Resolution No. 2006- 129

A RESOLUTION OF THE BOARD OF COUNTY COMMISSIONERS OF ST. JOHNS COUNTY, FLORIDA, ADOPTING A FACILITY PLANNING DOCUMENT TITLED "FACILITIES PLAN FOR THE ST. AUGUSTINE BEACH SEWER SYSTEM IMPROVEMENTS" AS THE PLANNING DOCUMENT FOR THE WASTEWATER MANAGEMENT PLAN, AND PROVIDING AN EFFECTIVE DATE.

WHEREAS, the Board of County Commissioners of St. Johns County has determined that the construction of the improvement program projects, as set forth in the Facilities Plan for the St. Augustine Beach Sewer System Improvements is in the best interest and welfare of its citizens; and

WHEREAS, the Board of County Commissioners of St. Johns County examined the Facility Planning Document titled, "Facilities Plan for the St. Augustine Beach Sewer System Improvements" dated March, 2005, prepared by Camp Dresser & McKee Inc., Engineers, and discussed the results and recommendations of the report at a public hearing on Tuesday May 2, 2006; and

WHEREAS, the Board of County Commissioners of St. Johns County examined the Facilities Plan for the St. Augustine Beach Sewer System Improvements and Capital Finance Plan, dated March, 2005, prepared by Camp Dresser & McKee, Inc., Engineers, and discussed the results of the report at a public hearing on Tuesday May 2, 2006;

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF ST. JOHNS COUNTY, FLORIDA:

Section 1. The Board of County Commissioners of St. Johns County does hereby adopt the Facilities Planning Document titled "Facilities Plan for the St. Augustine Beach Sewer System Improvements" prepared by Camp Dresser & McKee, dated March, 2005, as the planning document for the wastewater management system.

Section 2. This resolution shall take effect immediately upon adoption.

PASSED AND ADOPTED this 2nd day of May, 2006.

BOARD OF COUNTY COMMISSIONERS OF ST. JOHNS COUNTY, FLORIDA

By James E. Bryant
James E. Bryant, Chair

ATTEST:
Cheryl Strickland, County Clerk
By Patricia DeGrande

APPROVED AS TO FORM:
Michael D. H
Dep. County Attorney

St. Johns County

Facilities Plan for the St. Augustine Beach Sewer System Improvements

March 2005

Report

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Executive Summary

Introduction

This facilities plan was prepared by Camp Dresser & McKee Inc. (CDM), in accordance with the requirements for State Revolving Fund (SRF) loan funding of wastewater management system improvements. The area considered in preparing this plan is located within the City of St. Augustine Beach, located on Anastasia Island in the central eastern portion of St. Johns County, east of the Intracoastal Waterway and south of St. Augustine. The St. Augustine Beach primarily consists of residential properties and no significant commercial establishments are present. The recommendations resulting from this study are consistent with both the County's Local Comprehensive Plan and its Water and Wastewater Master Plan.

Need

Approximately 860 homes currently utilize onsite septic systems for wastewater treatment in the St. Augustine Beach area and approximately 143 vacant lots in the unsewered subdivisions. Seven major unsewered areas were identified and were included in this study. Several investigations and reports illustrate that the area is poorly suited for wastewater treatment by onsite systems, and that the high density of septic tanks in the study area have a poor record of operation, particularly during the wet season. As a result of the area's high groundwater conditions, the septic tanks contribute to the environmental quality degradation of the Matanzas River Basin.

Solution

There is not a clear economic spread between the two options presented for each area and both are considered viable options. The capital cost to construct a gravity sewer system for the entire area is slightly higher than the cost to construct the vacuum sewer system. Based on the present worth analysis of the two options, there is less than a 10 percent difference in total costs of the options. This margin is considered to be insignificant in the economic evaluation and the two alternatives are considered equal. Qualitative factors such as previous experience with vacuum and gravity systems, operation and maintenance preferences, standards, and reliability were also considered. These qualitative factors favored the gravity sewer option for each project area. Recent experience associated with increased maintenance and operational costs of a recently installed vacuum sewer system in the service area have raised concerns about the long term reliability of vacuum sewer systems.

The capital costs for the wastewater collection program are estimated to be approximately $13.6 million, with $9 million planned to be provided by SRF grant funds and the balance from the County.

Recommendations

It is recommended that St. Johns County take the following actions:

- Adopt this facilities plan and implement the cost-effective alternative of installing a gravity sewer system to serve the unsewered areas of Woodland, Coquina North, Coquina South, Coquina West, Versaggi, Lisbon-Sevilla, and Sandpiper.

- Pursue SRF funding of the sewer system improvements from the Department of Environmental Protection (FDEP). The planning documentation, including this report as soon as it is adopted, should be sent to the governmental agencies having review jurisdiction.

Section 1 Introduction

1.1 Background

This project consists of expanding the sewerage collection system within the City of St. Augustine Beach in St. Johns County, Florida. The City of St. Augustine Beach is located on Anastasia Island in the central eastern portion of St. Johns County, east of the Intracoastal Waterway and south of St. Augustine. This facility plan, prepared for St. Johns County, will focus on the unsewered areas in the City of St. Augustine Beach. The unsewered subdivisions are located throughout the City of St. Augustine Beach with the majority in the northern portion of the City. The areas within the City of St. Augustine Beach that are still served by septic tanks are determined as the study area and are shown on **Figure 1-1**. The study area consists primarily of residential properties. There are a few hotels, motels, and restaurants present in the study area.

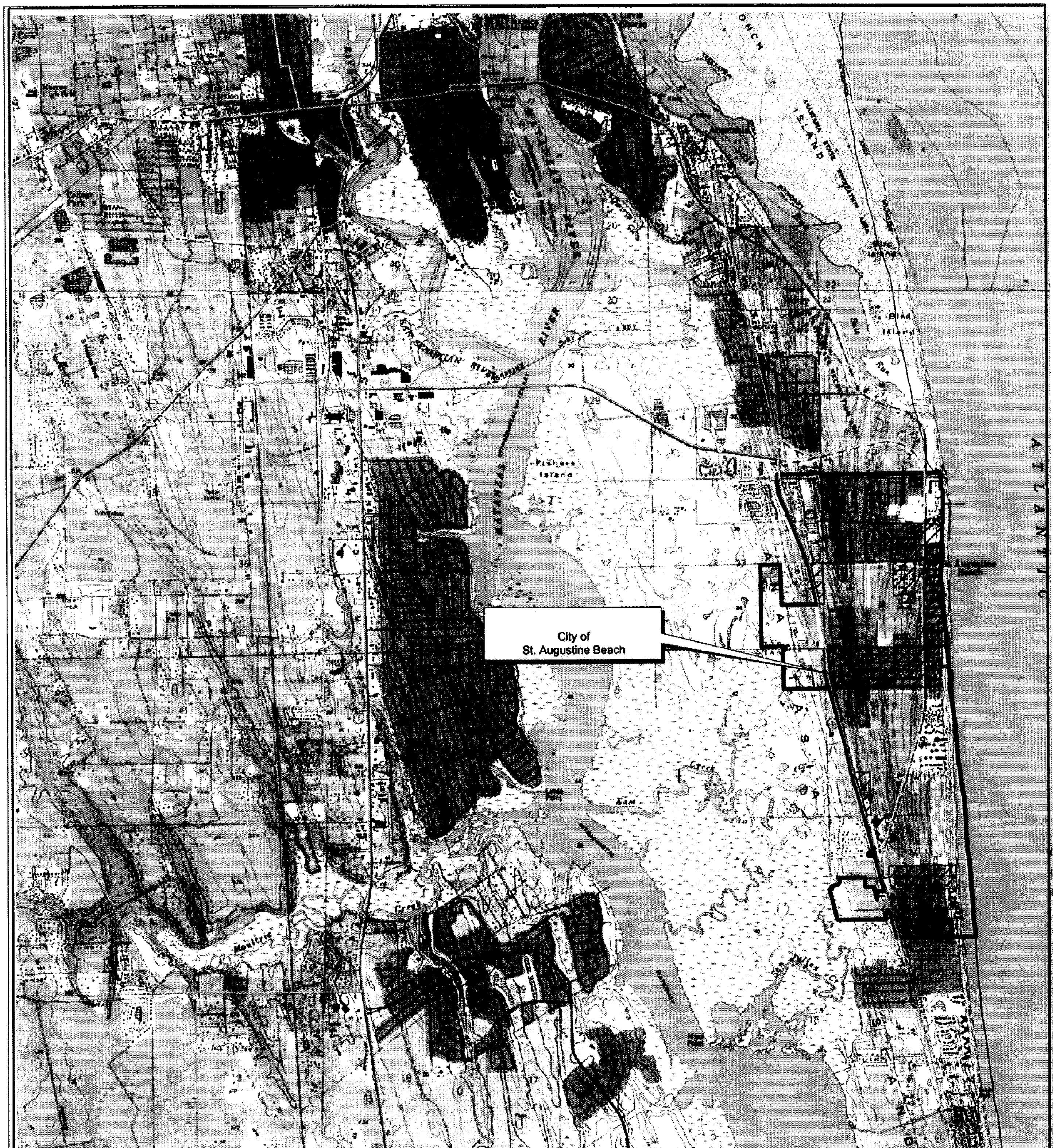
According to the St. Johns County Health Department, approximately 700 homes are currently served by septic systems or onsite sewage treatment disposal systems (OTSTDS) in the St. Augustine Beach Area. According to the St. Johns County Utility Records, there are approximately 860 existing utility customers with service connections for water only. St. Johns County's GIS data indicates that there are approximately 143 vacant properties inside the unsewered subdivisions within the City of St. Augustine Beach. Therefore, this facilities planning study will be completed on the assumption that a total of 1,003 homes will be connected to the sewerage system. A detailed view of the study area is shown on **Figure 1-2**.

The collection system will include all facilities within the right of way to serve each household. The new sewer system will be connected to the existing collection/transmission system for the Anastasia Island Wastewater Treatment Plant, located at 860 West 16th Street in St. Johns County, Florida. This wastewater treatment plant has been owned and operated by St. Johns County Utility Department (SJCUD) since 1983. SJCUD will provide treatment capacity as needed to accommodate the additional wastewater flow.

1.2 Need

Approximately 860 homes currently utilize septic systems for wastewater treatment in the St. Augustine Beach area and there are approximately 143 vacant lots in the unsewered subdivisions.

One study (Guana, Tolomato, and Matanzas River Basins Assessment of Environmental Impacts done in 1999 by Camp Dresser & McKee, Inc) and routine bacteriological surface water testing part of the beach monitoring program performed shown that the high density of septic tanks in the study area increase the risk of public exposure to waterborne diseases and greatly contribute to degrade the environmental quality of the Matanzas River Basin. A brief summary of these findings is given below.



Legend
Major Roads
Study Area
City of St. Augustine Beach

0 0.45 0.9 1.8 Miles

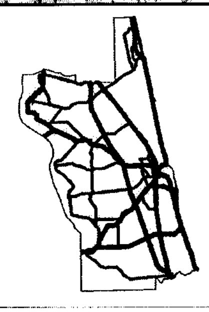


Figure 1-1
St. Augustine Beach Area
St. Johns County, Florida

CDM

Legend

Roads
Parcels
Study Area - Homes on Septic Tanks
Areas already connected to Sewerage System in St. Augustine Beach

2000 0 2000 4000 Feet

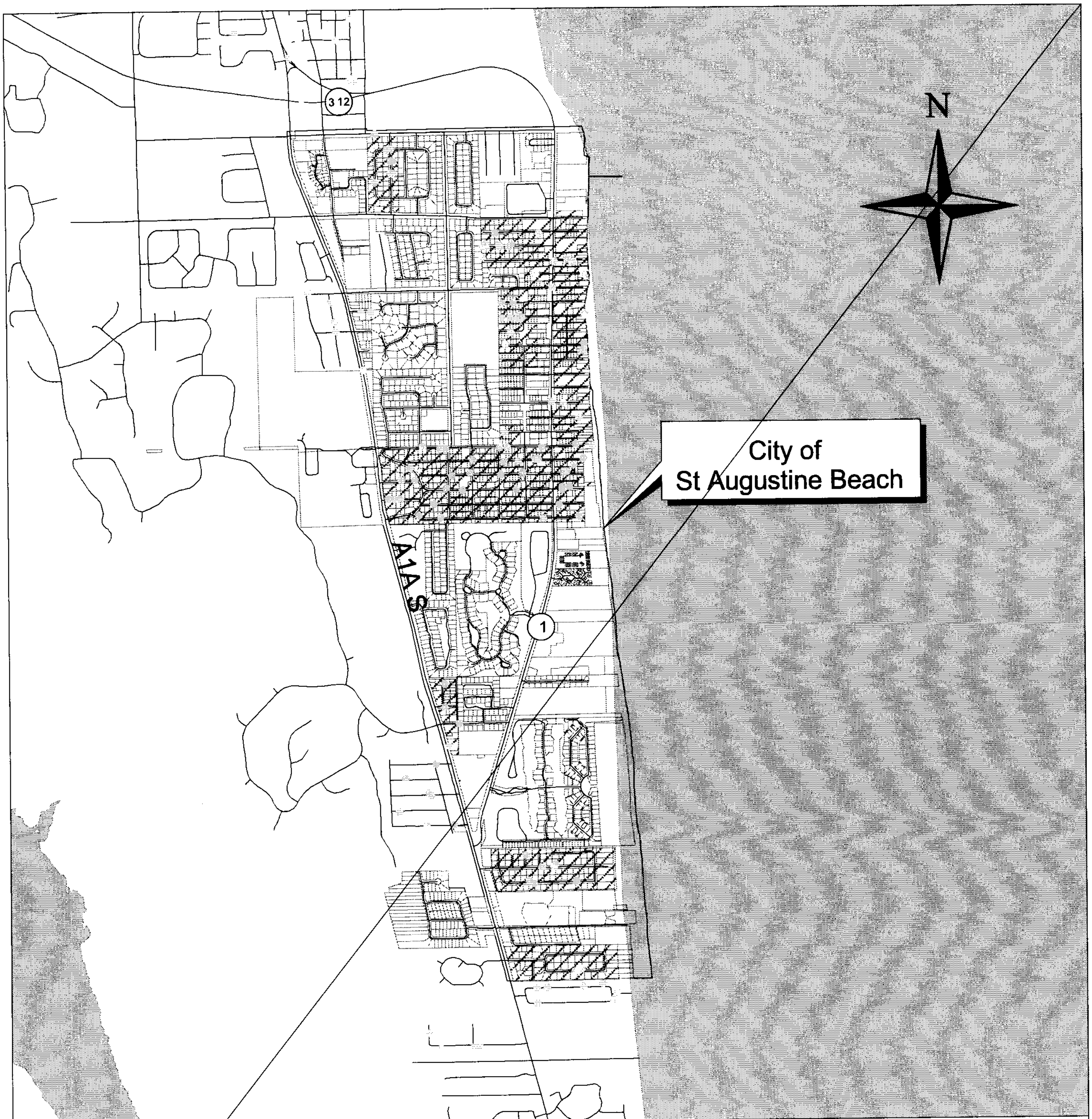
Figure 1-2
Detailed View of the Study Area
St. Johns County, Florida

- Most of the septic tanks were installed more than 30 years ago and were repaired or replaced before 1992. As no OSTDS repair permit was required by the State before 1992, no documentation on the size, age and description of these septic tanks is available. According to the Health Department, only 140 OSTDS repair permits were issued since 1992. **Figure 1-3** depicts the septic tank repairs in the study area from 1996 to 2000.

- The soils in this area range from good to fair in regards to OSTDS use. The seasonal estimated high water table ranges from 10" to 72" depending on location. Additionally it is reasonable to assume that many of the extant systems are undersized relative to current code requirements for sizing, setbacks, or separation to seasonal estimated high water tables. The septic tank areas located within 50 feet of a surface water boundary pose a higher risk of groundwater or surface water contamination. Must of the development area exists in low lying areas between dune ridges running the length of Anastasia Island. The poorly drained soil with seasonal high groundwater levels combined with the improper functioning of septic tanks systems in the study area increase the exposure of the residents to public health risks to an unacceptable level.

- The vast majority of the properties in the St. Augustine Beach area are served by a water utility provider. However, there still may be homes on septic tanks that are also served by individual potable wells. The water table separation issue is of concern for those lots still utilizing private wells for potable use due to lateral movement of pathogens under saturated conditions. The presence of the septic tanks without the required water table separation greatly increases the risk of groundwater contamination and water borne diseases for these homes.

- Finally, the St. Augustine Beach area is located within the East Creek and Salt Run sub-basins which feed into the Matanzas River Basin, designated as a national estuarine research reserve in 1997. The Matanzas River is designated a Class II waterway by the Florida Department of Environmental Protection (FDEP) and as such is designed suitable for shellfish harvesting. Shellfish harvesting areas are classified as Approved, Conditionally Approved, Restricted, Conditionally Restricted, or Prohibited on the basis of comprehensive shellfish harvesting area surveys. The high density of septic tanks in concert with urban runoff has resulted in significant environmental impact in the Matanzas River Basin, such as decreasing the approved shellfish harvesting areas. As a result of the survey conducted in 1997, the Conditionally Approved harvesting area has been reduced by 209 acres and the Conditionally Restricted area has been increased by 721 acres. Septic tanks, even properly installed and operated, will not remove nutrients from the leachate. Septic tank systems installed in close proximity to pristine water bodies like the Matanzas River, will leach nutrients. Therefore, the replacement of these septic tanks by a central sewer collection system would reduce the contribution of nutrients and heavy metals in the urban runoff, and therefore help protect the water body in the Matanzas River Basin.



Legend

Septic Tank Repairs
Areas on Septic Tanks
Roads
Parcels in St. Augustine Beach

0.3 0 0.3 0.6 Miles

Figure 1-3
Septic Tank Repairs from 1996 to 2000
St. Johns County, Florida

CDM

Based on these findings, it is beneficial to connect the unsewered areas to a centralized collection, transmission and treatment system to decrease the risk of public exposure to waterborne diseases and limit the nutrients entering the Matanzas River Basin.

1.3 Scope of Study

The scope of study of this facility plan is:

- Inventory of existing sewerage collection system and wastewater facilities, service area characteristics, and environmental conditions;
- Establish the wastewater collection system needs;
- Identify and evaluate various alternatives to satisfy the needs;
- Document the extent of problems associated with existing unsewered areas, and evaluate alternatives to satisfy the need;
- Describe and recommend the most cost-effective, environmentally sound facilities to meet the need;
- Present a schedule and implementation plan for the recommended facilities;
- Identify a source of financing, and estimate the total cost per household;
- Discuss the environmental impacts of the proposed facilities, including any potential adverse effects; and
- Present this facility plan to the public at a public hearing to obtain input on the proposed plan and allow for public participation.

Sources consulted in preparing this facility plan are listed in Section 7.

Section 2
Existing Conditions

2.1 Description of Planning Area

2.1.1 Service Area

The planning area is part of the SJCUD service area. **Figure 2-1** presents the planning area as well as the SJCUD service area. The planning area is bounded by State Road 312 to the north, State Road A1A to the west, the Atlantic Ocean to the east, and Ocean Drive to the South.

2.1.2 Population and Land Use

This area of St. Johns County is mostly developed but will still be experiencing significant residential growth in the future. Within the subdivisions with septic tanks, there are roughly 143 vacant lots. The last US Census, taken in 2000, indicated a population of 4,683 in the City of St. Augustine Beach.

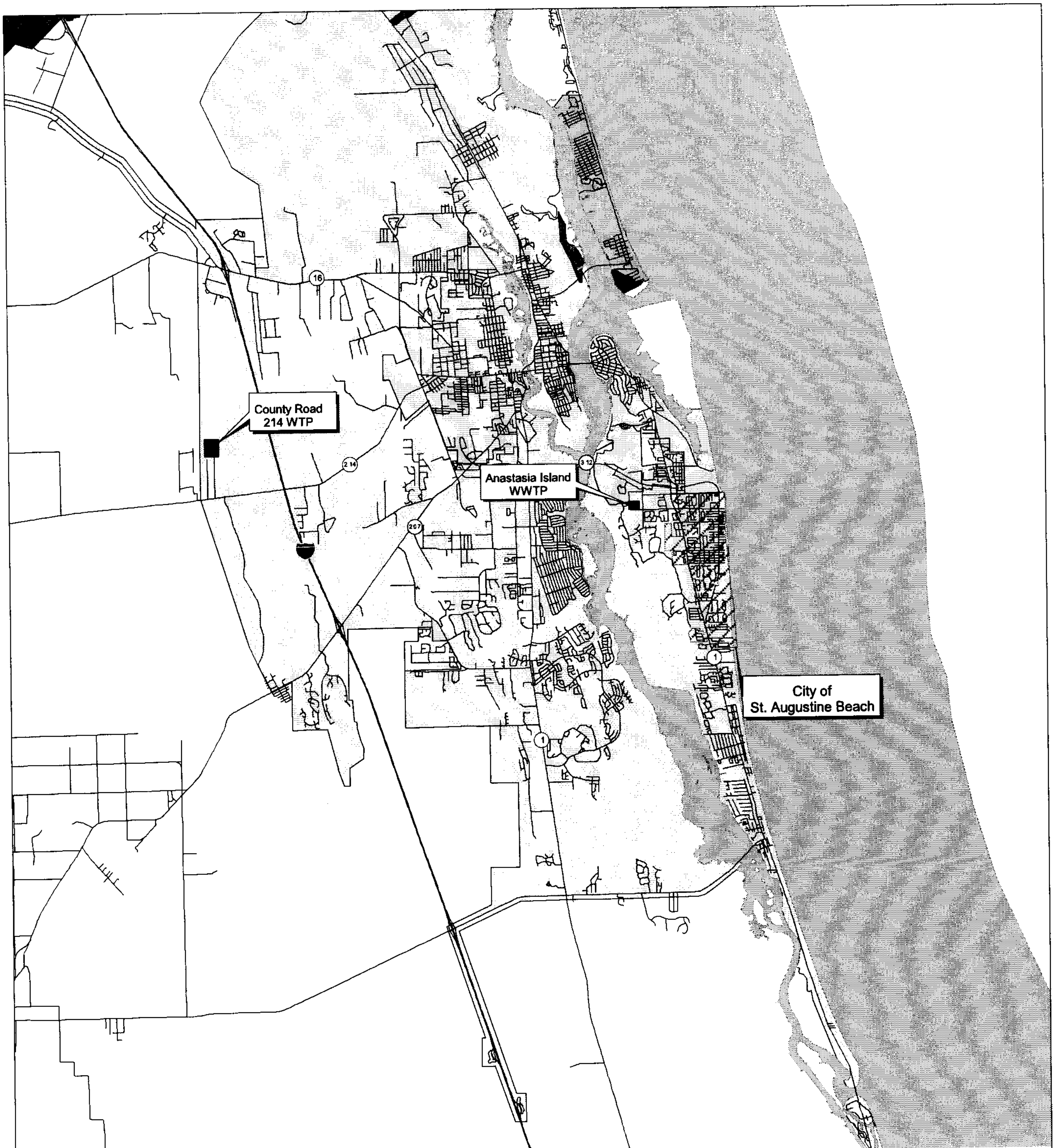
The predominant land use in the planning area is low to medium density, single-family residential with some condominiums and minor commercial areas. A few resort and hotel developments, restaurants and cafes, and office buildings are also present in the study area. There are approximately 51 acres of vacant residential lots with roughly 5 acres of vacant commercial lots. The most recent existing land use (from 1996) is shown on **Figure 2-2** and in **Table 2-1**.

Table 2-1 Existing Land Use in 1996 in the Study Area

Land Use Category	Acreage	Percent of Total Area
High Density Residential	0.110	0.04%
Low/Medium Density Residential	144.0	50.09%
Development Under Construction	0.00	0%
Commercial	8.06	2.80%
Industrial	0.00	0%
Institutional	0.018	0.01%
Agricultural and Forest Lands	0.791	0.28%
Recreation and Open Space	0.00	0%
Vacant Lots	55.96	19.46%
Right of Way	77.17	26.84%
Unclassified(1)	1.38	0.48%
Total Area	287.49	100.00%

(1) Parcels for which the land use could not be determined from the aerial photograph.

A large number of the residential homes within the planning area are currently using septic tanks. The land uses characteristic of an urbanized area, industrial/commercial, light and medium residential, and high density residential, contribute a significant portion of the pollutant load to a water body. The urbanized areas contribute approximately 84 percent of the Total Phosphorus (TP) concentrations and 60 percent



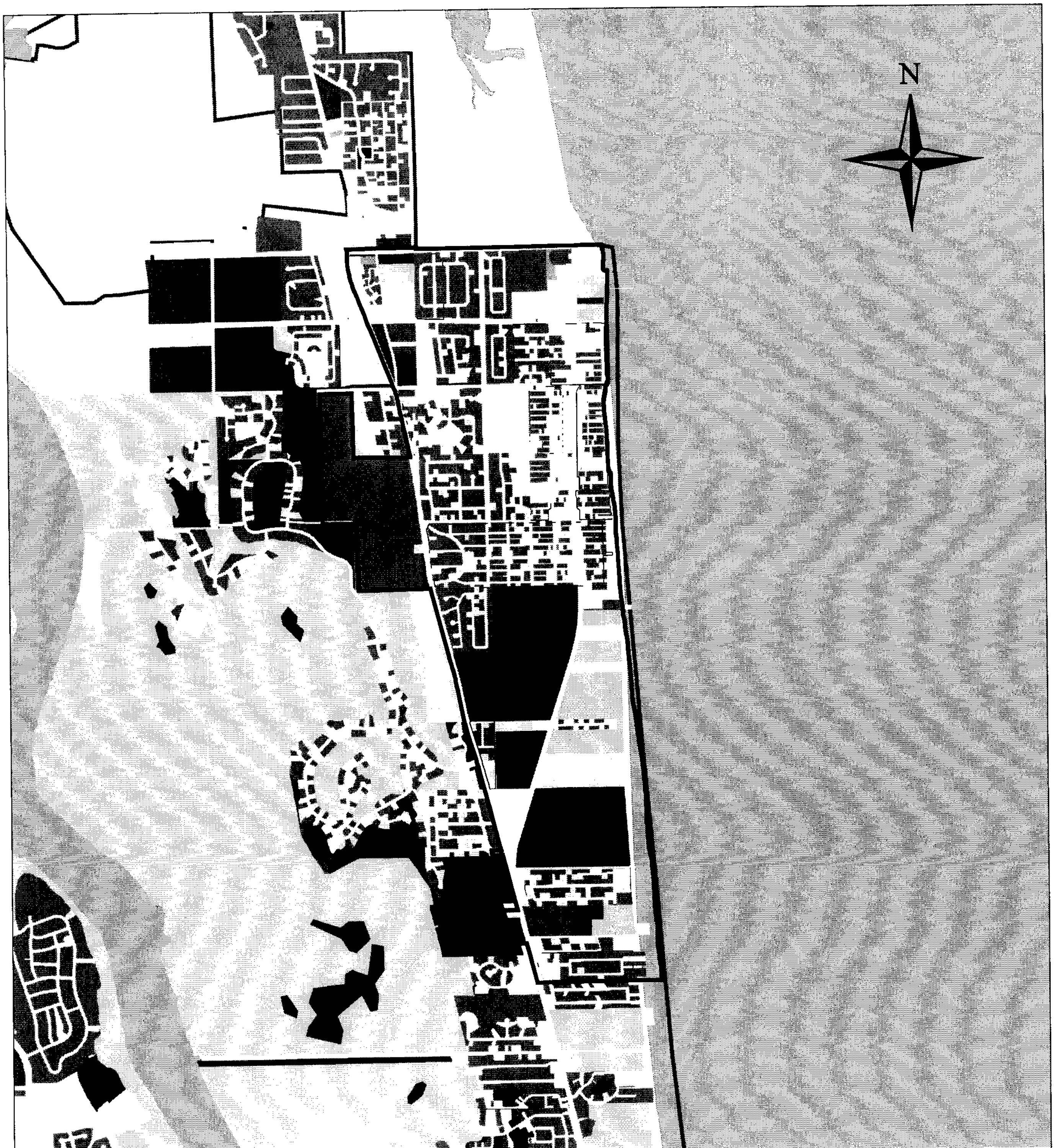
Legend

- City of St. Augustine Beach
- Roads
- Camachee Cove
- City Of St. Augustine Utilities
- Homeowner's Utilities (Porpoise Point)
- North Beach Utilities
- SJCUD - Mainland and Anastasia Island
- SJCUD - Northwest Utilities (WGV)
- SJCUD - Six Mile Creek
- SJCUD - US1 N Corridor
- Wildwood Water

N

Figure 2-1
Water and Wastewater Service Area
St. Johns County, Florida

7000 0 7000 14000 Feet



Legend

City of St Augustine Beach

Land Use in 1996

- Agricultural & Forest Lands
- Commercial
- High Density Residential
- Industrial
- Development Under Construction
- Institutional
- Low/Medium Residential
- Recreation & Open Space
- Right of Way
- Vacant

Figure 2-2
Land Use in
St. Augustine Beach in 1996
St. Johns County, Florida

0.2 0 0.2 0.4 Miles

CDM

of the Total Kjeldahl Nitrogen (TKN) concentrations. These land uses also contribute to more than half of the heavy metals such as Lead (Pb), Zinc (Zn), and Cadmium (Cd) to the receiving water.

2.1.3 Climate and Topography

Due to its proximity to the Atlantic Coast, the planning area has a subtropical maritime climate. It is characterized by long, warm, humid summers and mild, dry winters. The average temperature in the summer is 80 degrees F, and the average temperature in the winter is 62 degrees. Both winter and summer temperatures are moderated by the Atlantic Ocean. The rainy season lasts from June through the middle of October. Summer rains occur as convective afternoon and early evening thundershowers. These showers, which are local and of short duration, may produce 3 or more inches of rainfall in an hour. During the latter part of September and into early fall, when temperatures are fairly moderate, these showers occur earlier in the day and their frequency diminishes. Although thundershowers occur with the greatest frequency in the summer, they may occur in all seasons. The topography of the St. Augustine Beach area is generally flat and developed.

2.1.4 Soils, Geology and Groundwater

Soils have been mapped by the Soil Conservation Service (SCS) of the U.S. Department of Agriculture. The soils, located in the study area, are approximately 45 percent Satellite Fine Sand, 30 percent Fripp-Satellite Complex, and 15 percent Pompano Fine Sand. A soils map of the St. Augustine Beach area is shown on **Figure 2-3**. Satellite Fine Sands are somewhat poorly drained, nearly level soil in narrow to broad swales between higher relict beach sand dunes, on low knolls adjacent to drainageways, and on slight ridges in the flatwoods. Slope for the Satellite Fine Sands ranges from 0 to 2 percent. These soils have a high potential for community development. The Fripp-Satellite Complex are excessively drained, rolling or hilly Fripp soil on narrow relict beach dunces and somewhat poorly drained, nearly level Satellite soil in narrow swales between areas of the Fripp soil. Slopes for the Fripp soils range from 8 to 15 percent. Pompano Fine Sands are poorly drained, nearly level soil in low areas bordering poorly to well defined drainage ways and broad low flat areas. Potential for community development is medium for these soils.

St. Johns County is in the lower part of the Atlantic Coastal Plain. The County takes in four marine terraces composed of sandy and loamy sediments of Recent or Pleistocene age. These surface sediments of Pleistocene or Recent Age are mixed with marine shells.

Between the surface materials and the upper part of the porous limestone in the Floridan Aquifer lie unconsolidated lenses of sand, sandy clay, clay and marl. In the upper part, these materials are Upper Miocene or Pliocene deposits. The lower part of these materials, called the Hawthorne Formation, contains some phosphatic materials. The sediments and formations above the Floridan Aquifer are the source of groundwater supplies for most areas in the County.

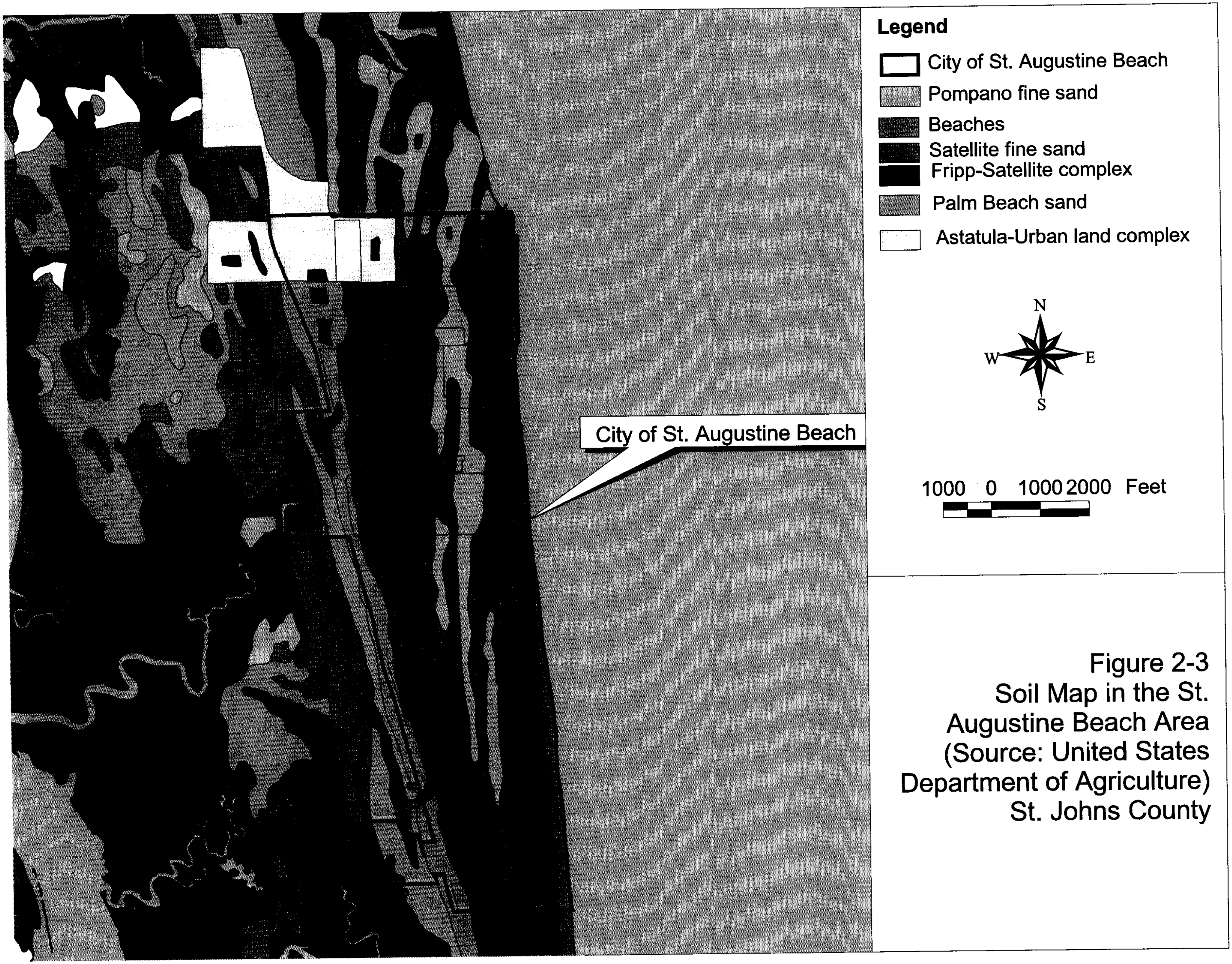


Figure 2-3
Soil Map in the St. Augustine Beach Area
(Source: United States Department of Agriculture)
St. Johns County

The Floridan Aquifer is composed of numerous limestone and dolomite formations of Eocene age. These formations are made up of carbonate materials that range from very hard and continuous to very soft and discontinuous. The soft materials contain many solution cavities, which hold and transmit large quantities of water. Most of the fresh water supplies for agriculture use are obtained from the Floridan Aquifer.

2.1.5 Surface Water Hydrology

Major water bodies are shown on **Figure 2-4**. The planning area is located within the two sub-basins, East Creek Basin and Salt Run. These sub-basins feed into the Matanzas River Unit, a drainage area of approximately 6,370 acres. The Matanzas River Unit is part of the Northern Coastal Planning Unit.

The shellfish harvesting areas in the Matanzas River have been decreased due to water quality degradation attributed to the high density of septic tanks, urban runoff and port activities.

2.1.6 Air Quality

Air quality within the service area is considered to be in-attainment of the State and Federal ambient Air Quality Standards.

2.1.7 Plant and Animal Communities

The dominant types of natural vegetation are primarily palmetto and scrub live oak to laurel oak, live oak, magnolia, and a few longleaf pines further from the beach.

Most of the area is now used for residential and commercial development. Animal life in the developed areas is limited. Non game species include raccoon, rabbit, armadillo, opossum, skunk, bobcat, gray and red foxes, otter, and a variety of songbirds, wading birds, shore birds, woodpeckers, reptiles, and amphibians. A wide variety of fish species, both fresh and saltwater, provide good fishing in the surrounding area.

2.2 Environmentally Sensitive Areas

2.2.1 Wetland, Floodplains, and Prime and Unique Farmlands

A few small wetlands areas were identified in the study area. The wetland areas found are classified as palustrine, non-tidal wetlands.

Floodplains were identified using a FEMA Flood Insurance Rate Map, Panel 125146001C, 125146002C, and 1241470227E, and are shown on **Figure 2-5**. Flood plains are localized adjacent to the water bodies in the study area. Within the septic tanks areas, 30 percent are located within the 100-year flood plain. Over half of the study area is located within the 500-year flood plain. The remaining 18 percent of the study area is located outside of the 100-year flood plain and the 500-year flood plain.

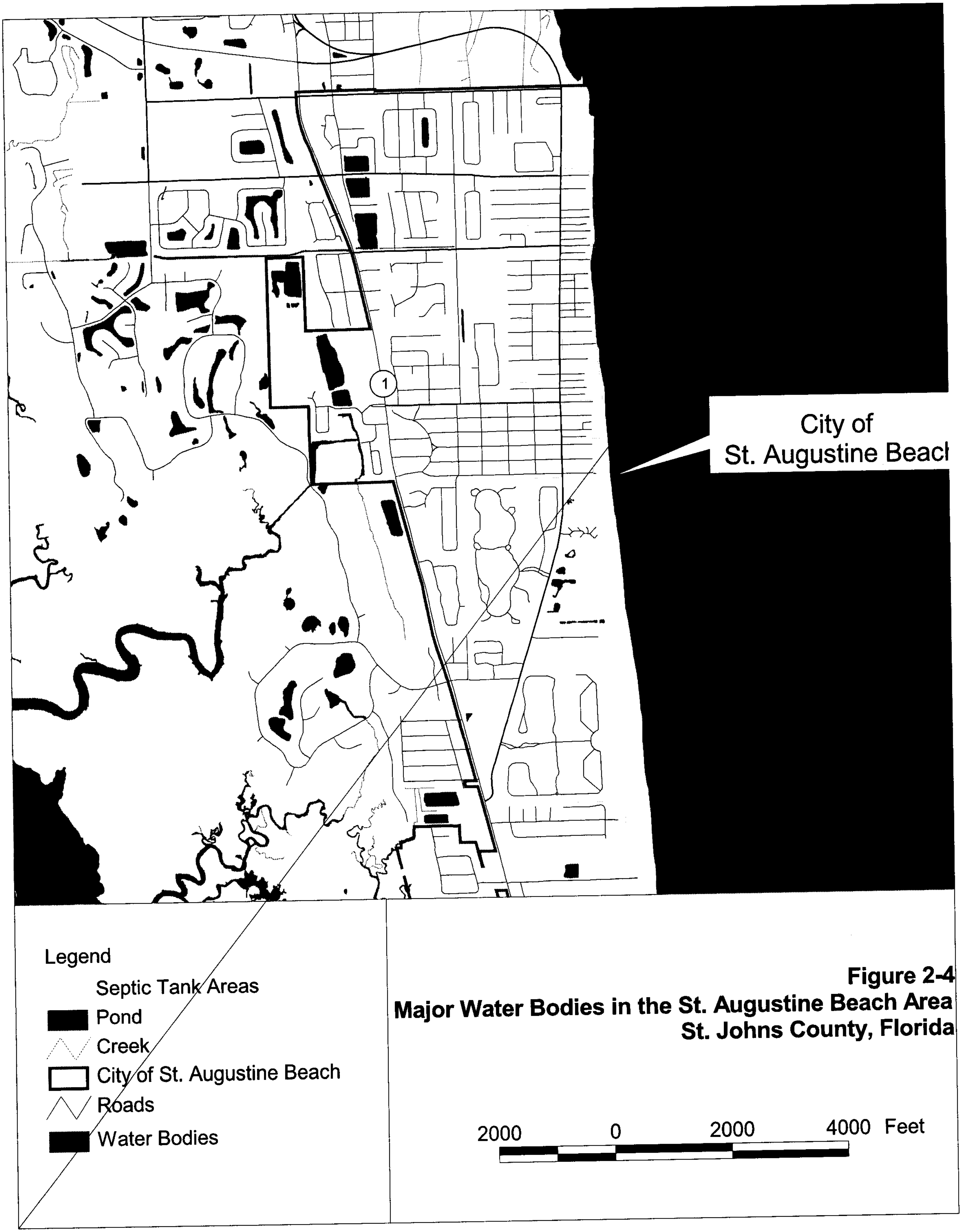


Figure 2-4
Major Water Bodies in the St. Augustine Beach Area
St. Johns County, Florida

CDM

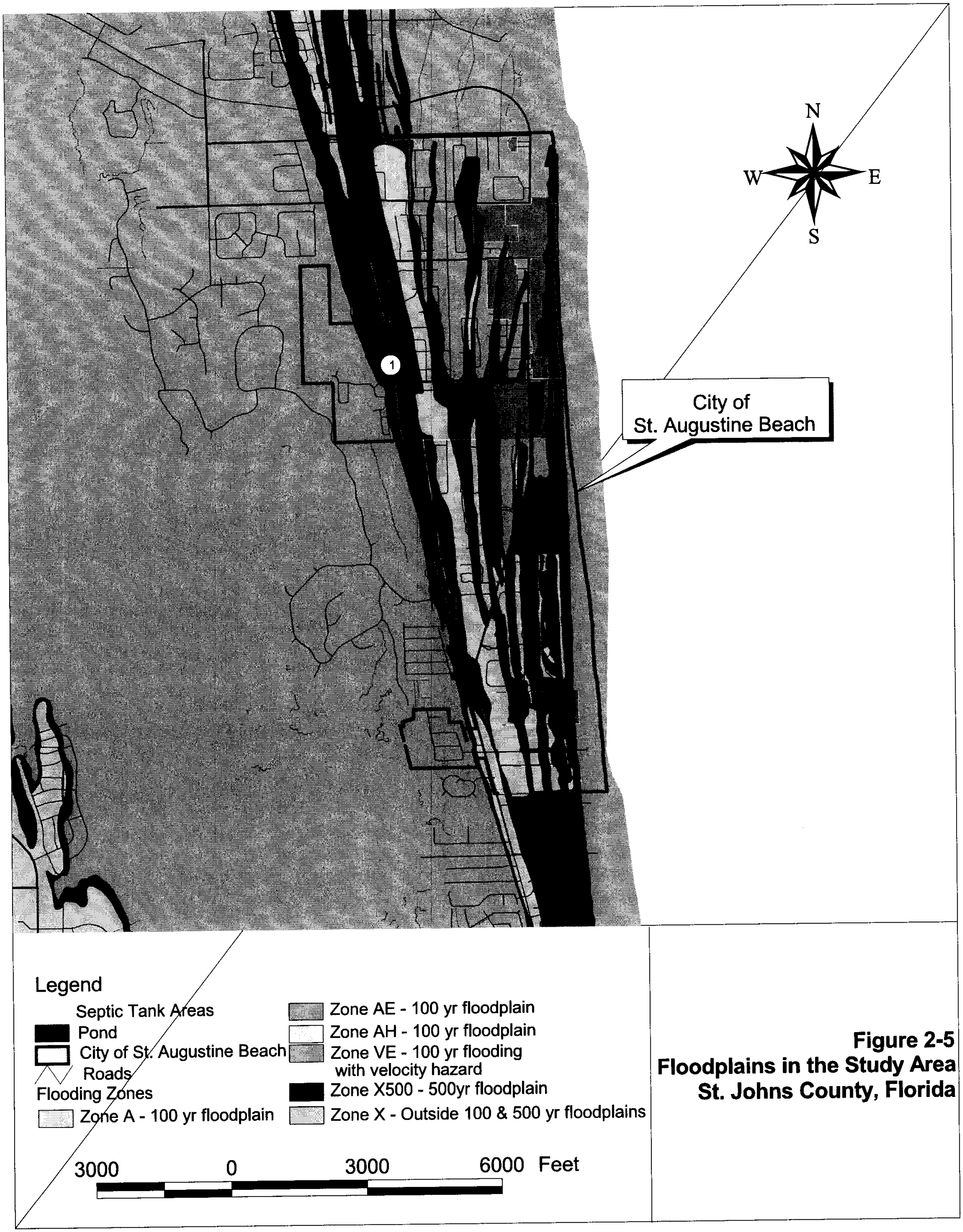


Figure 2-5
Floodplains in the Study Area
St. Johns County, Florida

CDM

The planning area is highly urbanized. There are no prime or unique farmlands within the planning area.

2.2.2 National and Natural Landmarks and Historical and Archaeological Sites

CDM contacted the State Division of Historical Resources to identify historic and archaeological landmarks within the study area. The results are provided in **Appendix A**. Five of the recorded sites are archaeological, while the remainders are historical standing structures from as early as the 1920s.

2.2.3 Open Spaces and Recreation Areas

As shown on Figure 2-2 and in Table 2-1, there are no recreational facilities and open spaces within the study area.

2.3 Existing Wastewater Management System

2.3.1 Flows and Pollution Sources

SJCUD provides the entire study area with its water and sewer service. No other public or private entity provides water or sewer services in the study area. SJCUD has operated the Anastasia Island Wastewater Treatment Plant (AI WWTP) since it opened in 1983. Some areas are unsewered and are still on septic tanks, as described in Section 4 of this report. Septic tank leachate has been cited as contributing to the pollution of the Matanzas River Unit and increasing the risk of exposure to waterborne pathogens.

This wastewater treatment facility has been operated by the SJCUD (Anastasia Sanitary District) since 1983. SJCUD operates the facility under Florida Department of Environmental Protection (FDEP) Facility Permit Number FL0038831-003-DW1P, which will expire in July 2008. The AI WWTP is currently receiving an average flow of 1.454 mgd, based on the most recent 12 months of data. These data are summarized in **Table 2-2**.

Table 2-2 Summary of Recent Wastewater Flow Data

Month - Year	Average Daily Flow (mgd)	Maximum Daily Flow (mgd)
August-03	1.656	2.021
September-03	1.209	1.604
October-03	1.210	1.658
November-03	1.233	1.513
December-03	1.18	1.482
January-04	1.263	1.463
February-04	1.493	1.864
March-04	1.765	2.046
April-04	1.48	1.936
May-04	1.458	1.714
June-04	1.589	1.898
July-04	1.502	2.017
12-Month Average	**1.454**	

The AI WWTP receives wastewater flows from residential homes, condominiums, and minor commercial areas. At this time, there is one industrial client, Hydro-Aluminum. There are only two very small areas zoned for industrial development in the future within the AI WWTP service area.

2.3.2 Water Supply

Table 2-3 provides a summary of estimated potable water use from 2000 to 2004. The average daily consumption per person was 103 gpd. As each residential connection averages 2.5 persons, this amounts to 258 gallons of potable water per person per day.

Table 2-3 Historic Water Use at the County Road 214 Water Treatment Plant (Source: SJCUD)

Year	Population	Number of Connections	Average Daily Flow (mgd)	Per Capita Usage (gpcd)
2000	34,165	13,666	3.56	104
2001	35,525	14,210	3.52	99
2002	36,875	14,750	3.92	106
2003	38,660	15,464	3.90	101
2004	40,072	16,029	4.26	106
Average	**37,059**	**14,824**	**3.93**	**103**

Water is withdrawn from the Floridan Aquifer under a Consumptive Use Permit (CUP) from the St. Johns River Water Management District.

2.3.3 Treatment Plant Effluent

Based on the review of the discharge monitoring reports from the year 2003, effluent CBOD5 concentrations ranged from 2.0 to 10.5 mg/L, TSS concentrations from 0.8 to 5.5 mg/L, and effluent fecal coliform counts from 1 to 400. Effluent from the plant can be either discharged to the Matanzas River or to the Marsh Creek Golf Course pond.

2.3.4 Existing Facilities

Collection System

Areas within the City of St. Augustine Beach that are currently provided with service through an existing gravity sewer system include:

- The St. Augustine Beach and Tennis Club
- The St. Augustine Ocean and Racket Club
- All other subdivisions within the city including Sea Colony, Anastasia Dunes, Ocean Trace

Less than half of the City of St. Augustine Beach is on septic tanks and therefore, not currently provided with sanitary sewer. According to the Health Department, approximately 140 OSTDS have been repaired or replaced over the past 10 years. The normal service life of an OSTDS drainfield is between 15 and 20 years. Most of the lots were developed more than 30 years ago.

There is concern that some of the older developments in the project area that have in-ground OSTDS installations as and high seasonal water tables pose a risk of groundwater or surface water contamination, particularly if these systems are located within 50 feet of a surface water boundary. Therefore, many of the OSTDSs currently serving the area do not meet the current code requirements for sizing, setbacks, or separation to seasonal estimated high water tables.

Transmission System

Figure 2-6 presents the existing transmission system. Two force mains, located southeast of the AI WWTP, run along the western AIA and eastern A1A and transmit the major portion of the flow to the AI WWTP: a 12-inch force main is located along the western side of A1A and a 6-inch along the eastern side. These two force mains are interconnected. Another 8-inch force main, located directly east of the wastewater treatment plant, runs from east to west and transmits the flow from the homes in the Seaside at Anastasia and Anastasia Oaks subdivisions to the wastewater treatment plant.

Twenty-seven existing lift stations are located within the City of St. Augustine Beach. Five of the existing lift stations are located in the unsewered areas:

- At the Sunset Grille on 15th Street;

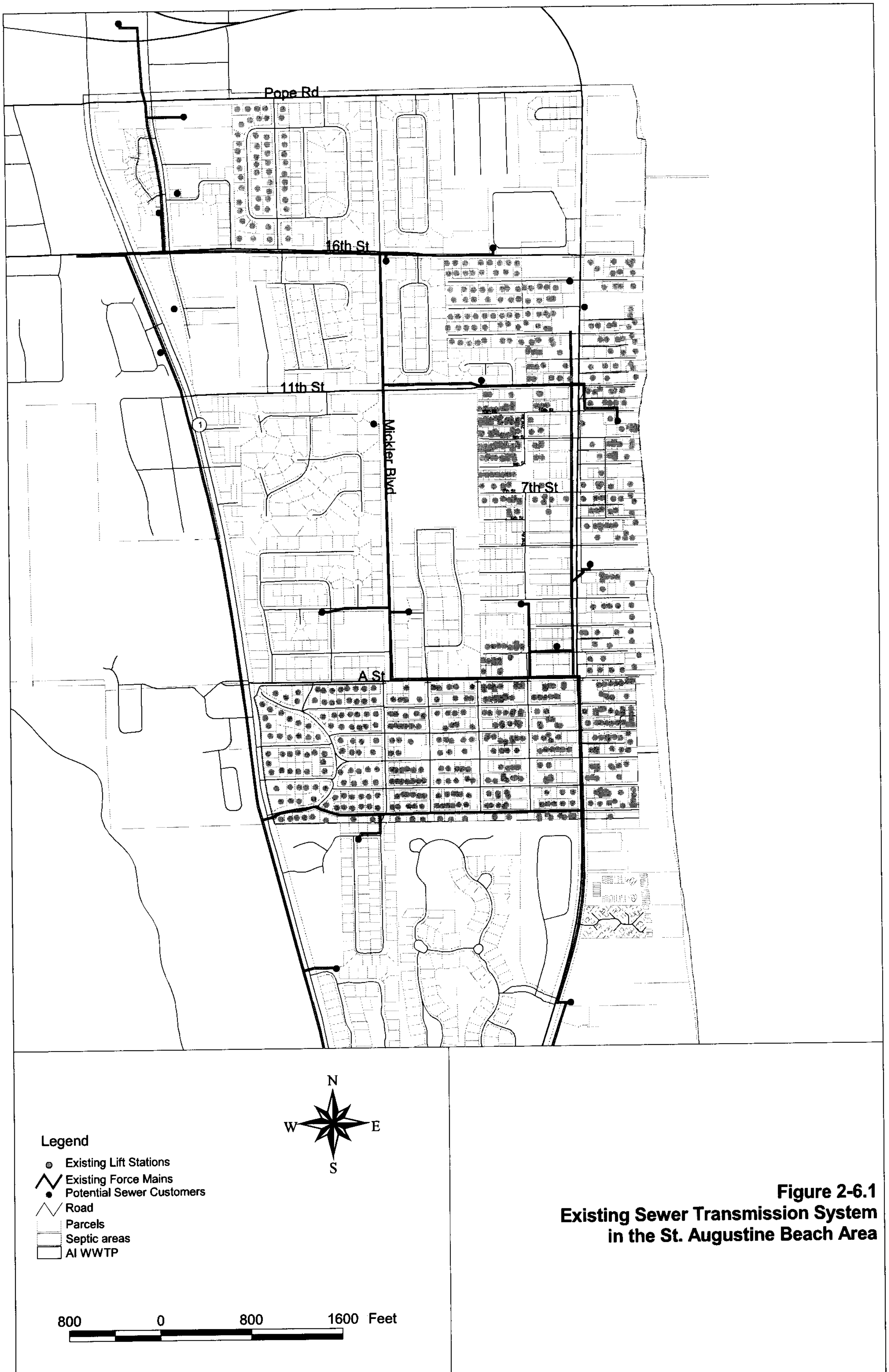


Figure 2-6.1
Existing Sewer Transmission System in the St. Augustine Beach Area

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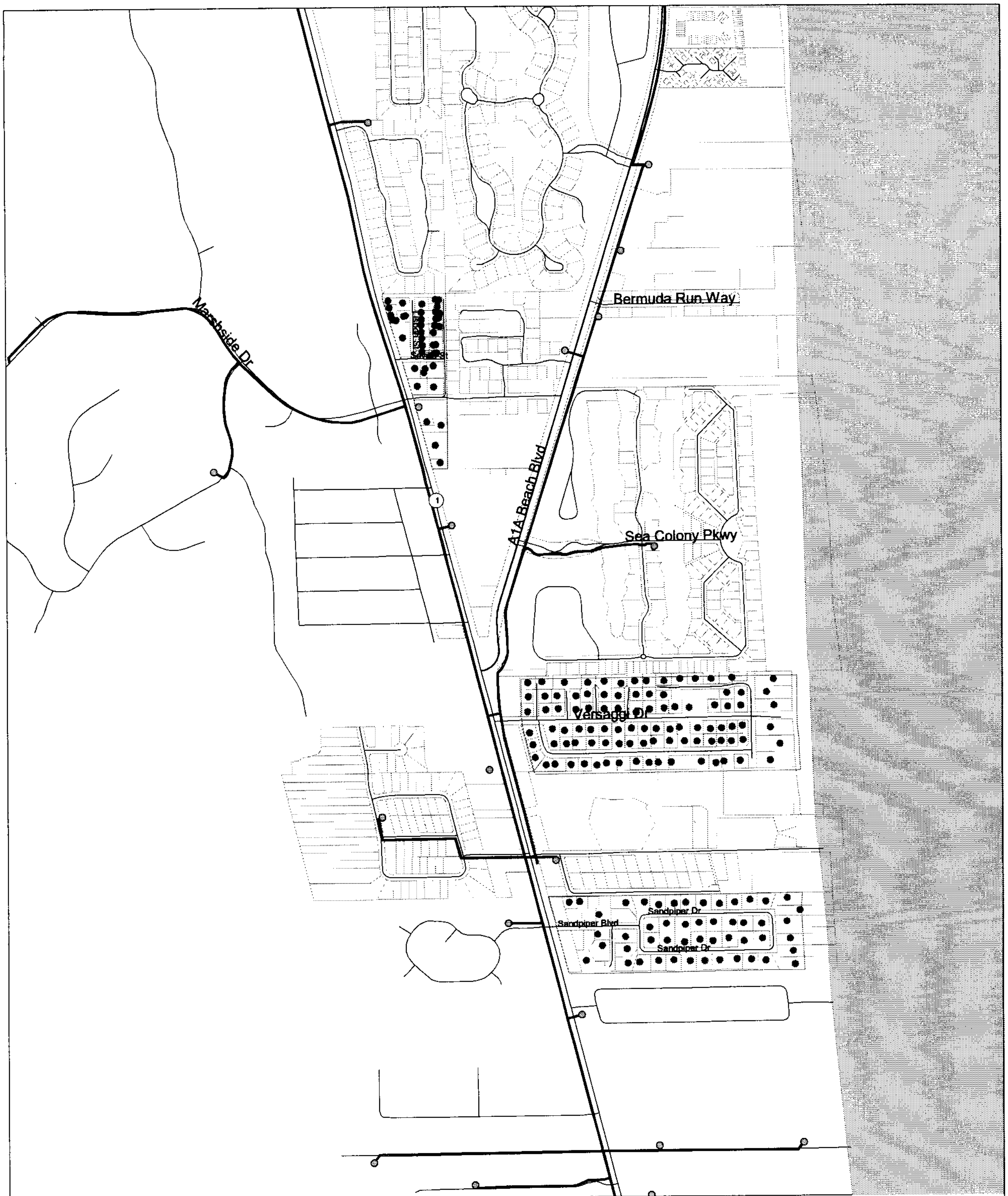

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Legend
- Existing Lift Stations
- Existing Force Mains
- Potential Sewer Customers
- Road
- Parcels
- Septic areas
- AI WWTP

800 0 800 1600 Feet

Figure 2-6.2
Existing Sewer Transmission System in the St. Augustine Beach Area

CDM

- At the Hampton Inn on AIA Beach Blvd;
- On 10th Street east of AIA Beach Blvd;
- At the St. Augustine Beach Lots north of 4th Street
- At the southeast corner of AIA South and Madrid Street

Wastewater Treatment Plant

The AI WWTP is located at 860 West 16th Street, west of the northern part of the City of St. Augustine Beach. The wastewater treatment facility was first constructed in 1983 as a Davco Package Plant with a capacity of 0.5 mgd. In 1985, the capacity was increased to 2.0 mgd and was a complete mix extended air wastewater treatment plant. In 1990, the plant's capacity was increased to 4.0 mgd with the same treatment processes. The actual treatment process consists of screening, activated sludge, secondary clarification, and disinfection. The effluent after chlorine disinfection is divided into two streams. One stream flows to a post-aeration basin to increase the dissolved oxygen content and to provide dechlorination with sulfur dioxide before discharge to the Matanzas River. The other stream is pumped to a shallow bed sand filter, and then rechlorinated before discharge to the Marsh Creek Country Club Golf Course ponds. The domestic wastewater residuals are thickened with a belt thickener and stored in the aerobic digester prior to dewatering with a belt filter press. The dewatered residuals are hauled to Florida Enviro Residual Management Facility for further treatment and final disposal. **Table 2-4** summarizes the treatment processes at the AI WWTP and **Figure 2-7** provides a flow diagram of the plant.

Table 2-4 Treatment Processes at AI WWTP

Process Description	Permitted Capacity
Influent Channel Bar Screen	
Quantity	2
Bar Slot Openings, mm	3
Maximum Approach Velocity, fps	0.48
Aerated Grit Chamber	
Capacity, gals	15,620
Detention Time, min	7
Air Diffuser Capacity (each), cfm	4 to 12
Aeration Tanks	
Detention Time (two tanks), hours	4.98
Capacity (each tank), gal	311,400
Quantity	4
Solids Phase Treatment Units	
Aerobic Digester, gal	416,545
Primary Sludge Dewatering, gph	3,400
Output, CY/hour	3
Secondary Clarifier	
Quantity	4
Capacity, each, gal	176,256
Weir Loading Rate, all tanks, gpd/ft2	4,775
Surface Loading Rate ,all tanks, gpd/SF	382
Chlorine Disinfection System	
Length of Flow Path (max), LF	243
Detention Time at peak flow, minutes	15

The DEP permit No. FL0038831 limits monthly effluent concentrations of BOD to 25 mg/L, TSS to 30 mg/L and ammonia to 12 mg/L as N. Water quality data were reviewed for the 12 months of record in 2003. Based on this information, the AI WWTP produces a high quality of effluent and effluent limits have not been violated (except for the quarterly copper sample of 8.2 µg/L in February 2003).

The AI WWTP is currently undergoing some improvements including replacing and adding new yard piping, renovating the existing digesters No. 1 and No. 2, rehabilitating Secondary Clarifiers No. 1 and No. 2, and new air piping in Aeration Tanks No. 1 and No. 2.

Sludge Facilities

The domestic wastewater residuals are thickened with a belt thickener and stored in the aerobic digester prior to dewatering with a belt filter press. The dewatered

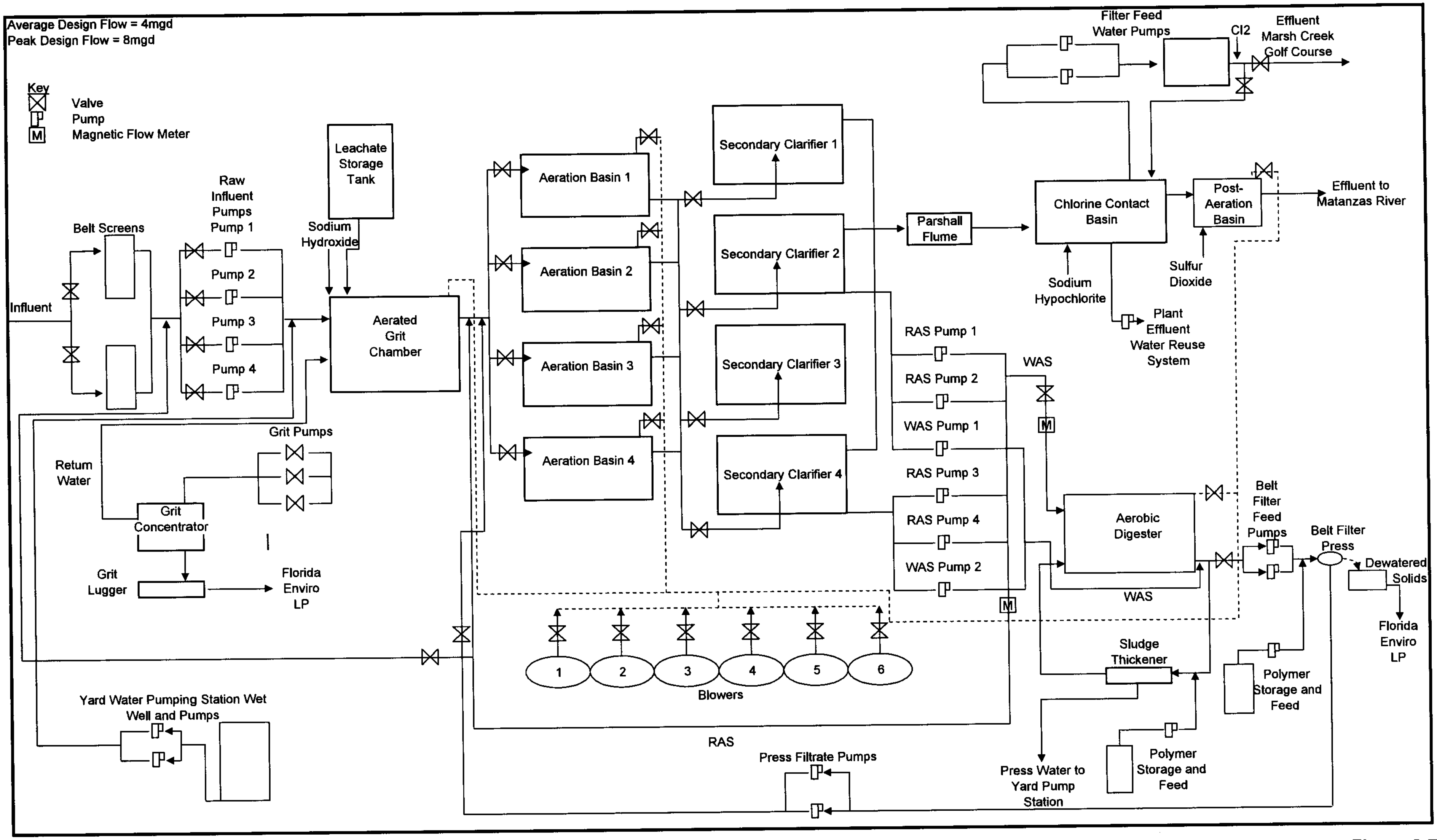

Figure 2-7
Existing Flow Diagram
Anastasia Island Wastewater Treatment Facility
(Source: Gee and Jenson)

residuals are then hauled to Florida Enviro Residual Management Facility for further treatment and final disposal.

2.4 Inflow and Infiltration

The U.S. Environmental Protection Agency (EPA) describes infiltration as water, other than wastewater, that enters a sewer system (including sewer service connections and foundations drains) from the ground by such means as defective pipes, pipe joints, connections or manholes. The current EPA regulatory guideline concerning infiltration states that no further I/I analysis is required if domestic wastewater plus infiltration does not exceed 120 gallons per capita per day (gpcd) during periods of high groundwater.

The EPA describes inflow as water, other than wastewater, that enters a sewer system from sources such as roof leaders, cellar drains, yard drains, drains from springs and swampy areas, manhole covers, cross connections between storm sewers and sanitary sewers, catch basins, cooling towers, and stormwater surface runoff. The EPA guidelines indicate that no further I/I analysis will be required of the total daily wastewater flow plus inflow during a storm does not exceed 275 gpcd.

The major part of the study area utilizes septic tanks for wastewater treatment and therefore dos not contribute to infiltration or inflow into the current collection system.

2.5 Need for Facilities

An extension of the collection and transmission system is needed to serve the unsewered areas in St. Augustine Beach. Since average flow for the AI WWTP for the most recent 12 months is 1.5 mgd, the wastewater treatment plant will still be under the permitted capacity of 4.0 mgd with the addition of approximately 1,003 equivalent residential connections. A collection system study addressing these areas is included in Section 4 of this facility plan.

Section 3
Future Conditions

3.1 Flow Projections

Wastewater flow projections must take in account the number and type of service connections (residential and commercial), future service connections, number of persons per connection, and per capita wastewater production. Nearly all the structures in the study area are residential. This area of St. Johns County is generally well developed, but has approximately 50 acres of vacant residential property and approximately 5 acres of commercial property.

Based on information from St. Johns County staff, it is projected that approximately 1,003 homes or vacant lots will be connected to the sewer collection system during the project. Based on information from the County and the data in Table 2-3, it is assumed that in the St. Augustine Beach area, each household consists of an average of 2.5persons. Therefore, approximately 2,508 persons are projected to be added to the sewerage system in the next 3 to 5 years.

3.2 Design Flows

Wastewater collection piping and vacuum/pump stations are typically designed to handle peak flow rates. Peak flow rates are defined as the largest volume of wastewater discharged to the wastewater collection system. Based on the monthly operating report from the past year, the maximum daily flow to the monthly average daily flow factor computed ranged from 1.16 to 1.37. However, a conservative peak flow rate factor of 2.5 was used as the design flow for the contributing areas.

The FDEP accepted average wastewater production volume of approximately 350 gallons per household per day was used for this study. Based on the estimated daily flow per household per day and the number of households estimate from above (1,003), the average daily wastewater production volume was estimated to be 351,050 gpd for the study area. Additionally, based on a peak flow rate factor of 2.5, the peak flow rate was determined to be equal to 877,625 gpd or approximately 609 gpm. The summary of the wastewater flow calculations is provided in **Table 3-1**.

Table 3-1 Summary of Wastewater Flow Projections for the Next 5 Years

	Units	Value
Existing Residences Added	home	1003
Assumed Average Wastewater Flow per Household	gallons/household*day	350
Projected Total Average Wastewater Flow for the Study Area	gpd	351,050
Assumed Peak Flow Factor		2.5
Projected Peak Water Flow for the Study Area	mgd	0.88
Plant Max Flow Rate (last 12 months)	mgd	2.05
Actual Plant Capacity	mgd	4.00
Projected Max Flow Rate	mgd	2.93

Based on the flow calculations, the projected maximum flow rate will be 2.93 mgd. The permitted capacity of 4.0 mgd at the plant will be able to handle the additional 0.88 mgd peak wastewater flows.

3.3 Design Strength of Wastewater

Influent concentrations of biochemical oxygen demand (BOD) and total suspended solids (TSS) are not expected to change through the design period. Strengths will continue to reflect the basic domestic origins of the wastewater. The range of influent BOD, as determined from Monthly Operating Reports for the period of January 2003 to December 2003 is 34 to 376 mg/L. The range of influent TSS for the same period is 141 to 302 mg/L. The design strength of the influent CBOD5 and TSS was taken to be respectively 180 mg/L and 150 mg/L, which corresponds to the average of the monthly values over the past year. No toxics or significant industrial wastes are anticipated to be added.

3.4 Land Use and Economic Development

The study area is well developed by residential property but has approximately 55 acres of vacant lots, 5 of which are commercial properties.

3.5 Effluent Limits

The effluent limitations presented in **Table 3-2** are based on the current operating permit for the Anastasia Island Wastewater Treatment Plant.

Table 3-2 Current Effluent Limitations at the Anastasia Island Wastewater Treatment Plant

Parameter	Unit	Annual Value	Monthly Value	Weekly Average	Single Sample	Monitor Frequency
BOD5	mg/L	20	25	40	60	Monthly and Weekly
TSS(Surface discharge)	mg/L	20	30	30	60	Monthly and Weekly
TSS(Reuse)	mg/L				5	Daily
pH	S.U.	Range 6 to 8.5				5 Days a Week
Fecal Coliform (Surface Discharge)	#/100 mL	200[1]	See Below[2]		800[3]	Monthly and Weekly
Fecal Coliform (Reuse)	#/100mL	1[4]			25	Daily

Notes: [1]Arithmetic Mean of the Monthly Fecal Coliform Values

[2]Geometric Mean of a Minimum of 10 Samples Collected on a Separate Day during a Period of 40 Consecutive Days (monthly)

[3]No more than 10% of the Samples Collected during a Period of 30 Consecutive Days shall exceed 400#/100ml. Any one sample shall not exceed 800 #/100 mL

[4]Non Detectable in 75% of the values

Section 4
Development of Wastewater Management Alternatives

4.1 General

The alternatives analysis focuses on the most cost-effective means of connecting the 1,003 homes to the existing sewerage system. This is being done to decrease the risk of public exposure to waterborne pathogens, reduce the contribution of nutrients and biological oxygen demand in the urban runoff, and therefore, help protect the pristine water bodies in the Matanzas River Basin.

The wastewater management alternatives to be considered for the study area consist of:

- No Action
- Vacuum Sewer System
- Gravity Sewer Collection System

4.2 Collection System Alternatives

4.2.1 No Action

Under this alternative, the existing unsewered systems would remain on septic tanks. This alternative is the least costly, but there are numerous problems associated with the use of septic tanks in the St. Augustine Beach area. These problems are listed below:

- **Aging Septic Tanks** - A major portion of the St. Augustine Beach area is now served by septic tanks that were installed more than 30 years ago. According to the Health Department, many of the septic systems were undersized relative to the current code requirements. The vast majority of the properties in the St. Augustine Beach area are served by a water utility provider. However, there still may be homes on septic tanks also served by individual potable wells. The water table separation issue is of concern for those lots still utilizing private wells for potable use due to lateral movement of pathogens under saturated conditions. The presence of the septic tanks without the required water table separation greatly increases the risk of groundwater contamination and water borne diseases for these homes.

- **High Groundwater Table and Floods** - The poorly drained soil with seasonal high groundwater levels, combined with the improper functioning of septic tank systems in the study area, increases the exposure of the residents to public health risks to an unacceptable level. It is reasonable to assume that many of the existing septic systems are undersized relative to current code requirements for sizing, setbacks, or separation to seasonal estimated high water tables. The septic tank areas located within 50 feet of a surface water boundary pose a higher risk of groundwater or surface water contamination. Most of the development area exists in low lying areas between dune ridges running the length of Anastasia Island. The poorly drained soil with seasonal high groundwater levels, combined with the improper functioning of septic tanks systems in the study area, increases the exposure of the residents to public health risks to an unacceptable level.

- **Adjacent to Pristine Water Bodies** - As noted earlier, the St. Augustine Beach area is located within the East Creek and Salt Run sub-basins which feed into the Matanzas River Basin, designated as a national estuarine research reserve in 1997. The high density of septic tanks in concert with urban runoff has resulted in significant environmental impact in the Matanzas River Basin, such as decreasing the approved shellfish harvesting areas. As a result of the survey conducted in 1997, the Conditionally Approved harvesting area has been reduced by 209 acres and the Conditionally Restricted area has been increased by 721 acres. Septic tanks, even properly installed and operated, will not remove nutrients from the leachate. Septic tank systems installed in close proximity to pristine water bodies like the Matanzas River will leach nutrients. Therefore, the replacement of these septic tanks by a central sewer collection system would reduce the contribution of nutrients and heavy metals in the urban runoff, and therefore help protect the water body in the Matanzas River Basin.

- **High Density Development** - Septic tanks are not appropriate for densely developed areas because there is inadequate room for the drainfields associated with these systems. The poorly drained soils and high groundwater table make the use of septic tank systems particularly undesirable.

Based on these findings, the "No Action" may result in continued environmental degradation. Additionally, the high density of septic tanks increases the risk of exposure of the residents to waterborne diseases and is considered unacceptable to St. Johns County. Therefore, this option is not viable.

4.2.2 Vacuum Sewer System

4.2.2.1 Vacuum Sewer System Description

This alternative consists of conveying the raw sewage from the 1,003 homes currently on septic tanks by induced air vacuum from valve pits to a vacuum station. The proposed vacuum sewer layout for the St. Augustine Beach study area is shown on **Figure 4-1**. The vacuum pump system is essentially composed of three main elements:

- Service Laterals and Valve Pits
- Vacuum Transmission Pipeline
- Vacuum and Pumping Station

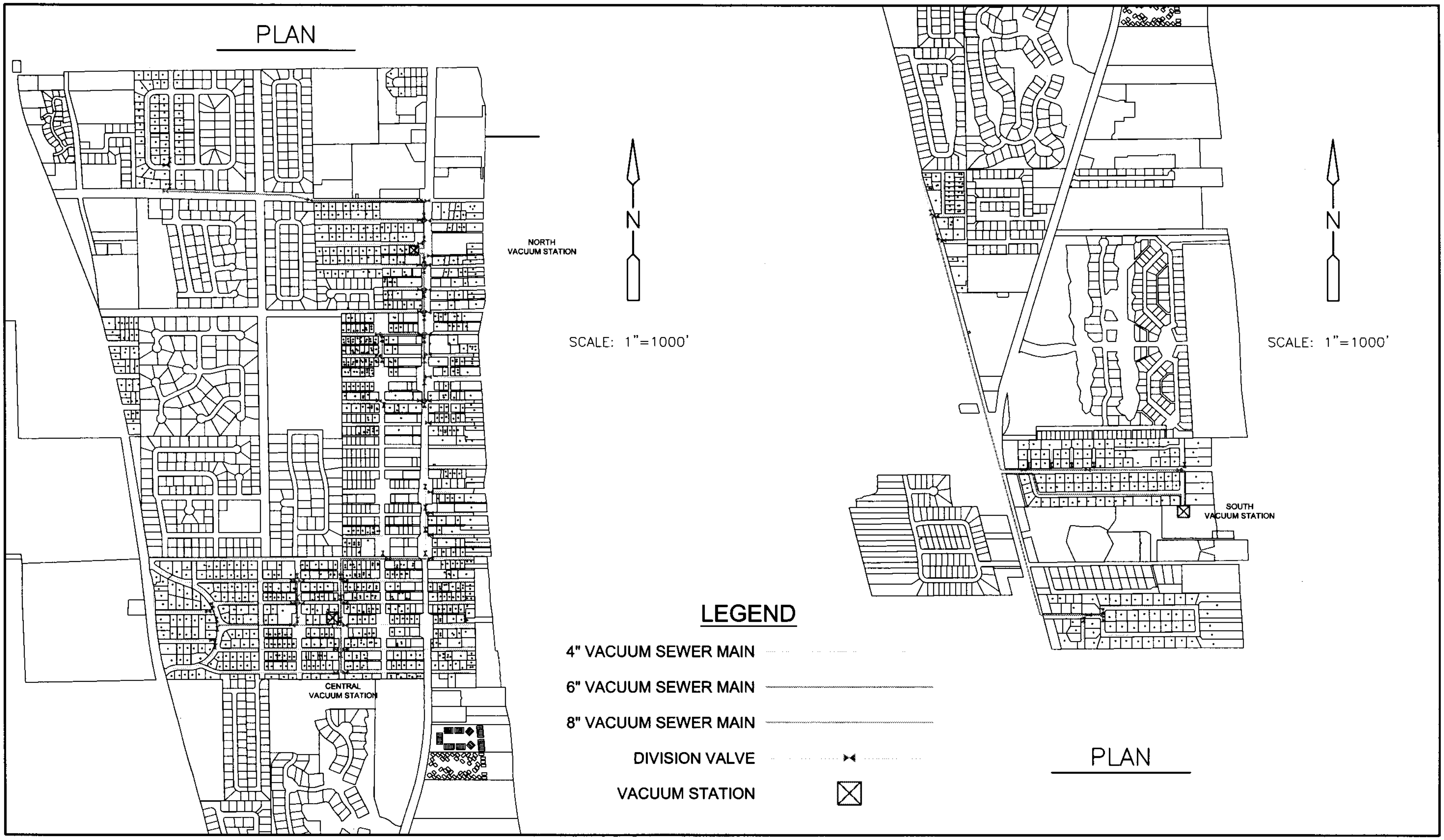

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Figure No. 4-1
VACUUM LAYOUT FOR ST. AUGUSTINE BEACH

Service Laterals and Valve Pits

The wastewater flows from individual dwellings via conventional gravity sewer service laterals to the valve pits, designed to temporarily store and discharge wastewater into the vacuum piping. A pressure valve located in the valve pit responds to an increase in hydrostatic pressure caused by the build-up of wastewater in the valve pit sump, therefore opening the valve and subjecting the wastewater to the pressure differential created by the vacuum station.

An average of one vacuum valve pit per two lots was assumed. This results in an estimate of 502 valve pits needed to serve approximately 1,003 homes that will be connected to the vacuum system. Individual valve pits are not shown on Figure 4-1, since their locations need to be coordinated with individual homeowners during the final design. Collection chambers are typically located along common property lines and near rights-of-way.

Pipeline

Mains will be composed of PVC piping and range in size from 4 inches to 8 inches. Vacuum main sizes are based on the number of homes they serve and the distance of the homes to the vacuum station. Vacuum mains will be installed at shallow depths and will follow the existing topography of the area.

Vacuum and Pumping Station

The main vacuum and pumping station contains two main components:

- Vacuum pumps, which maintain vacuum pressure in the collection mains, and collection tank to collect the wastewater from the service area; and
- Wastewater pumps, which pump the wastewater collected from the vacuum station to an existing wastewater transmission main for delivery to the Anastasia Island (AI) Wastewater Treatment Plant.

The preliminary design calculations have shown that three vacuum and pumping stations are needed for the North, Central, and South areas. The vacuum and pumping stations have been located to minimize the lengths of the vacuum mains extending from them. The North vacuum and pumping station will be located at 901 Pope Road, on a parcel already owned by the St. Johns County Utility Department. The Central Vacuum Station will be located in the rights-of-way near the corner of A1A Beach Blvd and 14th Street. The South Vacuum Station will be located in the right-of-way on Oceanside Drive in the Versaggi Subdivision. The North vacuum and pumping station will contain two vacuum pumps (300 cfm each) and two sewage pumps (260 gpm each). The Central vacuum and pumping station will contain two vacuum pumps (300 cfm each) and two sewage pumps (320 gpm each). The South vacuum and pumping station will contain two vacuum pumps (300 cfm each) and two sewage pumps (130 gpm each).

4.2.2.2 Vacuum System Advantages and Disadvantages

Table 4-1 presents the advantages and disadvantages of the vacuum system.

Table 4-1 Advantages and Disadvantages of the Vacuum System

Advantages	
Vacuum and Pumping Station	Only three vacuum and pumping stations are required.
Pipeline	Small pipe diameters are sufficient
	High wastewater transport velocities nearly eliminate the risk of blockages in vacuum mains
Closed system	Infiltration from the collection system is minimized therefore the operating and pumping costs at the wastewater treatment plant are reduced
Safety	They are no manholes or wetwells to be entered by the operation and maintenance personnel
Maintenance	They are no mechanical components to a gravity connection (from dwellings to the collection chambers) therefore no routine maintenance cost are associated with it
System Integrity	The integrity of the system (from collection chambers to the vacuum station) can be monitored by the operators from a control panel located at the vacuum station
Costs	Vacuum mains can be installed in shallow trenches reducing construction costs
	No power is required in the collection chambers, power is only required at the vacuum station, therefore reducing the power cost.
Disadvantages	
Personnel Training	Operators and maintenance personnel will have to be trained to maintain and fix problems for a new technology.
Maintenance Calls	Operators will be required to respond to low vacuum alarms in a timely fashion.
Spare Parts Inventory	SJC will need to purchase and maintain a spare parts inventory for the vacuum system

4.2.2.3 Construction Cost Evaluation

The costs associated with the construction of the three vacuum sewer stations are presented in **Table 4-2**.

Table 4-2 Vacuum Station Costs

North Vacuum Station (376 EDUs)	Cost
Equipment Cost (Two Vacuum Pumps (300 cfm), Two Sewage Pumps (260 gpm), One Collection Tank (2,000 gal))	$132,600
Equipment Installation	$30,000
Station Building	$75,000
Building Landscape	$10,000
Station, Wiring, Piping, Etc (includes Telemetry)	$15,000
Odor Control	$15,000
Motor-Generator Set	$20,000
Total North Vacuum Station	**$297,600**

Central Vacuum Station Cost (446 EDUs)	Cost
Equipment Cost (Two Vacuum Pumps (300 cfm), Two Sewage Pumps (320 gpm), One Collection Tank (2,500 gal))	$132,600
Equipment Installation	$30,000
Station Building	$75,000
Building Landscape	$10,000
Station, Wiring, Piping, Etc (includes Telemetry)	$15,000
Odor Control	$15,000
Motor-Generator Set	$20,000
Total Central Vacuum Station	**$297,600**

South Vacuum Station Cost (181 EDUs)	Cost
Equipment Cost (Two Vacuum Pumps (300 cfm), Two Sewage Pumps (130 gpm), One Collection Tank (1,000 gal))	$126,600
Equipment Installation	$29,000
Station Building	$75,000
Building Landscape	$10,000
Station, Wiring, Piping, Etc (includes Telemetry)	$15,000
Odor Control	$15,000
Motor-Generator Set	$20,000
Total South Vacuum Station	**$290,600**

(a) The schedule and costs identified in this table are subject to change based upon completion of the preliminary design report.

The costs associated with the complete construction, operation and maintenance of the vacuum system for each of the seven subdivisions are presented in **Tables 4-3** through **4-9**. Piping quantities were taken from the plan layouts and the quantity of collection chambers was based on the assumption of a 2:1 ratio of homes per collection chamber. Additionally, the vacuum station was designed to handle the flow from the 1,003 homes, which corresponds to an estimated average daily wastewater flow of 351,050 gpd and a peak flow of 615 gpm.

Each of the seven cost tables are broken down into four major components for the vacuum sewer system: Major Vacuum System Equipment, Vacuum Station, Collection/Transmission System, and Miscellaneous Other. The Major Vacuum System Equipment includes the valve pit packages for this area, spare parts, special tools, six inch laterals, and a portable vacuum pump for testing. The valve pit package and lateral pricing are based on a unit price per valve pit or lateral. The spare parts cost is a percent of the total valve pit package cost. One set of special tools and one portable vacuum pump for testing will be needed. However, these tools and pump can be shared among all of the areas in the County. Therefore, a cost per customer is assumed and the cost is attributed accordingly.

The three vacuum stations and their associated costs are presented in Table 4-3. The North Vacuum Station serves three subdivisions: Woodland, Coquina North, and Coquina South. The Central Vacuum Station serves one subdivision: Coquina West. The South Vacuum Station serves three subdivisions: Lisbon-Sevilla, Versaggi, and Sandpiper. The costs for each vacuum station are shared between each area and are weighted based on the number of EDUs in each subdivision.

The Collection/Transmission System cost component includes the vacuum main piping associated with transporting the flows to the vacuum station. These costs include PVC piping, division valves, and the force main piping. Since one vacuum station can serve multiple subdivisions, costs were shared for piping that was used for duplicate areas. The piping unit costs include installation, pavement repair, and dewatering.

The Miscellaneous Other cost component includes Maintenance of Traffic (MOT), Land Acquisition, Directional Drill, Driveway Repair, Vacuum System Training, and Field Survey/As Built. The MOT component is based on a $300/day cost for traffic control and assumes a rate of 200 linear feet of pipe installed per day. The three proposed vacuum stations are located within the rights-of-way and no land will need to be purchased. For two roads, AIA and AIA Beach Blvd, open cuts will not be permitted and directional drill is assumed for these areas. Driveway repairs are assumed on one third of all residents (half are assumed to be decorative and half are assumed to be concrete). Vacuum System Training is required for operators and its cost ($25 per EDU) is attributed on a cost per resident connection. The Vacuum System Training cost also includes six weeks of part time field services during construction.

Table 4-3 Cost Evaluation for Vacuum Sewer System in Woodland Subdivision

Items	Quantity	Unit	Unit Cost	Total
Major Vacuum System Equipment				
Valve Pit Package (includes 3" valve, Valve Pits, Sump)	27	ea	$3,200	$86,400
Spare Parts (3% of Valve Pit Package)			$2,592	$2,592
1 Set Special Tools ($3/EDU)	53	EDU	$3	$159
Portable Vacuum Pump for Testing ($16/EDU))	53	EDU	$16	$848
Laterals (6")	53	ea	$270	$14,310
Subtotal				$104,309
North Vacuum Station				
14% of the Cost of North Vacuum Station				$41,664
Collection/Transmission System (including Pavement Repair and Dewatering)				
Crossover Connections (20' @ $20/foot)	27	ea	$400	$10,800
4" PVC SDR 21 Vacuum main	2533	lf	$41	$103,853
6" PVC SDR 21 Vacuum main	3060	lf	$43	$131,580
8" PVC SDR 21 Vacuum main (50% of the cost - shared with Area 2)	564	lf	$46	$12,972
4" Division Valve	3	ea	$800	$2,400
6" Division Valve	3	ea	$1,000	$3,000
8" Division Valve - (50% of the cost - shared with Area 2)	2	ea	$1,250	$1,250
6" PVC SDR 18 Force Main (14% of the cost)	410	lf	$30	$1,722
Subtotal				$267,577
Subtotal				$413,550
Miscellaneous Other				
MOT	33	days	$300	$9,900
Land Acquisition	N/A	N/A	N/A	$0
Directional Drill	N/A	N/A	N/A	$0
Driveway Repair (Decorative Paver) (assumed 17% of the driveways)	90	sy	$70	$6,300
Driveway Repair (Concrete) (assumed 17% of the driveways)	90	sy	$28	$2,520
Vacuum System Training ($25/EDU)	53	EDU	$25	$1,325
Field Survey/As Builts (14% of the Cost)	1	ls	$25,000	$3,500
Subtotal				$23,545
Subtotal				$437,095
General Conditions (10%)				$43,710
Contractor Overhead and Profit (15%)				$65,564
Subtotal				$546,369
Contingency (25%)				$136,592
Subtotal				$682,961
Non Construction Cost @ 15%				$102,444
Total Project Cost				**$785,405**

Table 4-4 Cost Evaluation for Vacuum Sewer System in Coquina North Subdivision

Items	Quantity	Unit	Unit Cost	Total
Major Vacuum System Equipment				
Valve Pit Package (includes 3" valve, Valve Pits, Sump)	64	ea	$3,200	$204,800
Spare Parts (3% of the Valve Pit Package)				$6,144
1 Set Special Tools ($3/EDU)	127	EDU	$3	$381
Portable Vacuum Pump for Testing ($16/EDU))	127	EDU	$16	$2,032
Laterals (6")	127	ea	$270	$34,290
Subtotal				$247,647
34% of North Vacuum Station				
Subtotal				$101,184
Collection/Transmission System (including Pavement Repair and Dewatering)				
Crossover Connections (20' @ $20/foot)	64	ea	$400	$25,600
4" PVC SDR 21 Vacuum main	6248	lf	$41	$256,168
8" PVC SDR 21 Vacuum main (50% of the cost - shared with Area 1)	564	lf	$46	$12,972
8" PVC SDR 21 Vacuum main -50% of the cost (shared with Area 3)	449	lf	$46	$10,327
4" Division Valve	9	ea	$800	$7,200
8" Division Valve - (50% of the cost - shared with Area 1)	2	ea	$1,250	$1,250
8" Division Valve - 50% of the cost(shared with Area 3)	2	ea	$1,250	$1,250
6" PVC SDR 18 Force Main (34% of the cost)	410	lf	$30	$4,182
Subtotal				$318,949
Subtotal				$667,780
Miscellaneous Other				
MOT	38	days	$300	$11,400
Land Acquisition	1	ls	-	$0
Directional Drill	1100	lf	$65	$71,500
Driveway Repair (Decorative Paver) (assumed 17% of the driveways)	220	sy	$70	$15,400
Driveway Repair (Concrete) (assumed 17% of the driveways)	220	sy	$28	$6,160
Vacuum System Training ($25/EDU)	127	EDU	$25	$3,175
Field Survey/As Builts (34% of the Cost)	1	ls	$25,000	$8,500
Subtotal				$116,135
Subtotal				$783,915
General Conditions (10%)				$78,392
Contractor Overhead and Profit (15%)				$117,587
Subtotal				$979,894
Contingency (25%)				$244,973
Project Construction Cost				**$1,224,867**
Non Construction Cost @ 15%				$183,730
Total Project Cost				**$1,408,597**

Table 4-5 Cost Evaluation for Vacuum Sewer System in Coquina South Subdivision

Items	Quantity	Unit	Unit Cost	Total
Major Vacuum System Equipment				
Valve Pit Package (includes 3" valve, Valve Pits, Sump)	100	ea	$3,200	$320,000
Spare Parts (3% of Valve Pit Package)				$9,600
1 Set Special Tools ($3/EDU)	199	EDU	$3	$597
Portable Vacuum Pump for Testing ($16/EDU))	199	EDU	$16	$3,184
Laterals (6")	199	ea	$270	$53,730
Subtotal				$387,111
52% of North Vacuum Station				
Subtotal				$154,752
Collection/Transmission System (including Pavement Repair and Dewatering)				
Crossover Connections (20' @ $20/foot)	100	ea	$400	$40,000
4" PVC SDR 21 Vacuum main	8742	lf	$41	$358,422
6" PVC SDR 21 Vacuum main	1408	lf	$43	$60,544
8" PVC SDR 21 Vacuum main -50% of the cost (shared with Area 2)	449	lf	$46	$10,327
8" PVC SDR 21 Vacuum main	481	lf	$46	$22,126
4" Division Valve	16	ea	$800	$12,800
6" Division Valve	5	ea	$1,000	$5,000
8" Division Valve - 50% of the cost(shared with Area 2)	2	ea	$1,250	$1,250
8" Division Valve	2	ea	$1,250	$2,500
6" PVC SDR 18 Force Main (52% of the cost)	410	lf	$30	$6,396
Subtotal				$519,365
Subtotal				$1,061,228
Miscellaneous Other				
MOT	57	days	$300	$17,100
Land Acquisition	1	ls	-	$0
Directional Drill	1600	lf	$65	$104,000
Driveway Repair (Decorative Paver) (assumed 17% of the driveways)	340	sy	$70	$23,800
Driveway Repair (Concrete) (assumed 17% of the driveways)	340	sy	$28	$9,520
Vacuum System Training ($25/EDU)	199	EDU	$25	$4,975
Field Survey/As Builts (53% of the Cost)	1	ls	$25,000	$13,250
Subtotal				$172,645
Subtotal				$1,233,873
General Conditions (10%)				$123,387
Contractor Overhead and Profit (15%)				$185,081
Subtotal				$1,542,341
Contingency (25%)				$385,585
Project Construction Cost				**$1,927,926**
Non Construction Cost @ 15%				$289,189
Total Project Cost				**$2,217,115**

Table 4-6 Cost Evaluation for Vacuum Sewer System in Coquina West Subdivision

Major Vacuum System Equipment				
Valve Pit Package (includes 3" valve, Valve Pits, Sump)	222	ea	$3,200	$710,400
Spare Parts (3% of Valve Pit Package)				$21,312
1 Set Special Tools ($3/EDU)	443	EDU	$3	$1,329
Portable Vacuum Pump for Testing ($16/EDU))	443	EDU	$16	$7,088
Laterals (6")	443	ea	$270	$119,610
Subtotal				$859,739
100% of Central Vacuum Station				
Subtotal				$297,600
Collection/Transmission System (including Pavement Repair and Dewatering)				
Crossover Connections (20' @ $20/foot)	222	ea	$400	$88,800
4" PVC SDR 21 Vacuum main	19967	lf	$41	$818,647
6" PVC SDR 21 Vacuum main	3603	lf	$43	$154,929
8" PVC SDR 21 Vacuum main	348	lf	$46	$16,008
4" Division Valve	27	ea	$800	$21,600
6" Division Valve	8	ea	$1,000	$8,000
6" PVC SDR18 Force Main	580	lf	$30	$17,400
Subtotal				$1,125,384
Subtotal				$2,282,723
Miscellaneous Other				
MOT	121	days	$300	$36,300
Land Acquisition	1	ls	-	$0
Directional Drill	1050	lf	$65	$68,250
Driveway Repair (Decorative Paver) (assumed 17% of the driveways)	750	sy	$70	$52,500
Driveway Repair (Concrete) (assumed 17% of the driveways)	750	sy	$28	$21,000
Vacuum System Training ($25/EDU)	443	EDU	$25	$11,075
Field Survey/As Builts	1	ls	$25,000	$25,000
Subtotal				$214,125
Subtotal				$2,496,848
General Conditions (10%)				$249,685
Contractor Overhead and Profit (15%)				$374,527
Subtotal				$3,121,060
Contingency (25%)				$780,265
Project Construction Cost				**$3,901,325**
Non Construction Cost @ 15%				$585,199
Total Project Cost				**$4,486,524**

Table 4-7 Cost Evaluation for Vacuum Sewer System in Lisbon Sevilla Subdivision

Items	Quantity	Unit	Unit Cost	Total
Major Vacuum System Equipment				
Valve Pit Package (includes 3" valve, Valve Pits, Sump)	21	ea	$3,200	$67,200
Spare Parts (3% of Valve Pit Package)				$2,016
1 Set Special Tools ($3/EDU)	41	EDU	$3	$123
Portable Vacuum Pump for Testing ($16/EDU))	41	EDU	$16	$656
Laterals (6")	41	ea	$270	$11,070
Subtotal				$81,065
23% of South Vacuum Station				
Subtotal				$66,838
Collection/Transmission System (including Pavement Repair and Dewatering)				
Crossover Connections (20' @ $20/foot)	21	ea	$400	$8,400
4" PVC SDR 21 Vacuum main	1851	lf	$41	$75,891
6" PVC SDR 21 Vacuum main	2857	lf	$43	$122,851
6" PVC SDR 21 Vacuum main -50% of the cost (shared with Area 6)	2380	lf	$43	$51,170
4" Division Valve	3	ea	$800	$2,400
6" Division Valve	1	ea	$1,000	$1,000
6" Division Valve- 50% of the cost (shared with Area 6)	3	ea	$1,000	$1,500
4" PVC SDR 18 Force Main (23% of the cost)	2400	lf	$25	$13,800
Subtotal				$277,012
Subtotal				$424,915
Miscellaneous Other				
MOT	47	days	$300	$14,100
Land Acquisition	1	ls	-	$0
Directional Drill	3250	lf	$65	$211,250
Driveway Repair (Decorative Paver) (assumed 17% of the driveways)	70	sy	$70	$4,900
Driveway Repair (Concrete) (assumed 17% of the driveways)	70	sy	$28	$1,960
Vacuum System Training ($25/EDU)	41	EDU	$25	$1,025
Field Survey/As Builts (23% of Cost)	1	ls	$25,000	$5,750
Subtotal				$238,985
Subtotal				$663,900
General Conditions (10%)				$66,390
Contractor Overhead and Profit (15%)				$99,585
Subtotal				$829,875
Contingency (25%)				$207,469
Project Construction Cost				**$1,037,344**
Non Construction Cost @ 15%				$155,602
Total Project Cost				**$1,192,945**

Table 4-8 Cost Evaluation for Vacuum Sewer System in Versaggi Subdivision

	Quantity	Unit	Unit Cost	Total
Major Vacuum System Equipment				
Valve Pit Package (includes 3" valve, Valve Pits, Sump)	48	ea	$3,200	$153,600
Spare Parts (3% of Valve Pit Package)				$4,608
1 Set Special Tools ($3/EDU)	96	EDU	$3	$288
Portable Vacuum Pump for Testing ($16/EDU))	96	EDU	$16	$1,536
Laterals (6")	96	ea	$270	$25,920
Subtotal				$185,952
53% of South Vacuum Station				
Subtotal				$154,018
Collection/Transmission System (including Pavement Repair and Dewatering)				
Crossover Connections (20' @ $20/foot)	48	ea	$400	$19,200
4" PVC SDR 21 Vacuum main	1718	lf	$41	$70,438
6" PVC SDR 21 Vacuum main -50% of the cost (shared with Area 5)	2380	lf	$43	$51,170
6" PVC SDR 21 Vacuum main -50% of the cost (shared with Area 7)	2270	lf	$43	$48,805
4" Division Valve	5	ea	$800	$4,000
6" Division Valve- 50% of the cost (shared with Area 5)	3	ea	$1,000	$1,500
4" PVC SDR 18 Force Main (53% of the cost)	2400	lf	$25	$31,800
Subtotal				$226,913
Subtotal				$566,883
Miscellaneous Other				
MOT	44	days	$300	$13,200
Land Acquisition	1	ls	-	$0
Directional Drill	0	lf	$65	$0
Driveway Repair (Decorative Paver) (assumed 17% of the driveways)	160	sy	$70	$11,200
Driveway Repair (Concrete) (assumed 17% of the driveways)	160	sy	$28	$4,480
Vacuum System Training ($25/EDU)	96	EDU	$25	$2,400
Field Survey/As Builts (53% of Cost)	1	ls	$25,000	$13,250
Subtotal				$44,530
Subtotal				$611,413
General Conditions (10%)				$61,141
Contractor Overhead and Profit (15%)				$91,712
Subtotal				$764,266
Contingency (25%)				$191,067
Project Construction Cost				**$955,333**
Non Construction Cost @ 15%				$143,300
Total Project Cost				**$1,098,633**

Table 4-9 Cost Evaluation for Vacuum Sewer System in Sandpiper Subdivision

Items	Quantity	Unit	Unit Cost	Total
Major Vacuum System Equipment				
Valve Pit Package (includes 3" valve, Valve Pits, Sump)	22	ea	$3,200	$70,400
Spare Parts (3% of Valve Pit Package)				$2,112
1 Set Special Tools ($3/EDU)	44	EDU	$3	$132
Portable Vacuum Pump for Testing ($16/EDU))	44	EDU	$16	$704
Laterals (6")	44	ea	$270	$11,880
Subtotal				$85,228
Vacuum Station				
Subtotal				$69,744
Collection/Transmission System (including Pavement Repair and Dewatering)				
Crossover Connections (20' @ $20/foot)	22	ea	$400	$8,800
4" PVC SDR 21 Vacuum main	2648	lf	$41	$108,568
6" PVC SDR 21 Vacuum main	2268	lf	$43	$97,524
6" PVC SDR 21 Vacuum main -50% of the cost (shared with Area 6)	2270	lf	$43	$48,805
4" Division Valve	3	ea	$800	$2,400
6" Division Valve	1	ea	$1,000	$1,000
4" PVC SDR 35 Force Main (24% of the cost)	2400	lf	$25	$14,400
Subtotal				$281,497
Subtotal				$436,469
Miscellaneous Other				
MOT	48	days	$300	$14,400
Land Acquisition	1	ls	$0	$0
Directional Drill	1625	lf	$65	$105,625
Driveway Repair (Decorative Paver) (assumed 17% of the driveways)	80	sy	$70	$5,600
Driveway Repair (Concrete) (assumed 17% of the driveways)	80	sy	$28	$2,240
Vacuum System Training ($25/EDU)	44	EDU	$25	$1,100
Field Survey/As Builts (24% of Cost)	1	ls	$25,000	$6,000
Subtotal				$134,965
Subtotal				$571,434
General Conditions (10%)				$57,143
Contractor Overhead and Profit (15%)				$85,715
Subtotal				$714,293
Contingency (25%)				$178,573
Project Construction Cost				**$892,866**
Non Construction Cost @ 15%				$133,930
Total Project Cost				**$1,026,795**

4.2.2.4 Operation and Maintenance Cost Evaluation

The costs associated with the operation and maintenance of the vacuum system is presented in **Table 4-10**. The costs were based on AIRVAC vacuum system cost information, using the mid-range of values given. The annual salary and benefit for labor was estimated to be $27,000. Annual costs for the operation and maintenance of the vacuum system were estimated to be approximately $52,000. Pump replacement was not included in the operation and maintenance costs, but was treated in the following sections as a component of the present worth evaluation.

Table 4-10 Vacuum Sewer System – Operation and Maintenance Costs per Year

Items		Estimated Units	Unit Cost	Useful Life	Total
Labor	Vacuum Station - Hours	900	$13.00	-	$11,700
	Collection Chambers - Hours	262	$13.00	-	$3,406
	Piping -Hours	180	$13.00	-	$2,340
	Valves -Hours	893	$13.00	-	$11,609
					$29,055
Power	Power - Flat Rate		$150/month	-	$1,800
	Power - Consumption	1003	$1.75/mo/EDU	-	$21,063
					$22,863
Total Operation & Maintenance Costs[1]					**$51,918**

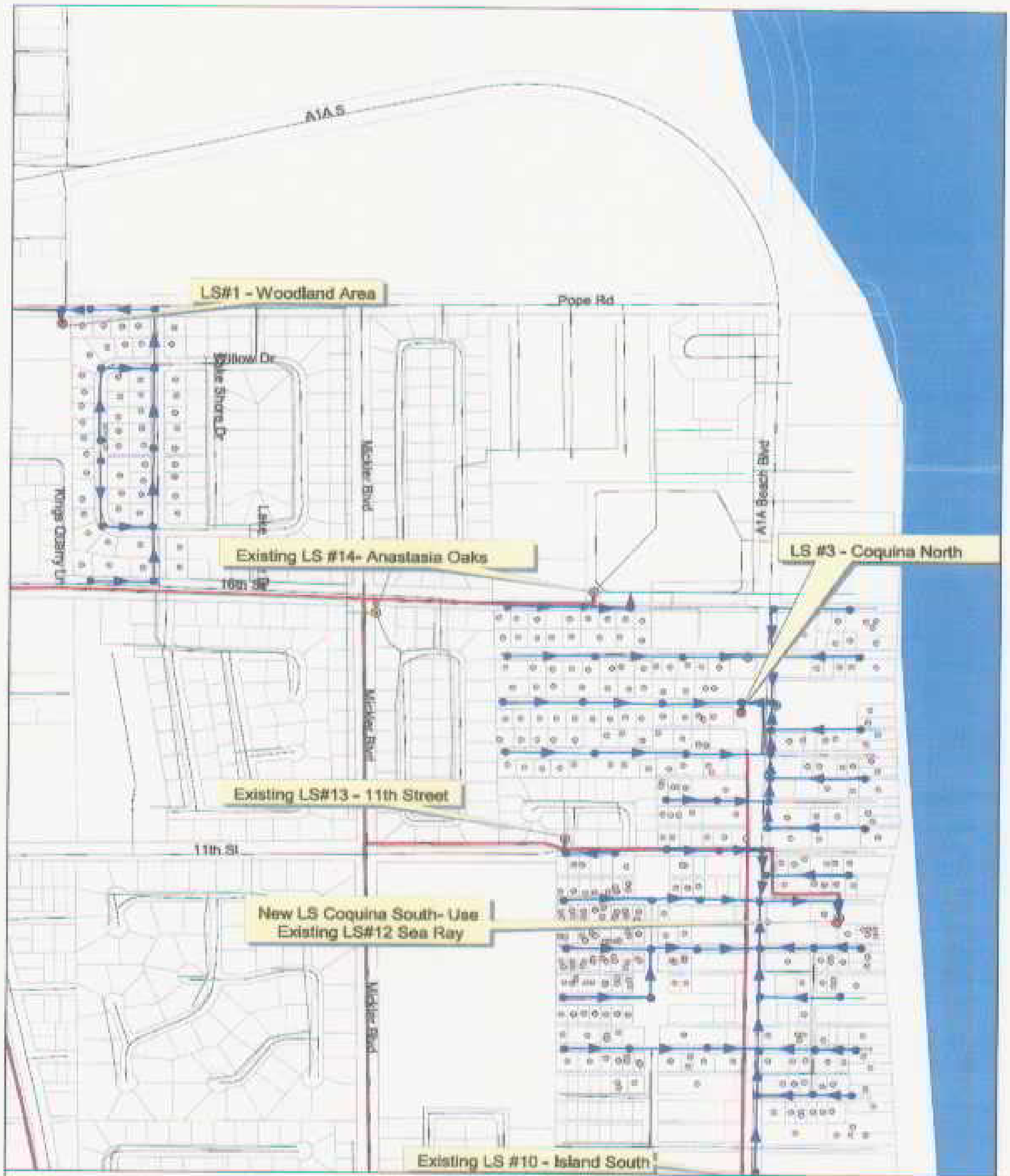
1 Cost based on AIRVAC estimate.

4.2.3 Gravity Collection System

4.2.3.1 Gravity Collection System Description

This alternative consists of connecting the 1,003 homes currently on septic tanks to the existing gravity collection system. Wastewater would flow by gravity from the property to the gravity sewer in the street. These street sewers would collect flow from side streets and abutting buildings and ultimately discharge to several lift stations located at the lowest points of the study area. Wastewater would then flow from the lift stations to the AI WWTP through force mains.

The unsewered areas in St. Augustine Beach were divided into seven different areas and/or subdivisions: Woodland, Coquina North, Coquina South, Coquina West, Lisbon-Sevilla, Versaggi, and Sandpiper. Each of the seven subdivisions is served by a new lift station with the exception of Coquina South, which will be a rehabilitation/expansion of the existing Sea Ray lift station and three other existing lift stations that will be utilized. The Island South lift station will be utilized for five additional customers, the 11th Street lift station will be utilized for three additional customers, and the Anastasia Oaks lift station will be utilized for eight additional customers. The proposed gravity sewer system layout is shown on **Figures 4-2, 4-3, and 4-4.** An expanded view of the proposed gravity sewer system layout is also



LEGEND

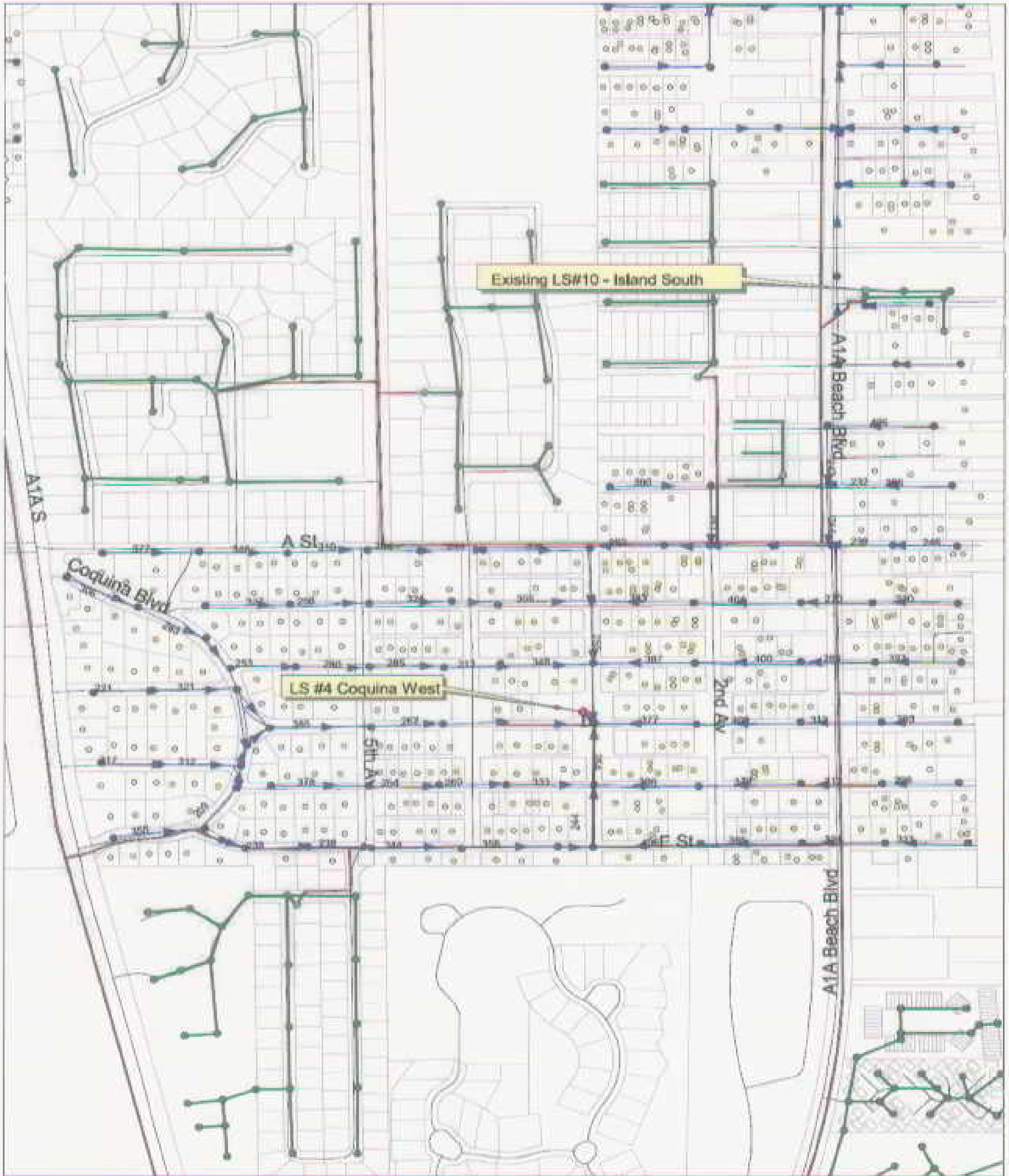
- Roads
- New Force Mains
- New 8" Gravity Sewer Lines
- New Manholes
- New Lift Stations
- Existing Lift Stations
  - Private
  - SJC
- Potential Sewer Customers
- Existing Forcemains
- Existing Gravity Mains
- Parcels

N

400 0 400 800 Feet

Exhibit 1
Drawing 1 of 3
Gravity Layout in Northern St. Augustine Beach
City of St. Augustine Beach, Florida

CDM



LEGEND

- Roads
- New Force Mains
- New 8" Gravity Sewer Lines
- New Manholes
- New Lift Stations
- Existing Lift Stations
  - Private
  - SJC
- Potential Sewer Customers
- Existing Forcemains
- Existing Gravity Mains
- Parcels

N

300 0 300 600 Feet

Exhibit 1
Drawing 2 of 3
Gravity Layout in Central St. Augustine Beach
City of St. Augustine Beach, Florida

CDM

LEGEND

- Roads
- New Force Mains
- New 8" Gravity Sewer Lines
- New Manholes
- New Lift Stations
- Existing Lift Stations
  - Private
  - SJC
- Potential Sewer Customers
- Existing Forcemains
- Existing Gravity Mains
- Parcels

N

400 0 400 800 Feet

Exhibit 1
Drawing 3 of 3
Gravity Layout in Southern St. Augustine Beach
City of St. Augustine Beach, Florida

CDM

provided in **Appendix C**. The location for the lift stations and force mains, shown on Figures 4-2 to 4-4, are preliminary and may require adjustment during final design. The following assumptions were made to design the gravity sewer system:

- A 0.4 percent slope for 8-inch lines;
- Force mains were designed to have a velocity ranging between 2.5 ft/s and 6 ft/s.

4.2.3.2 Gravity System Advantages and Disadvantages

Table 4-11 presents the advantages and disadvantages of the gravity system.

Table 4-11 Advantages and Disadvantages of the Gravity System

Advantages	
Familiarity	The existing sewer system in the St. Augustine Beach area is a gravity system; therefore, the St. Johns County staff is familiar with the operation and maintenance of a gravity sewer system.
Maintenance	There are no mechanical components to a gravity connection and therefore no routine maintenance associated with it.
Disadvantages	
Infiltration	Based on the depth of sewers, the high groundwater table and the number of manholes, the groundwater infiltration in the collection system is high, therefore it will increase the operational cost at the wastewater plant.
Land	The eight proposed lift stations will require the acquisition of four parcels of land, which will increase the cost of the project.
Most Disruptive	As the sewer lines are installed in deep trenches, traffic impact and disturbance to existing pavement will occur.
Impact to Wells	The groundwater level will need to be lowered to install the sewer lines, this operation will lower the groundwater level at surrounding shallow drinking water wells.

4.2.3.3 Construction Cost Evaluation

The costs associated with the construction, operation and maintenance of the gravity sewer system in each area/subdivision are presented in **Tables 4-12 through 4-19**. Each subdivision has is own lift station. Six of the areas will be utilizing new lift stations and one area will be replacing an existing lift station to handle the additional flow capacity. Sixteen households will be served by the existing lift stations that are presented in Table 4-19. There will be no changes at these three lift stations that are planned to accommodate the additional flows. The cost estimate assumed that the entire roadway would need to be replaced after the installation of the sewer lines. Additionally, the cost estimate includes the replacement of unsuitable soils when needed.

Each of the seven cost tables are broken down into three major components for the vacuum sewer system: Pump Station, Collection/Transmission System, and

Miscellaneous Other. Table 4-19 assumes that three of the existing lift stations can be utilized to handle flows from 16 additional households. The Pump Station cost includes the submersible pumps, wetwell, building, and other cost associated with the pump station. The landscaping done around the lift station building is also included in the pump station cost.

The Collection/Transmission System cost component includes the 8-inch PVC gravity piping, laterals, manholes, and force main piping. The piping unit costs include installation, pavement repair, and dewatering.

The Miscellaneous Other cost component includes MOT, Land Acquisition, Directional Drill, Driveway Repair, and Field Survey/As Built. The MOT component is based on a $300/day cost for traffic control and assumes a rate of 200 linear feet of pipe installed per day. For locating the potential lift station sites, preference was given to rights-of-way land or land that was owned by the City or the County. However, there were a few lift stations that are located on private land. For those parcels, the cost of the parcel from the SJC's Property Appraiser website was used. For two roads, AIA and AIA Beach Blvd, open cuts will not be allowed and directional drill is assumed for these areas. Driveway repairs are assumed on one third of all residents (half are assumed to be decorative and half are assumed to be concrete).

Table 4-12 Cost Evaluation for Gravity Sewer System in Woodland Area

Items	Quantity	Unit	Unit Cost	Total
Pump Station				
Lift Station 1 (Peak Flow Capacity = 53,000 gpd, Pipe invert Elevation = -6.08 feet, Rim Elevation = 8 feet)	1	ls	$50,000	$50,000
Building Landscape	1	ls	$8,000	$8,000
Subtotal				$58,000
Collection/Transmission System (including Pavement Repair and Dewatering)				
8" Gravity Sewer (4 feet)	576	lf	$64	$36,864
8" Gravity Sewer (5-7 feet)	1521	lf	$76	$115,596
8" Gravity Sewer (8-10 feet)	226	lf	$85	$19,210
8" Gravity Sewer (11-14 feet)	756	lf	$108	$81,648
8" Gravity Sewer (greater than 15 feet)	189	lf	$141	$26,649
6" Laterals	53	ea	$655	$34,715
4" SDR 18 Force Main	812	lf	$25	$20,300
Manholes (4 feet)	3	ea	$4,258	$12,774
Manholes (5-7 feet)	3	ea	$4,258	$12,774
Manholes (8-10 feet)	1	ea	$5,046	$5,046
Manholes (11-14 feet)	2	ea	$7,068	$14,136
Manholes (greater than 15 feet)	2	ea	$10,015	$20,030
Subtotal				$399,742
Subtotal				$457,742
Miscellaneous Other				
MOT	20	days	$300	$6,000
Land Acquisition		N/A		$0
Directional Drill		N/A		$0
Driveway Repair (Decorative Paver) (assumed 17% of the driveways)	90	sy	$70	$6,300
Driveway Repair (Concrete) (assumed 17% of the driveways)	90	sy	$28	$2,520
Field Survey/As Builts	1	ls	$5,000	$5,000
Subtotal				$19,820
Subtotal				$477,562
General Conditions (10%)				$47,756
Contractor Overhead and Profit (15%)				$71,634
Subtotal				$596,953
Contingency (25%)				$149,238
Project Construction Cost				**$746,191**
Non Construction Cost @ 15%				$111,929
Total Project Cost				**$858,119**

Table 4-13 Cost Evaluation for Gravity Sewer System in Coquina North Area

Items	Quantity	Unit	Unit Cost	Total
Pump Station				
Lift Station 3 (Peak Flow Capacity = 119,000 gpd, Pipe invert Elevation = -4.27 feet, Rim Elevation = 6 feet)	1	ls	$120,000	$120,000
Building Landscape	1	ls	$8,000	$8,000
Subtotal				$128,000
Collection/Transmission System (including Pavement Repair and Dewatering of a 5' trench area)				
8" Gravity Sewer (4 feet)	3869	lf	$64	$247,616
8" Gravity Sewer (5-7 feet)	2465	lf	$76	$187,340
8" Gravity Sewer (8-10 feet)	854	lf	$85	$72,590
8" Gravity Sewer (11-14 feet)	3	lf	$108	$324
8" Gravity Sewer (greater than 15 feet)	0	lf	$141	$0
6" Laterals	119	ea	$655	$77,945
6" SDR 18 Force Main	410	lf	$30	$12,300
Manholes (4 feet)	12	ea	$4,258	$51,096
Manholes (5-7 feet)	8	ea	$4,258	$34,064
Manholes (8-10 feet)	4	ea	$5,046	$20,184
Manholes (11-14 feet)	1	ea	$7,068	$7,068
Manholes (greater than 15 feet)	0	ea	$10,015	$0
Subtotal				$710,527
Subtotal				$838,527
Miscellaneous Other				
MOT	38	day	$300	$11,400
Land Acquisition	1	ls	$0	$0
Directional Drill	1100	lf	$65	$71,500
Driveway Repair (Decorative Paver) (assumed 17% of the driveways)	220	sy	$70	$15,400
Driveway Repair (Concrete) (assumed 17% of the driveways)	220	sy	$28	$6,160
Field Survey/As Builts	1	ls	$10,500	$10,500
Subtotal				$114,960
Subtotal				$953,487
General Conditions (10%)				$95,349
Contractor Overhead and Profit (15%)				$143,023
Subtotal				$1,191,859
Contingency (25%)				$297,965
Project Construction Cost				**$1,489,823**
Non Construction Cost @ 15%				$223,474
Total Project Cost				**$1,713,297**

Table 4-14 Cost Evaluation for Gravity Sewer System in Coquina South Area

Items	Quantity	Unit	Unit Cost	Total
Pump Station				
Expand Lift Station 12 -Sea Ray (Peak Flow Capacity = 191,000 gpd, Pipe invert Elevation = -5.76 feet, Rim Elevation = 9.5 feet)	1	ls	$150,000	$150,000
Building Landscape	1	ls	$8,000	$8,000
Subtotal				$158,000
Collection/Transmission System (including Pavement Repair and Dewatering of a 5' trench area)				
8" Gravity Sewer (4 feet)	3788	lf	$64	$242,432
8" Gravity Sewer (5-7 feet)	2915	lf	$76	$221,540
8" Gravity Sewer (8-10 feet)	1151	lf	$85	$97,835
8" Gravity Sewer (11-14 feet)	628	lf	$108	$67,824
8" Gravity Sewer (greater than 15 feet)	12	lf	$141	$1,692
6" Laterals	191	ea	$655	$125,105
Manholes (4 feet)	16	ea	$4,258	$68,128
Manholes (5-7 feet)	11	ea	$4,258	$46,838
Manholes (8-10 feet)	5	ea	$5,046	$25,230
Manholes (11-14 feet)	1	ea	$7,068	$7,068
Manholes (greater than 15 feet)	0	ea	$10,015	$0
Subtotal				$903,692
Subtotal				$1,061,692
Miscellaneous Other				
MOT	42	day	$300	$12,600
Land Acquisition	1	ls	$0	$0
Directional Drill	2000	lf	$65	$130,000
Driveway Repair (Decorative Paver) (assumed 17% of the driveways)	340	sy	$70	$23,800
Driveway Repair (Concrete) (assumed 17% of the driveways)	340	sy	$28	$9,520
Field Survey/As Builts	1	ls	$16,500	$16,500
Subtotal				$192,420
Subtotal				$1,254,112
General Conditions (10%)				$125,411
Contractor Overhead and Profit (15%)				$188,117
Subtotal				$1,567,640
Contingency (25%)				$391,910
Project Construction Cost				**$1,959,550**
Non Construction Cost @ 15%				$293,933
Total Project Cost				**$2,253,483**

Table 4-15 Cost Evaluation for Gravity Sewer System in Coquina West Area

Items	Quantity	Unit	Unit Cost	Total
Pump Station				
Lift Station 4 (Peak Flow Capacity = 437,000 gpd, Pipe invert Elevation = -7.8 feet, Rim Elevation = 8 feet)	1	ls	$200,000	$200,000
Building Landscape	1	ls	$8,000	$8,000
Subtotal				$208,000
Collection/Transmission System (including Pavement Repair and Dewatering of a 5' trench area)				
8" Gravity Sewer (4 feet)	6472	lf	$64	$414,208
8" Gravity Sewer (5-7 feet)	9916	lf	$76	$753,616
8" Gravity Sewer (8-10 feet)	5052	lf	$85	$429,420
8" Gravity Sewer (11-14 feet)	1729	lf	$108	$186,732
8" Gravity Sewer (greater than 15 feet)	187	lf	$141	$26,367
6" Laterals	437	ea	$655	$286,235
6" SDR 18 Force Main	580	lf	$30	$17,400
Manholes (4 feet)	27	ea	$4,258	$114,966
Manholes (5-7 feet)	30	ea	$4,258	$127,740
Manholes (8-10 feet)	17	ea	$5,046	$85,782
Manholes (11-14 feet)	5	ea	$7,068	$35,340
Manholes (greater than 15 feet)	1	ea	$10,015	$10,015
Subtotal				$2,487,821
Subtotal				$2,695,821
Miscellaneous Other				
MOT	120	day	$300	$36,000
Land Acquisition	1	ls	$0	$0
Directional Drill	550	lf	$65	$35,750
Driveway Repair (Decorative Paver) (assumed 17% of the driveways)	750	sy	$70	$52,500
Driveway Repair (Concrete) (assumed 17% of the driveways)	750	sy	$28	$21,000
Field Survey/As Builts	1	ls	$35,000	$35,000
Subtotal				$180,250
Subtotal				$2,876,071
General Conditions (10%)				$287,607
Contractor Overhead and Profit (15%)				$431,411
Subtotal				$3,595,089
Contingency (25%)				$898,772
Project Construction Cost				**$4,493,861**
Non Construction Cost @ 15%				$674,079
Total Project Cost				**$5,167,940**

Table 4-16 Cost Evaluation for Gravity Sewer System in Lisbon-Sevilla Area

Items	Quantity	Unit	Unit Cost	Total
Pump Station				
Lift Station 6 (Peak Flow Capacity = 41,000 gpd, Pipe invert Elevation = -1.42 feet, Rim Elevation =10 feet)	1	ls	$35,000	$35,000
Building Landscape	1	ls	$8,000	$8,000
Subtotal				$43,000
Collection/Transmission System (including Pavement Repair and Dewatering of a 5' trench area)				
8" Gravity Sewer (4 feet)	1171	lf	$64	$74,944
8" Gravity Sewer (5-7 feet)	787	lf	$76	$59,812
8" Gravity Sewer (8-10 feet)	508	lf	$85	$43,180
8" Gravity Sewer (11-14 feet)	303	lf	$108	$32,724
8" Gravity Sewer (greater than 15 feet)	0	lf	$141	$0
6" Laterals	41	ea	$655	$26,855
4" SDR 18 Force Main	80	lf	$25	$2,000
Manholes (4 feet)	6	ea	$4,258	$25,548
Manholes (5-7 feet)	3	ea	$4,258	$12,774
Manholes (8-10 feet)	1	ea	$5,046	$5,046
Manholes (11-14 feet)	2	ea	$7,068	$14,136
Manholes (greater than 15 feet)	0	ea	$10,015	$0
Subtotal				$297,019
Subtotal				$340,019
Miscellaneous Other				
MOT	14	day	$300	$4,200
Land Acquisition	1	ls	$146,090	$146,090
Directional Drill	1000	lf	$65	$65,000
Driveway Repair (Decorative Paver) (assumed 17% of the driveways)	70	sy	$70	$4,900
Driveway Repair (Concrete) (assumed 17% of the driveways)	70	sy	$28	$1,960
Field Survey/As Builts	1	ls	$3,500	$3,500
Subtotal				$225,650
Subtotal				$565,669
General Conditions (10%)				$56,567
Contractor Overhead and Profit (15%)				$84,850
Subtotal				$707,086
Contingency (25%)				$176,772
Project Construction Cost				**$883,858**
Non Construction Cost @ 15%				$132,579
Total Project Cost				**$1,016,436**

Table 4-17 Cost Evaluation for Gravity Sewer System in Versaggi-Linda Mar Area

Items	Quantity	Unit	Unit Cost	Total
Pump Station				
Lift Station 7 (Peak Flow Capacity = 96,000 gpd, Pipe invert Elevation = -1.77 feet, Rim Elevation = 9 feet)	1	ls	$80,000	$80,000
Building Landscape	1	ls	$8,000	$8,000
Subtotal				$88,000
Collection/Transmission System (including Pavement Repair and Dewatering of a 5' trench area)				
8" Gravity Sewer (4 feet)	1508	lf	$64	$96,512
8" Gravity Sewer (5-7 feet)	2069	lf	$76	$157,244
8" Gravity Sewer (8-10 feet)	2018	lf	$85	$171,530
8" Gravity Sewer (11-14 feet)	180	lf	$108	$19,440
8" Gravity Sewer (greater than 15 feet)	0	lf	$141	$0
6" Laterals	96	ea	$655	$62,880
4" SDR 18 Force Main	2400	lf	$25	$60,000
Manholes (4 feet)	8	ea	$4,258	$34,064
Manholes (5-7 feet)	6	ea	$4,258	$25,548
Manholes (8-10 feet)	6	ea	$5,046	$30,276
Manholes (11-14 feet)	1	ea	$7,068	$7,068
Manholes (greater than 15 feet)	0	ea	$10,015	$0
Subtotal				$664,562
Subtotal				$752,562
Miscellaneous Other				
MOT	41	day	$300	$12,300
Land Acquisition	1	ls	$0	$0
Directional Drill	30	lf	$65	$1,950
Driveway Repair (Decorative Paver) (assumed 17% of the driveways)	160	sy	$70	$11,200
Driveway Repair (Concrete) (assumed 17% of the driveways)	160	sy	$28	$4,480
Field Survey/As Builts	1	ls	$8,500	$8,500
Subtotal				$38,430
Subtotal				$790,992
General Conditions (10%)				$79,099
Contractor Overhead and Profit (15%)				$118,649
Subtotal				$988,740
Contingency (25%)				$247,185
Project Construction Cost				**$1,235,925**
Non Construction Cost @ 15%				$185,389
Total Project Cost				**$1,421,314**

Table 4-18 Cost Evaluation for Gravity Sewer System in Sandpiper Area

Items	Quantity	Unit	Unit Cost	Total
Pump Station				
Lift Station 8 (Peak Flow Capacity = 44,000 gpd, Pipe invert Elevation = -0.83 feet, Rim Elevation = 11.5 feet)	0	ls	$35,000	$35,000
Building Landscape	1	ls	$8,000	$0
Subtotal				$35,000
Collection/Transmission System (including Pavement Repair and Dewatering of a 5' trench area)				
8" Gravity Sewer (4 feet)	407	lf	$64	$26,048
8" Gravity Sewer (5-7 feet)	938	lf	$76	$71,288
8" Gravity Sewer (8-10 feet)	662	lf	$85	$56,270
8" Gravity Sewer (11-14 feet)	845	lf	$108	$91,260
8" Gravity Sewer (greater than 15 feet)	0	lf	$141	$0
6" Laterals	44	ea	$655	$28,820
4" SDR 18 Force Main	500	lf	$25	$12,500
Manholes (4 feet)	4	ea	$4,258	$17,032
Manholes (5-7 feet)	2	ea	$4,258	$8,516
Manholes (8-10 feet)	2	ea	$5,046	$10,092
Manholes (11-14 feet)	4	ea	$7,068	$28,272
Manholes (greater than 15 feet)	0	ea	$10,015	$0
Subtotal				$350,098
Subtotal				$385,098
Miscellaneous Other				
MOT	17	day	$300	$5,100
Land Acquisition	1	ls	$110,000	$110,000
Directional Drill	30	lf	$65	$1,950
Driveway Repair (Decorative Paver) (assumed 17% of the driveways)	80	sy	$70	$5,600
Driveway Repair (Concrete) (assumed 17% of the driveways)	80	sy	$28	$2,240
Field Survey/As Builts	1	ls	$40,000	$40,000
Subtotal				$164,890
Subtotal				$549,988
General Conditions (10%)				$54,999
Contractor Overhead and Profit (15%)				$82,498
Subtotal				$687,485
Contingency (25%)				$171,871
Project Construction Cost				**$859,356**
Non Construction Cost @ 15%				$128,903
Total Project Cost				**$988,260**

Table 4-19 Cost Evaluation for Utilizing Existing Gravity Sewer System and Lift Stations

Items	Quantity	Unit	Unit Cost	Total
Collection/Transmission System (including Pavement Repair and Dewatering of a 5' trench area)				
Existing Lift Station 10 - Island South (add 5 customers)				
8" Gravity Sewer (4 feet)	254	lf	$64	$16,266
8" Gravity Sewer (5-7 feet)	25	lf	$76	$1,891
8" Gravity Sewer (8-10 feet)	0	lf	$85	$0
8" Gravity Sewer (11-14 feet)	0	lf	$108	$0
8" Gravity Sewer (greater than 15 feet)	0	lf	$141	$0
6" Laterals	5	ea	$655	$3,275
Manholes (4 feet)	2	ea	$4,258	$8,516
Manholes (5-7 feet)	0	ea	$4,258	$0
Manholes (8-10 feet)	0	ea	$5,046	$0
Manholes (11-14 feet)	0	ea	$7,068	$0
Manholes (greater than 15 feet)	0	ea	$10,015	$0
Subtotal				$29,948
Existing Lift Station 13 - 11th Street (add 3 customers)				
8" Gravity Sewer (4 feet)	268	lf	$64	$17,162
8" Gravity Sewer (5-7 feet)	30	lf	$76	$2,269
8" Gravity Sewer (8-10 feet)	0	lf	$85	$0
8" Gravity Sewer (11-14 feet)	0	lf	$108	$0
8" Gravity Sewer (greater than 15 feet)	0	lf	$141	$0
6" Laterals	3	ea	$655	$1,965
Manholes (4 feet)	2	ea	$4,258	$8,516
Manholes (5-7 feet)	0	ea	$4,258	$0
Manholes (8-10 feet)	0	ea	$5,046	$0
Manholes (11-14 feet)	0	ea	$7,068	$0
Manholes (greater than 15 feet)	0	ea	$10,015	$0
Subtotal				$29,912
Existing Lift Station 14- Anastasia Oaks (add 8 customers)				
8" Gravity Sewer (4 feet)	343	lf	$64	$21,965
8" Gravity Sewer (5-7 feet)	298	lf	$76	$22,537
8" Gravity Sewer (8-10 feet)	0	lf	$85	$0
8" Gravity Sewer (11-14 feet)	0	lf	$108	$0
8" Gravity Sewer (greater than 15 feet)	0	lf	$141	$0
6" Laterals	8	ea	$655	$5,240
Manholes (4 feet)	1	ea	$4,258	$4,258
Manholes (5-7 feet)	2	ea	$4,258	$8,516
Manholes (8-10 feet)	0	ea	$5,046	$0
Manholes (11-14 feet)	0	ea	$7,068	$0
Manholes (greater than 15 feet)	0	ea	$10,015	$0
Subtotal				$62,517
Subtotal				$122,377
Miscellaneous Other				
MOT	6	day	$300	$1,800
Land Acquisition		N/A		$0
Directional Drill	0	lf	$65	$0
Driveway Repair (Decorative Paver) (assumed 17% of the driveways)	90	sy	$70	$6,300
Driveway Repair (Concrete) (assumed 17% of the driveways)	90	sy	$28	$2,520
Field Survey/As Builts	0	ls	$1,000	$0
Subtotal				$10,620
Subtotal				$132,997
General Conditions (10%)				$13,300
Contractor Overhead and Profit (15%)				$19,949
Subtotal				$166,246
Contingency (25%)				$41,561
Project Construction Cost				**$207,807**
Non Construction Cost @ 15%				$31,171
Total Project Cost				**$238,978**

4.2.3.4 Operation and Maintenance Cost Evaluation

The costs associated with the operation and maintenance of the gravity system are presented in **Table 4-20**. The costs were based on actual average costs of operating a gravity system in St. Johns County. Annual costs for the operation and maintenance of the gravity system were estimated to be approximately $57,000. Pump replacement was not included in the operation and maintenance costs, but was treated in the following sections as a component of the present worth evaluation.

Table 4-20 Gravity Sewer System – Operation and Maintenance Costs

Items	Total
Lift Stations	
Labor per lift station	$4,000
Power per lift station	$ 600
Maintenance per lift station	$1,800
Subtotal	$6,400
Times 7 lift stations	$44,800
Pipeline	
Labor	$9,000
Maintenance Supplies	$3,000
Subtotal	$12,000
Total Operation & Maintenance Costs	$56,800

4.3 Cost Comparison

A cost comparison between gravity and vacuum including all of the unsewered areas in the City of St. Augustine Beach is presented in **Table 4-21.** Table 4-21 shows the total cost for the vacuum and gravity systems. It also gives an estimate of the cost per household for each area. The total cost for all of the areas on vacuum is $12.2 million and the total cost for all areas on gravity is $13.7 million. Also, the vacuum system has a total of approximately $52,000 per year in Operation and Maintenance Costs, which is approximately $5,000 less than for the gravity system.

Table 4-21 Cost Comparison for each Area

	Vacuum			Gravity		
Area	**Total Cost**	**EDU**	**Cost per EDU**	**Total Cost**	**EDU**	**Cost per EDU**
Woodland Area	$785,405	53	$14,819	$858,119	53	$16,191
Coquina North Area	$1,408,597	127	$11,091	$1,713,297	119	$14,397
Coquina South Area	$2,217,115	199	$11,141	$2,253,483	191	$11,798
Coquina West Area	$4,486,524	443	$10,128	$5,167,940	443	$11,666
Lisbon Sevilla Area	$1,192,945	41	$29,096	$1,016,436	41	$24,791
Versaggi Area	$1,098,633	96	$11,444	$1,421,314	96	$14,805
Sandpiper Area	$1,026,795	44	$23,336	$988,260	44	$22,460
Existing Lift Stations	N/A	N/A	N/A	$238,978	16	$14,936
Total	**$12,216,015**	**1003**	**$12,179**	**$13,657,827**	**1003**	**$13,617**

4.4 Cost Effectiveness

Present worth is an economic analysis tool for evaluating project alternatives. Project costs, both operating and capital, were projected for a planning period of 20 years. The value of the project costs were then restated in terms of their cost in today's dollars (present worth).

Present worth has therefore been used in the comparison of the alternatives developed in this facility plan. Criteria used for the evaluation of present worth were as follows:

- Planning period of 20 years;
- Discount rate of 5.875 percent;
- Inflation rate of 2.47 percent (average of Inflation Index for 1995 through 2004, Bureau of Labor Statistics);
- Nominal rate - equals a discount rate including inflation of 8.49 percent;
- Capital costs (construction, contingency, engineering, administrative);
- Operation and maintenance costs;
- Salvage value based on appropriate useful lives of various project components (structures and Improvements - 40 years, connections - 30 years, pumping equipment - 15 years, pipelines and manholes- 40 years); and
- Costs were based on bid tabulations from similar projects and prices obtained from recognized suppliers.

4.4.1 Present Worth Vacuum System

The original capital costs were developed previously in Section 4.2. This section develops the present worth of the capital components as follows:

- The original capital costs are already in present value;
- The replacement costs are in inflated future dollars, with the nominal rate used to discount these costs to present value; and
- The salvage value is in today's dollars, thus the discount rate without inflation was used.

Table 4-22 provides an analysis of the present worth of the vacuum system, with the assumptions made per the following discussion.

The assumption was made that the assets whose useful life expires during the study period will be replaced in the year after the useful life ends, such that all of the original assets or their replacements will continue to function throughout the study period. The value of the assets at the time of replacement was estimated to be equal to the current replacement cost plus inflation from 2004 to the year of replacement. The replacement costs with inflation are presented in Table 4-22 for each year in which replacement will be required. The present worth is then calculated from the replacement year back to 2004 dollars. The nominal rate of 8.49 percent was used in this instance in order to correspond to the use of inflation in calculating asset costs at the time of replacement.

Table 4-22 Vacuum Sewer System - Total Annual Costs and 20-Year Present Worth

	Vacuum System	Original Cost	Present Worth Factors	Notes	Present Worth
A.	**Original Cost**	$12,216,015	1.0000		$12,216,015
		Replacement Value with Inflation	**Present Worth Factors**		**Present Worth**
B.	**Replacement Costs**				
	Year 10	$396,140	0.4427	1	$175,372
	Year 15	$5,770,474	0.2945	1	$1,699,405
C.	**Less: Salvage Value**				
	Year 20	$7,755,657	0.3193	2	($2,476,381)
D.	**Total Capital Costs Net of Salvage**				**$11,614,411**
E.	**Operation & Maintenance Costs**	$51,918	9.4702	3	**$491,674**
	Total Present Worth				**$12,106,085**

[1]Present Worth Factor (nominal value) formula is: $1/(1 + i)^n$.

[2]Present Worth Factor (discount value) formula is: 1/(1 + i)n.

[3]The Modified Uniform (Series) Present Value factor formula is: $[(1+ e)/(i-e)]x[1-((1 + e)/(1 + i)^n]$.

Salvage value calculations were made for the remaining value of the initial cost (non-depreciated) and for the cost of replacing assets during the 20-year study period. The discount rate of 5.875percent was used in this instance to correspond to the fact that the salvage value costs were already at present value. The salvage value was then deducted from a total of the original cost plus the replacement cost.

There are annually recurring costs that are subject to inflation, i.e., operation and maintenance costs. Therefore, in order to convert the operation and maintenance costs in year one to present value, add annual inflationary costs, and convert this amount to present worth, the Modified Uniform (Series) Present Value factor formula was used, as presented in Table 4-22.

4.4.2 Present Worth Gravity System

The original capital costs were developed previously in Section 4.2. This section develops the present worth of the capital components as follows:

- The original capital costs are already in present value;
- The replacement costs are in inflated future dollars, with the nominal rate used to discount these costs to present value; and
- The salvage value is in today's dollars, thus the discount rate without inflation was used.

Table 4-23 provides an analysis of the present worth of the gravity system, with the assumptions made per the following discussion.

The assumption was made that the assets whose useful life expires during the study period will be replaced in the year after the useful life ends, such that all of the original assets or their replacements will continue to function throughout the study period. The value of the assets at the time of replacement was estimated to be equal to the current replacement cost plus inflation from 2004 to the year of replacement. The replacement costs with inflation are presented in Table 4-23 for each year in which replacement will be required. The present worth is then calculated from the replacement year back to 2004 dollars. The nominal rate of 8.49% was used in this instance in order to correspond to the use of inflation in calculating asset costs at the time of replacement.

Salvage value calculations were made for the remaining value of the initial cost (non-depreciated) and for the cost of replacing assets during the 20-year study period. The discount rate of 5.875 percent was used in this instance to correspond to the fact that the salvage value costs were already at present value. The salvage value was then deducted from a total of the original cost plus the replacement cost.

There are annually recurring costs that are subject to inflation, i.e. operation and maintenance costs. Therefore, in order to convert the operation and maintenance costs in year one to present value, add annual inflationary costs, and convert this amount to present worth, the Modified Uniform (Series) Present Value factor formula was used, as presented in Table 4-23.

Table 4-23 Gravity Sewer System - Total Annual Costs and 20-Year Present Worth

	Gravity System	Original Cost	Present Worth Factors	Notes	Present Worth
A.	**Original Cost**	$13,657,828	1.0000		$13,657,828
		Replacement Value with Inflation	**Present Worth Factors**		**Present Worth**
B.	**Replacement Costs**				
	Year 10	$384,149	0.4427	1	$170,063
	Year 15	$607,592	0.2945	1	$178,936
C.	**Less: Salvage Value**				
	Year 20	$6,642,722	0.3193	2	($2,121,021)
D.	**Total Capital Costs Net of Salvage**				**$11,885,805**
E.	**Operation & Maintenance Costs**	$56,800	9.4702	3	**$537,907**
	Total Present Worth				**$12,423,712**

[1]Present Worth Factor (nominal value) formula is: $1/(1 + i)^n$.

[2]Present Worth Factor (discount value) formula is: 1/(1 + i)n.

[3]The Modified Uniform (Series) Present Value factor formula is: $[(1+ e)/(i-e)]x[1-((1 + e)/(1 + i)^n]$.

4.4.3 Comparison of Present Worth Vacuum Systems and Gravity Systems

In addition to the combined present worth analysis previously presented, the present worth for each service area was prepared. **Tables 4-24 through 4-30** present a comparison of the present worth for the vacuum sewer system and the gravity sewer system.

Table 4-24 Comparison of Woodland Present Worth for Vacuum Sewer System and Gravity Sewer System

Vacuum Sewer System	2004 Capital Costs	Present Value of Replacement	Present Value of Salvage	Present Value Operation/Maint	Total Present Value
Capital Costs	$ 785,405	$ 98,855	$ (153,111)		$ 731,148
Operation & Maintenance Costs				68,244	68,244
Total	$ 785,405	$ 98,855	$ (153,111)	$ 68,244	**$ 799,393**
Gravity Sewer System	**2004 Capital Costs**	**Present Value of Replacement**	**Present Value of Salvage**	**Present Value Operation/Maint**	**Total Present Value**
Capital Costs	$ 858,119	$ 26,045	$ (128,393)		$ 755,771
Operation & Maintenance Costs				66,614	66,614
Total	$ 858,119	$ 26,045	$ (128,393)	$ 66,614	**$ 822,386**

Table 4-25 Comparison of Coquina North Present Worth for Vacuum Sewer System and Gravity Sewer System

Vacuum Sewer System	2004 Capital Costs	Present Value of Replacement	Present Value of Salvage	Present Value Operation/Maint	Total Present Value
Capital Costs	$ 1,408,597	$ 231,326	$ (290,374)		$ 1,349,550
Operation & Maintenance Costs				69,879	69,879
Total	$ 1,408,597	$ 231,326	$ (290,374)	$ 69,879	**$ 1,419,429**
Gravity Sewer System	**2004 Capital Costs**	**Present Value of Replacement**	**Present Value of Salvage**	**Present Value Operation/Maint**	**Total Present Value**
Capital Costs	$ 1,713,297	$ 62,507	$ (252,873)		$ 1,522,931
Operation & Maintenance Costs				74,999	74,999
Total	$ 1,713,297	$ 62,507	$ (252,873)	$ 74,999	**$ 1,597,930**

Table 4-26 Comparison of Coquina South Present Worth for Vacuum Sewer System and Gravity Sewer System

Vacuum Sewer System	2004 Capital Costs	Present Value of Replacement	Present Value of Salvage	Present Value Operation/Maint	Total Present Value
Capital Costs	$ 2,217,116	$ 364,424	$ (456,484)		$ 2,125,056
Operation & Maintenance Costs				71,470	71,470
Total	$ 2,217,116	$ 364,424	$ (456,484)	$ 71,470	**$ 2,196,526**
Gravity Sewer System	**2004 Capital Costs**	**Present Value of Replacement**	**Present Value of Salvage**	**Present Value Operation/Maint**	**Total Present Value**
Capital Costs	$ 2,492,461	$ 78,134	$ (372,103)		$ 2,198,492
Operation & Maintenance Costs				83,156	83,156
Total	$ 2,492,461	$ 78,134	$ (372,103)	$ 83,156	**$ 2,281,649**

Table 4-27 Comparison of Coquina West Present Worth for Vacuum Sewer System and Gravity Sewer System

Vacuum Sewer System	2004 Capital Costs	Present Value of Replacement	Present Value of Salvage	Present Value Operation/Maint	Total Present Value
Capital Costs	$4,486,524	$768,907	$(936,483)		$4,318,947
Operation & Maintenance Costs				76,861	76,861
Total	$4,486,524	$768,907	$(936,483)	$76,861	**$4,395,808**
Gravity Sewer System	**2004 Capital Costs**	**Present Value of Replacement**	**Present Value of Salvage**	**Present Value Operation/Maint**	**Total Present Value**
Capital Costs	$5,167,940	$104,179	$(790,637		$4,481,482
Operation & Maintenance Costs				110,802	110,802
Total	$5,167,940	$104,179	$(790,637)	$110,802	**$4,592,284**

Table 4-28 Comparison of Lisbon Sevilla Present Worth for Vacuum Sewer System and Gravity Sewer System

Vacuum Sewer System	2004 Capital Costs	Present Value of Replacement	Present Value of Salvage	Present Value Operation/Maint	Total Present Value
Capital Costs	$1,192,947	$96,067	($216,012)		$1,073,002
Operation & Maintenance Costs				67,979	67,979
Total	$1,192,947	$96,067	($216,012)	$67,979	**$1,140,981**
Gravity Sewer System	**2004 Capital Costs**	**Present Value of Replacement**	**Present Value of Salvage**	**Present Value Operation/Maint**	**Total Present Value**
Capital Costs	$1,016,436	$18,231	($114,341)		$920,327
Operation & Maintenance Costs				65,255	65,255
Total	$1,016,436	$18,231	($114,341)	$65,255	**$985,582**

Table 4-29 Comparison of Versaggi Present Worth for Vacuum Sewer System and Gravity Sewer System

Vacuum Sewer System	2004 Capital Costs	Present Value of Replacement	Present Value of Salvage	Present Value Operation/Maint	Total Present Value
Capital Costs	$1,098,633	$216,434	($233,547)		$1,081,520
Operation & Maintenance Costs				69,194	69,194
Total	$1,098,633	$216,434	($233,547)	$69,194	**$1,150,714**
Gravity Sewer System	**2004 Capital Costs**	**Present Value of Replacement**	**Present Value of Salvage**	**Present Value Operation/Maint**	**Total Present Value**
Capital Costs	$1,421,314	$41,671	($213,143)		$1,248,842
Operation & Maintenance Costs				71,486	71,486
Total	$1,421,314	$41,671	($213,143)	$71,486	**$1,321,329**

Table 4-30 Comparison of Sandpiper Present Worth for Vacuum Sewer System and Gravity Sewer System

Vacuum Sewer System	2004 Capital Costs	Present Value of Replacement	Present Value of Salvage	Present Value Operation/Maint	Total Present Value
Capital Costs	$1,026,795	$99,208	($190,507)		$935,496
Operation & Maintenance Costs				68,046	68,046
Total	$1,026,795	$99,208	($190,507)	$68,046	**$1,003,542**
Gravity Sewer System	**$2,004 Capital Costs**	**Present Value of Replacement**	**Present Value of Salvage**	**Present Value Operation/Maint**	**Total Present Value**
Capital Costs	$988,260	$18,231	($120,196)		$886,295
Operation & Maintenance Costs				65,595	65,595
Total	$988,260	$18,231	($120,196)	$65,595	**$951,890**

The present worth for the majority of the service areas is lowest for the vacuum sewer system. It was only the Lisbon Sevilla and Sandpiper subdivisions that had a lower present worth for the gravity system.

4.5 Proposed Facilities

Based on these findings, there is not a clear economic spread between the two options presented for each area and both are considered viable options. The capital cost to construct a gravity sewer system for the entire area is slightly higher than the cost to construct the vacuum sewer system. Based on the present worth analysis of the two options, there is less than a 10 percent difference in total costs of the options. This margin is considered to be insignificant in the economic evaluation and the two alternatives are considered equal. Qualitative factors such as previous experience with vacuum and gravity systems, operation and maintenance preferences, standards, and reliability were also considered. These qualitative factors favored the gravity sewer option for each project area. Recent experience associated with increased maintenance and operational costs of a recently installed vacuum sewer system in the service area have raised concerns about the long term reliability of vacuum sewer systems.

Based on the relatively small individual project areas, the gravity sewer alternative has the advantages associated with shallow depth of installation, long term maintenance-free operation, and only marginally higher overall life cycle costs. Therefore, it is recommended that the gravity sewer alternative be selected as the approach to phasing out septic tanks in the identified study areas. This recommendation, however, is based on typical considerations for subsurface and groundwater conditions.

In the event that the presence of coquina rock or other unsuitable materials; or excessive groundwater is discovered during subsurface investigations associated with project final design, then project costs for the gravity sewer alternative may be significantly impacted. As a result, the vacuum sewer system alternative may become economically advantageous to the City. In this scenario, the implementation of the vacuum sewer alternative may be preferred over the gravity sewer alternative.

The implementation of a gravity collection system to serve all of the unsewered areas of St. Augustine Beach is considered to be the environmentally sound, cost-effective alternative. Figures 4-2 through 4-4 provide facilities layout maps for the study area recommended alternative. There were also two areas not to be served (Anastasia Lodge and Florida Avenue), as they were not included for service during the grant application process and are not cost effective to be served.

Section 5
Description of the Selected Plan

5.1 Proposed Facilities

The expansion of the sewerage collection system in the study area will eliminate the problems associated with septic tanks, including aging systems, high-density development, high groundwater table and proximity to pristine water bodies. As shown in Section 4, a gravity sewer system was a cost effective and viable alternative.

A detailed description of the proposed gravity sewer systems is provided in Section 4.2.3.

5.2 Cost to Construct Facilities

The detailed breakdown of construction costs for the proposed gravity collection system is provided in Tables 4-12, 4-13, 4-14, 4-15, 4-16, 4-17, 4-18 and 4-19. A summary of the costs is presented in **Table 5-1**.

Table 5-1 Summary of Total Capital Cost

	Gravity System Cost
Pump Station	$718,000
Collection/Transmission System	$5,935,838
Miscellaneous Other	$947,040
Total Construction	$7,600,878
General Conditions & Contractor Overhead & Profit	$1,900,219
Contingency	$2,375,274
Non-Construction Costs	$1,781,456
Total Project Costs	**$13,657,827**

5.3 Environmental Impacts of Proposed Facilities

The short-term impacts during construction include increased noise levels, increase in dust and particles associated with the installation of the new lines and the gravity pump stations, and surface runoff during rainfall in the construction sites. Control measures (such as hay bales to control erosion and sedimentation and water sprinkling program to reduce dust) will be implemented to minimize these temporary effects. Additionally, the site on which the new vacuum and pump stations will be located will be landscaped as per owner's preferences to blend with existing site conditions.

The long-term impacts of this project are beneficial. The construction of the collection system in the study area will eliminate the septic tanks, which have been cited as significantly contributing to the high nutrients and heavy metals in the urban runoff. Therefore, the project implementation will help protect the pristine water bodies in the Matanzas River Basin. Additionally, problems such as the occurrence of high total and fecal coliform levels or the high public exposure risk to waterborne pathogens in the study area will be eliminated.

The proposed sewer collection system project will not have significant adverse effects on wild and scenic rivers or on flora, fauna, threatened and endangered plant or animal species, prime agricultural lands, wetlands, undisturbed natural areas, or the socio-economic character of the area. The collection system will be constructed adjacent to roadways where sufficient right-of-way exists, and under the roadbed where it does not. Each of the seven subdivisions is served by a new lift station with the exception of Coquina South, which will be a rehabilitation/expansion of the existing Sea Ray lift station and three other existing lift stations that will be utilized. The Island South lift station will be utilized for five additional customers, the 11th Street lift station will be utilized for three additional customers, and the Anastasia Oaks lift station will be utilized for eight additional customers. Vacant parcels of land will need to be purchased for two of the lift stations. The remaining new lift stations will be located in the rights-of way and no land will need to be purchased.

5.4 Conformance

The recommendations resulting from this study are consistent with the County's comprehensive plan.

Section 6
Implementation Plan

6.1 General

This section presents a detailed plan for implementing the recommended wastewater facilities for the planning area. The implementation plan includes institutional arrangements, an implementation schedule, and a financial plan. These aspects of the implementation plan are summarized as follows and discussed in more detail in the remainder of this section.

- Financial Plan (Section 6.2): Identifies the projected capital costs and their financing.

- Institutional Arrangements (Section 6.3): Identifies entities responsible for the design, construction, financing, ownership, operation and maintenance of the project facilities; cite the legal, financial, and administrative relationship between entities; and cite the associated laws, agreements and resolutions, etc.

- Implementation Schedule (Section 6.4): Describes an orderly schedule of the actions that must be taken to initiate and complete the proposed projects.

- An advertised public hearing will be held to encourage the public to learn about this program and the financing plan. The public will be encouraged to offer comments regarding the proposed programs. A record of this hearing will be kept for public record and review. The minutes from the hearing will be incorporated in this document as **Appendix D**.

6.2 Financial Plan

Capital financing of the wastewater program will be the combined responsibility of the City and County. **Table 6-1** provides the anticipated cost of the wastewater collection program. The program costs for the wastewater collection program are estimated to be approximately $13.6 million, with $9 million planned to be provided by SRF grant funds and the balance from the County. These costs include construction of the capital improvements, engineering and program management, administration and legal, and contingencies (Table 6-1).

Financing of the wastewater collection program will be obtained through a combination of State Revolving Fund (SRF) grant financing and County funds, as presented on **Table 6-2**.

Table 6-1 Gravity Sewer System Project Costs

	Gravity System Cost
Pump Station	$718,000
Collection/Transmission System	$5,935,838
Miscellaneous Other	
MOT	$89,400
Land	256,090
Directional Drill	306,150
Driveway Repair	173,880
Field Survey/As Builts	121,520
Total Miscellaneous	$947,040
Total Construction	$7,600,878
General Conditions (10%)	760,088
Contractor Overhead & Profit (15%)	1,140,131
Subtotal	$9,501,097
Contingency (25%)	2,375,274
Subtotal	$11,876,371
Non-Construction Costs (15%)	1,781,456
Total Project Costs	**$13,657,827**

Table 6-2 Financing Plan for SRF Projects

Plan Cost (a)	$13,657,827
SRF Grant (b)	($9,061,600)
Balance – County Funds	$4,596,227

(a) Total construction costs including engineering and contingency
(b) The construction grant portion is to be reimbursed at the rate of $750,000 per year until fully reimbursed. The construction grant portion is approximately $8.28 million and the pre-construction grant is approximately $0.78 million.

A financial analysis was conducted to determine the impact of the wastewater collection program on an equivalent residential unit (ERU). **Table 6-3** summarizes the impact per ERU from the construction of the improvements with the use of SRF grant funding and County funds for the balance. A new connection or ERU will pay a monthly cost of approximately $437 (repayment begins upon connection to the wastewater system).

Table 6-3 Annual Cost of Selected Plan with SRF Grant Financing

	Actual Annual Costs 2004
Existing O&M Costs - St. Johns County (a)	$5,371,423
Incremental O&M Costs - St. Augustine Beach (b)	$51,918
Subtotal	$5,423,341
Divided by Customer Base ERU (c)	18,408
Annual Cost per ERU	$294.62
Annual Bill (d)	$315.60
(Assume average use of 5,000 gallons/month water use billed at 100% for wastewater, monthly cap is 10,000 gallons)	
Total Monthly Bill per ERU	$26.30

(a) Based on St. Johns County preliminary 2004 year-end data, with Distribution/Transmission Costs allocated 50% to wastewater and Administration Costs allocated 61.26% to wastewater.
(b) Taken from Table 4-10.
(c) Customer base estimated at 18,408 for existing St. Johns County customers plus 860 for St. Augustine Beach.
(d) Calculation based on average monthly water use of 5,000 gallons/month billed at 100% for wastewater, using existing St. Johns County rates of $9.40/month base charge plus $3.38/1,000 gallons.

6.3 Institutional Arrangements

6.3.1 General

St. Johns County is authorized to own and operate a wastewater system in accordance with the authority granted by Florida law; Water and Wastewater Systems, FS Chapter 367. The planning, design, operation and maintenance of the wastewater collection facilities are the responsibility of the County.

6.3.2 Regulatory Agreements

St. Johns County operates the Anastasia Island Wastewater Treatment Plant under a permit from the Florida Department of Environmental Protection (FDEP Permit No. FL0038831-003-DW1P). There are two effluent streams generated at the treatment plant. One stream is filtered and re-chlorinated before discharge into the Marsh Creek Country Club Golf Course Ponds as reuse. The other stream is aerated to increase the dissolved oxygen content and de-chlorinated before discharge into the Matanzas River. As part of the review process for this plan and in order to qualify for a subsidized SRF grant, various governmental agencies must approve the manner in which the City and the County will implement the plan. Agencies that will have the opportunity to review and comment on the plan include:

- Florida Department of Environmental Protection
- St. Johns County Regional Planning Council
- St. Johns River Water Management District
- Office of the Governor's State Clearinghouse

6.3.3 St. Johns County Fees and Charges

The provisions and schedules for wastewater rates, charges and fees for retail and commercial customers of the system have been established by St. Johns County. These fees and charges establish the types of rates and fees for water and sewer service provided by St. Johns County, including:

- Residential and non-residential service - base charge based on meter size; and
- Volume charge per 1,000 gallons.

6.3.4 Industrial Strength Waste

St. Johns County's rate schedule provides for a surcharge for waste that exceeds 350 ppm COD and 300 ppm suspended solids. Should the waste strength or additional hydraulic loading hamper or reduce the effective operation of the wastewater treatment plant or facility, the right to discharge may be denied. St. Johns County requires that any industrial contributors to the system provide a monthly lab analysis with sufficient detail with which to bill the appropriate amount of surcharge and to ensure that the discharge will be compatible with the capacity, process, treatment and nutrient load of the wastewater facilities.

6.4 Implementation Schedule

The schedule for the disbursement of funds from the pre-construction grant is estimated on **Table 6-4**. The disbursement of pre-construction funds is based on allowances with no invoices for costs incurred required. The disbursement of construction funds will be based on the submittal of invoices for reimbursement. The disbursement function for construction funds is estimated to take two weeks from the date of invoice submittal to FDEP.

Table 6-4 Schedule of Pre-Construction Grant Disbursements

Item Number	Description	Date	DEP Amount (85%)	County Share (15%)	Total
1	50% of Administration & Planning Allowance (a)	After grant agreement final	$88,300	$15,600	$103,900
2	50% of Administration & Planning Allowance and 50% of Engineering Allowance (b)	1-Nov-05	$391,150	$69,050	$460,200
3	50% of Engineering Allowance	1-Mar-06	$302,850	$53,450	$356,300
Total			$782,300	$138,100	$920,400

(a) Administration & Planning Allowance, available upon signing pre-construction grant.
(b) 50% of Engineering Allowance, available upon completion of environmental review.
(c) 50% of Engineering Allowance, available upon approval of Plans & Specs.

The estimated project schedule for the construction portion of the SRF funding of the wastewater collection program is presented in **Table 6-5**. The schedule only includes the paper work relative to the application for construction funding and the actual grant agreement itself.

Table 6-5 Estimated Project Schedule for Construction

Task	Date
Facilities Plan and Capital Finance Plan Completed	April 2005
Public Hearing to be Scheduled and Held by City Commission	April 2005
DEP Review, Planning Document Approved	July 2005
Design	March 2006
Bid Date	June 2006
Construction Start	Sept 2006
Substantial Completion	July 2009

The schedule for construction and planning activities is presented in Table 6-5. The items listed are segregated into planning and major construction related components including permitting, advertisement of bids, bid opening, start-up and operation certification. In accordance with the schedule presented, the wastewater collection system is anticipated to be completed and operational by July 2009. It is anticipated that the construction will require 36 months to complete. Construction of these improvements is anticipated to commence by September 2006.

A capital financing plan has been prepared and is included in **Appendix C.**