Natural Resources, August, 1984.

Thompson, et.al., undertook a bacteriological data analysis of Apalachicola Bay waters to determine which environmental variables would best predict high fecal coliform counts. Five environmental variables were investigated: rainfall, river stage, salinity, river discharge, and water temperature. Employing statistical analyses, it was determined that rainfall and river stage provided the best environmental predictors of fecal coliform contamination.

5. Florida Department of Natural Resources, Preliminary Study Describing the Movement of a Conservative Tracer in Groundwater on St. George Island Adjacent to Apalachicola Bay. Division of Marine Resources, June, 1986.

On February 7, 1986, dye was released in a simulated septic tank drainfield on St. George Island fifty feet from mean high water of the Apalachicola Bay. Test wells were drilled at various distances from the release site. Recovery of dye from the test wells and from the Bay waters indicated that the dye traveled in a discrete slug approximately 30 feet long by 15 feet wide at rates from 2.25 to 3.46 feet per day. The study showed that the island's groundwater travels laterally toward adjacent surface waters and that septic tank effluent transported by the groundwater could reach Bay waters. Furthermore, the test indicated that little dilution and dispersion of dye occurs in groundwater. The study concluded that during periods of high water table, water borne contaminants are likely not only to travel from septic system drainfields to the Bay, but will experience little dilution and may arrive in the Bay in significant concentrations.

6. Heil, David C. Analysis of Correlation of the Incidence of Toll Traffic to St. George Island and Fecal Coliform in Near-Shore Waters of Apalachicola Bay, Florida Department of Natural Resources, Tallahassee, Florida, July, 1986.

Heil investigated the statistical association between monthly one-way toll traffic counts to St. George Island and fecal coliform levels in near-shore waters of the Apalachicola Bay over a five year period. The analysis was undertaken to determine whether any correlation exists between the number of people on the island, as reflected by the toll counts, and fecal coliform densities in near-shore Bay waters. It was hypothesized that the more people there were on the island, the more septic effluent that would be generated, and therefore, the greater the likelihood of finding elevated fecal coliform counts in the nearshore Bay waters. No association, statistically significant, or otherwise, was found.

Studies of Other Coastal Areas

7. Williams, Leslie A., Mason, Peter W. and Faircloth, Joseph M., An Assessment of Water Quality in Coastal Wakulla County, Florida, Based on Total and Fecal Coliform Bacteria. Florida Department of Environmental Regulation, March, 1981.

8. Williams, Leslie A., Mason, Peter W., and Faircloth, Joseph M., An Assessment of Selected Areas in Coastal Wakulla County, Based Upon Total and Fecal Coliform Bacteria. Florida Department of Environmental Regulation, April, 1982.

These studies were undertaken to determine the sources of total and fecal coliform pollution in the oyster harvesting waters of coastal Wakulla County. The results of the first study identified five major areas having elevated coliform counts which appeared to be independent of temperature, rainfall, and tidal influences. The second study investigated those five areas in finer detail. It found a positive association between coliform densities and residential and commercial areas using septic tanks. Dye tests were not conducted. It also revealed that bacterial densities associated with migratory birds, deer, and other naturally occurring fauna, were demonstrated to be, at times, comparable to levels of human-induced pollution. However, these environmental sources appeared to be intermittent and predictable in geographical and temporal occurrence. Although the study concludes that septic tank leachates appear to be the single, most important source of elevated fecal coliform densities in Wakulla County, no evidence was presented which demonstrated how the relative amount of coliform bacteria in the coastal waters was calculated and proportioned between septic tanks and other sources.

9. Missimer, Thomas M., A Preliminary Investigation of the Effects of Septic Tank Discharge on the Ground- and Surface-water Quality of Sanibel, Florida. Thomas M Missimer and Associates: Sanibel, Florida, December, 1976.

A five month field investigation was conducted to determine the relation of groundwater and surface water quality to existing septic tank absorption systems on Sanibel Island. The study found that septic tank effluent had caused large increases in the concentration of nutrients in the groundwater. Evidence that fecal coliform was also contaminating groundwater was ambiguous; nevertheless, the report states that movement of large quantities of bacteria and viruses into the groundwater system from septic tanks on Sanibel Island does occur. Tests indicated that nutrients from septic tank effluent entered adjacent surface water bodies and helped to accelerate their eutrophication, although natural causes were found to be the primary contributors to that process. Again, the data collected in the investigation yielded inconclusive results regarding contamination of surface waters by bacteria originating in septic tank effluent. Nevertheless, the study states that there is a high probability that bacteria and viruses do move into certain surface water bodies where septic tank absorption systems are located very close to the water body in question (less than 25 feet), and that movement up to 50 feet is possible when the water table is temporarily high and movement occurs through permeable shell bed sediments of half a foot or more. Due to unfavorable sediment characteristics, the possiblity that pathogenic bacteria and viruses would travel 100 feet was considered remote.

10. Surveillance and Analysis Division, Water Quality Studies: Dauphin Island, AL, U.S. Environmental Protection Agency, September 1976.

The U.S. Environmental Protection Agency was requested to conduct water quality and sanitary surveys on Dauphin Island following detection of high levels of fecal coliform contamination and isolated findings of pathogenic organisms. Dye tracings showed that septic tank leachates were readily transmitted to and through the groundwater. Nutrient concentrations an order of magnitude greater than those of the nearshore bay waters was found in the groundwater and canals in the vicinity of septic tank systems. Severe levels of bacteriological contamination were present in the groundwater system and in the canals immediately adjacent to septic tank/drainfield systems. However, fecal coliform bacteria densities in the nearshore bay waters were relatively low with the exception of one station near the most populous part of the island. Chemical and physical quality of the nearshore bay waters (dissolved oxygen, salinity, and temperature) were well within normal estuarine levels.

The report recommended that the continued use of septic tank disposal systems in the Dauphin Island and other high density coastal developments, where soil and hydrological conditions prevent their effective operation, should be discontinued. They should be replaced by conventional treatment facilities. Furthermore, because of serious shallow groundwater degradation, the report recommended that any use of private, shallow, water table wells for drinking water should be discouraged.

11. Surveillance and Analysis Division, Finger-Fill Canal Studies: Florida and North Carolina, U.S. Environmental Protection Agency, May, 1975.

Water quality studies of physical, chemical, and biological conditions associated with coastal waterway development in Punta Gorda, Big Pine Key, Panama City, and Marathon, Florida, and Atlantic Beach, North Carolina, were conducted in 1973-74 by the U.S. Environmental Protection Agency. The pollution of coastal canals with groundwater contaminated by septic tank leachates was documented with dye tracer studies. Tracer dyes introduced into septic tank systems located approximately 50 feet from finger-fill canals were rapidly transmitted to adjacent canal waters. In Punta Gorda, the leachates reached the canal in 25 hours, while at two separate North Carolina sites, travel times of 4 and 60 hours were recorded.

Total coliform bacteria densities exceeded allowable water quality criteria at all canal study areas with the exception of the Big Pine Key site. No coliform density violations were noted at any of the background stations nor at undeveloped canal sites. As a rule, total coliform densities increased from the mouth to the dead end of all developed canals.

Nutrient pollution was detected within the developed canals. Relative stages of development (dwelling unit density) along canal banks were positively correlated to general sediment composition: the greater the dwelling unit density, the greater the nutrient concentration in the sediment.

The study concludes by recommending that centralized waste collection and treatment systems be employed in coastal canal housing developments. In less densely settled areas, where a central sewage treatment system is not feasible, the report recommends that septic tank drainage fields be no closer than 100 feet from a surface water body and that the fields be 3 to 4 feet above the saturated soil zone at the wettest period of the year. However, the report states that even these minimum requirements may be inadequate; therefore, each proposed development should be examined in light of its own environmental setting (i.e. water supplies, magnitude of development, density, hydrologic factors, water classification, pollution potential, etc.)

CENTRALIZED SEWAGE TREATMENT

When considering sewage treatment for St. George Island, one question frequently raised is whether a central system for the island is a realistic option. To address that issue, Paul Sarvis, Department of Environmental Regulation - Northwest District, conducted a preliminary analysis. This section uses his report extensively. Due to time constraints, his analysis addressed only one alternative, and therefore, the discussion in this section is intended primarily to indicate the feasibility of a central system as opposed to final recommendations regarding facility type. The alternative developed here is an .8 million gallons per day (MGD) tertiary treatment facility located on the island with effluent disposal by means of land application. The size of the facility considered would be sufficient to accommodate existing population plus twenty years of growth based upon projections developed in a preceding section of this report. Other alternatives that might also be considered include 1) collection and transmission of flows to an expanded Eastpoint facility, and 2) treatment on the island with disposal by means of surface water discharge or an ocean outfall.

Siting

From an engineering standpoint, site selection is governed by several considerations. Chapter 17-6 F.A.C. requires that the facility be protected from 100-year flood damage, and for land application of effluent, soil type, water table depth, land area requirements, distance from water bodies, and direction of groundwater flow all become factors for consideration.

Land requirements for an 800,000 GPD facility utilizing percolation ponds for effluent disposal would range from 3.3 to 9.7 acres. A site 1,000 feet east of Sikes Cut on the Gulf side of the island has been selected which contains about 12 acres of land. Soils in this area appear to be predominantly Pomello and St. Lucie sands and "net" groundwater movement would most likely be in the direction of the Gulf of Mexico. This 12-acre site is located within a 100-year flood zone (Zone A8) with a base flood elevation of 8.0 feet NGVD. In order to provide protection from flood damage, the site could be altered by possibly transporting material from a nearby "C" flood zone (a zone of minimal flooding) to the proposed site. The Pomello and St. Lucie sands, in addition to the above mentioned site alteration, could provide acceptable permeabilities and depths to the groundwater table. Also, effluent discharged on this site would flow generally south to the Gulf of Mexico. Exact location of the treatment facilities and percolation ponds within this 12 acres could be done during the design phase. Further considerations for use of this site should be based on site availability and site specific information.

Preliminary Design for Treatment and Disposal

Design Basis

Parameter	Influent	Effluent
Average Daily Flow	.80 MGD	____
Peak Flow	2.40 MGD	____
BOD	200 mg/l	20 mg/l
Suspended Solids	200 mg/l	20 mg/l
Total nitrogen	40 mg/l	12 mg/l

Design/Flow

The proposed wastewater treatment facility should be capable of accommodating projected wastewater flows up to the year 2006. Flows generated on St. George Island would exhibit a wide range between low and high flows due to daily and seasonal fluctuations in island use. During a peak month, a treatment capacity for an average daily flow of .34 MGD would presently be required. Average daily flows in a non-peak month could be as low as .06 MGD. Based on current growth rates, the island is projected to have a peak monthly flow of .80 MGD in 2006.

Collection/Transmission

A collection and transmission system would be required to provide sewage service to the proposed service area. This system would require a great deal of study prior to design. However, preliminary measurements show that ultimately, through the year 2026, a total of approximately 15 to 20 miles of 4 and 6 inch forcemain plus 200,000 linear feet of collection system would be required for the collection and transport of all wastewaters generated on the island.

Treatment/Disposal

Treatment of the wastewater pumped to the plant will be accomplished by passing it through various treatment units. These include screens, a grit chamber, an equalization basin, an aeration basin, clarifiers, and chlorine contact chambers. Nitrogen removal will occur in a mechanically mixed anoxic chamber. The dried sludge cake from the treatment process will be removed and transported to the Franklin County landfill or other approved disposal site.

Chlorinated effluent will be dosed into a system of at least three percolation ponds. Based on a loading rate of 5.6 GPD/sq. ft., these ponds would cover an area of about 3.5 acres and would be located at least 500 feet from any shoreline. Groundwater monitoring wells will also be installed on all sides of the disposal area and will be incorporated into a groundwater monitoring plan.

A control building will also be provided at the facility and will house all instrumentation for the treatment facility as well as laboratory and operator facilities.

Project Phasing

Because of the immediate need to provide adequate wastewater treatment and disposal to a relatively small number of island users and inhabitants, project phasing should be considered. A first phase of .4 MGD would provide treatment for the existing flows of .34 MGD with some capacity for growth. A second phase of .4 MGD could be constructed at a later date as additional capacity is required.

> "Septic tank/sorption fields may be viewed as acceptable treatment in the context of rural development where the purity of the ground and surface waters can be protected. This protection is safeguarded by adequate sorption field design, long distances to surface water bodies, and relatively low housing unit densities. In contrast, coastal canal developments maximize housing unit density and proximity to surface water bodies, and thus eliminate the safeguards inherent in the rural environment" (U.S. Environmental Protection Agency, p. 8).

This study has attempted to examine comprehensively the impact of septic tanks on the Apalachicola Bay. The oyster bars of Apalachicola Bay are opened or closed to oyster harvesting by the Department of Natural Resources based upon the fecal coliform densities in the water. Conclusive evidence that septic tanks on the island are adding fecal coliform to the bay, and thus contributing to its closure, has not been found. Neither Livingston (1983), nor Heil (1986), found significant counts of fecal coliform that can confidently be attributed to septic tank effluent originating on St. George Island.

On the other hand, nitrogen and phosphorus contamination of the island's canals and boat basin was found (Livingston, 1983). Although tests were not conducted which determined with certainty where the excess nutrients originated, it is known that septic tank effluent contains substantial quantities of both chemicals. It has also been demonstrated that septic tank effluent can move through the island's groundwater and enter bay waters in significant concentrations (Department of Natural Resources, 1986). Based upon this evidence, it is reasonable to conclude that septic tanks are contributing to the water degradation that Livingston found.

Furthermore, the island has become a popular resort area, and as the Panhandle's growth continues, so will the island's. When completely developed, it is projected that from 14,000 to 17,000 people could be residing there. If the day visitors to the park and public beach, and temporary hotel guests are included, the number of people on the island at any one time could swell to 20,000 to 25,000. This population will be housed in 4,048 dwelling units. An analysis of the island's soils in terms of their suitability for septic tanks indicates that 88.4% of the soils have either severe limitations for septic tank use or are part of the coastal beach and dune system upon which the state limits development. Even so, without a central sewage system, the Department of Community Affairs estimates that 2,602, or 64.3%, of all future housing units will utilize septic tanks, and of those 2,298, or 88.3%, will be located in soils unsuited for septic tank use. If all septic tank users are included (businesses, and the state park), there will be 2,765 future septic tanks, of which 2,418, or 87.5%, will be located in unsuitable soils.

Most of the studies that have investigated the association between septic tank densities and ground-and surface water contamination have concluded that a septic tank density of an acre or more is required to provide minimal protection from septic contamination. However, approximately 55% of the island's buildable area will eventually be developed using septic tanks at a density of 2 or more per acre; 52% will be developed at 3.3 tanks or more per acre. The island's water table is high, its soils are sandy. Studies of areas with similar characteristics have documented the harmful effects of septic tank effluent on ground- and surface waters.

Scientific formulas are not available to tell us at what point septic tanks on St. George Island will begin to seriously jeopardize the bay's shellfish harvest. If, however, we were to wait until that time arrived, it might be too late to do anything about it, or at least too late to avoid serious disruption of the County's economy. On the other hand, growth is not proceeding at such a pace that an emergency need to halt the issuance of additional septic tank permits seems warranted; that, too, would threaten economic development. Instead, a series of actions are called for which will provide in the short term maximum protection against further environmental degradation, and at the same time, guarantee in the long term that bay waters will be safe. Based upon these considerations, therefore the following recommendations are submitted:

1. A planning study should begin at once to determine the economic and environmental feasibility of providing a central sewage system to St. George Island. Within six months, a planning feasibility study should be completed and involve a determination as to the type and location of central sewage treatment system that is most appropriate for the island. Within six months from the completion of the planning feasibility study, funding sources should be identified and implementation actions established to have the island fully sewered within two years. If a central wastewater treatment system is not operational within this three-year planning and implementation time frame, additional septic tank permits north of Gulf Beach Drive and Leisure Lane should only be issued for Class I Aerobic Treatment Units. The planning process should be accomplished within the context of Chapter 380.0555, F.S., and should consider the feasibility of alternative wastewater treatment systems and their financial, environmental, and aesthetic impacts on the island, its residents, and Apalachicola Bay. To allow progress to be monitored, the plan should specify interim steps that must be accomplished and establish milestone dates for their accomplishment. Funding for preparation of the plan will come from the Area of Critical State Concern Trust Fund.

2. Because densities on the island are the key, not only for septic tank pollution, but also for stormwater runoff, recreational demand, and potable water, they should not be permitted to rise beyond current levels specified in the Franklin County Comprehensive Plan and the Critical Area legislation, Section 380.0555 (9)(a)1,

either before or after a central sewage system is in place. The Department of Community Affairs should investigate additional safeguards to ensure the densities are kept constant.

3. Franklin County should immediately begin to require all new users on the island to connect to the central potable water system. In addition, when the new sewage system is available, Franklin County should require all users on the island to be connected to the central potable water system. The requirement of any additional connections to the central potable water system should be contingent on the availability of capacity of that system for such connections.

4. In the interim, between now and when a central sewage system is operational, the following safeguards regarding cumulative monitoring, location, type, and density of additonal septic tanks should be followed:

a. The issuance of all individual on-site sewage disposal permits should be temporary, and when centralized wastewater treatment becomes available to individual property owners, Franklin County should require all users of existing sanitary treatment systems to connect to it within 90 days.

b. The ordinance designating the Pollution Sensitive Segment and Critical Habitat Zone now under consideration by Franklin County should be adopted by the County in January, 1987, and approved by the Administration Commission and implemented by the County in March, 1987. If this is not done, the further issuance of septic tank permits should be closely monitored by the Department of Community Affairs pursuant to Chapter 380.05, F.S., and where necessary to protect the Bay, the Department should seek administrative or judicial remedies as provided by Chapter 380.11, F.S. The effectiveness of the ordinance in protecting the Bay from septic tank pollution will be monitored by the Department of Community Affairs through the DNR/DER water quality monitoring program recommended below. If it is determined that the ordinance is not providing adequate protection, additional measures will be proposed.

c. All wastewater disposal systems within the Critical Habitat Zone and Pollution Sensitive Segment of St. George Island, should be visually inspected by the Department of Health and Rehabilitative Services on an annual basis for proper operation. The Department of Environmental Regulation should conduct quarterly inspections of the septic tanks and package plants it has permitted for proper operation.

d. No individual on-site sewage disposal system should be approved within 75 feet of the mean high water line, or where wetlands exist, within 75' of the inland wetland boundary, as defined by the Department of Environmental Regulation at F.A.C. 17-4.022.

5. DER and DNR should establish a water quality monitoring program in the Apalachicola Bay. If signs of degradation appear, the Resource Planning and Management Committee should be notified and it should undertake a review of the causes of the pollution. The Committee should submit its findings to the State Land Planning Agency, which will make recommendations to the Administrative Commission regarding actions needed to abate the problem.

6. Franklin County and responsible agencies should take the appropriate actions to implement these recommendations pursuant to statutory authority as soon as possible. The Department of Community Affairs and other responsible agencies should provide technical assistance to property owners on the island to assist them in complying with the recommendations of this report.

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