ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY

PREPARED FOR:

UTILITIES, INC.
2335 SANDERS ROAD
NORTHBROOK, ILLINOIS 60062

PREPARED BY:

HARTMAN & ASSOCIATES, INC.
201 EAST PINE STREET, SUITE 1000
ORLANDO, FLORIDA 32801

MARCH 1996

HAI #95-099.01

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Hartman & Associates, Inc. (HAI) was commissioned by Alafaya Utilities, Inc., to investigate the expansion of the existing Alafaya reclaimed water disposal system to serve existing and proposed planned developments both within and adjacent to Alafaya's existing territory. The results of this study and its evaluations are to be provided to the Florida Public Service Commission (FPSC), as per the terms of the Memorandum of Intent entered into by the City of Oviedo and Alafaya, for the purpose of determining the relative feasibility of expanding the reclaimed water system.

Several different scenarios involving the provision of reclaimed water to both institutional and residential customers were investigated. The analyses reveal that the lowest cost and most efficient methodology by which to provide reclaimed water would include providing reclaimed water to the planned developments adjacent to Alafaya's existing service territory. These areas are yet to be developed therefore, the cost to install reclaimed water distribution facilities is substantially lower than in existing residential communities. A service territory expansion that would encompass the Flying Seminole Ranch, the Live Oak PUD, the River Oaks, and Estes Trust properties, as well as undeveloped parcels adjacent to the above-mentioned tracts is the appropriate first step. Only by inclusion of yet to be developed residential communities into the Alafaya reclaimed water expansion plan can economies of scale be brought to bear, through the utilization of existing and newly installed distribution and treatment capacity, so as to minimize both capital and operating costs to the benefit of existing and future reclaimed water customers.

Likewise, the expansion of the Alafaya regional wastewater treatment service territory to include these planned residential communities adjacent to the current service territory will improve the economics of providing sewer utility service. By more fully utilizing the installed treatment plant capacity at the Alafaya Utilities Regional WWTP, capital and operating costs on a per customer basis can be dramatically reduced to the benefit of both existing and future Alafaya Utilities, Inc., customers. The increase in customer base will also be a direct benefit to the existing and future customers of the utility with regards to stability of rates. With the existing capacity available at the wastewater treatment facility, Alafaya Utilities, Inc., is best able to serve the additional areas in a timely fashion, as well as more cost-effectively than duplicating facilities.

This report evaluates the treatment, transmission, and distribution capital improvements to provide additional reclaimed water within the existing and proposed service areas. The recommendations of this report will provide Alafaya Utilities, Inc., with:

- the required information to plan for a cost-effective expansion of reclaimed water facilities;
- the maximum utilization of its existing wastewater treatment plant facilities; and
- the provisions of reclaimed water and wastewater services to its existing and future customers at rates competitive with similar utilities in Florida.

This report identifies various scenarios for providing a regional reclaimed water system supplied by the Alafaya WWTP facilities. Based upon our evaluations, spray irrigation is the best available methodology to be implemented in order to supplant the present use of potable water for non-potable uses. Thereby, upon implementation alleviating to a great extent these existing demands upon the Floridan aquifer in the Oviedo area.

In summary, the extension of the service area to include the Flying Seminole Ranch property, the Live Oak PUD, River Oaks, and Estes Trust property, and the undeveloped property north of Flying Seminole Ranch property to the existing service territory will allow for the most beneficial and economical use of reclaimed water. It should also be noted that the inclusion of these properties into the Alafaya Utilities service area will be the best use of the existing wastewater facilities. Expansion of the existing wastewater service area to include these additional residential developments would contribute approximately 1.0 MGD of wastewater flow. The additional contribution will provide for a greater utilization of the existing Alafaya Utilities Regional WWTP facilities. In the future, when the existing WW facilities are approaching their maximum capacity utilization, these facilities can be expanded beyond their current 2.40 MGD capacity at the present plant site. The present plant site of approximately five acres has sufficient property available for such future facilities expansions. Any future expansion of the existing wastewater treatment facilities would make providing wastewater treatment, as well as reuse service to an expanded service area more economically attractive than duplicating such facilities. These additional areas will be constructed with reclaimed water distribution piping, as required in the Oviedo Land Development Code, Section 233. As such, there will always be sufficient effluent disposal capacity with the additional raw sewage flow.

Of course, the economic feasibility of these proposed facilities and implementation of this plan, including the capital improvements, will be directly impacted and dependent upon the future actions of the Florida PSC with regards to user rates and service availability charges. However, when compared to other similar systems already in service and approved by the PSC, it would appear that the economics of the recommended alternative as set forth in this report for Alafaya Utilities would be both viable and economically feasible.

TABLE OF CONTENTS

ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

SECTION 1

SECTION 1
INTRODUCTION

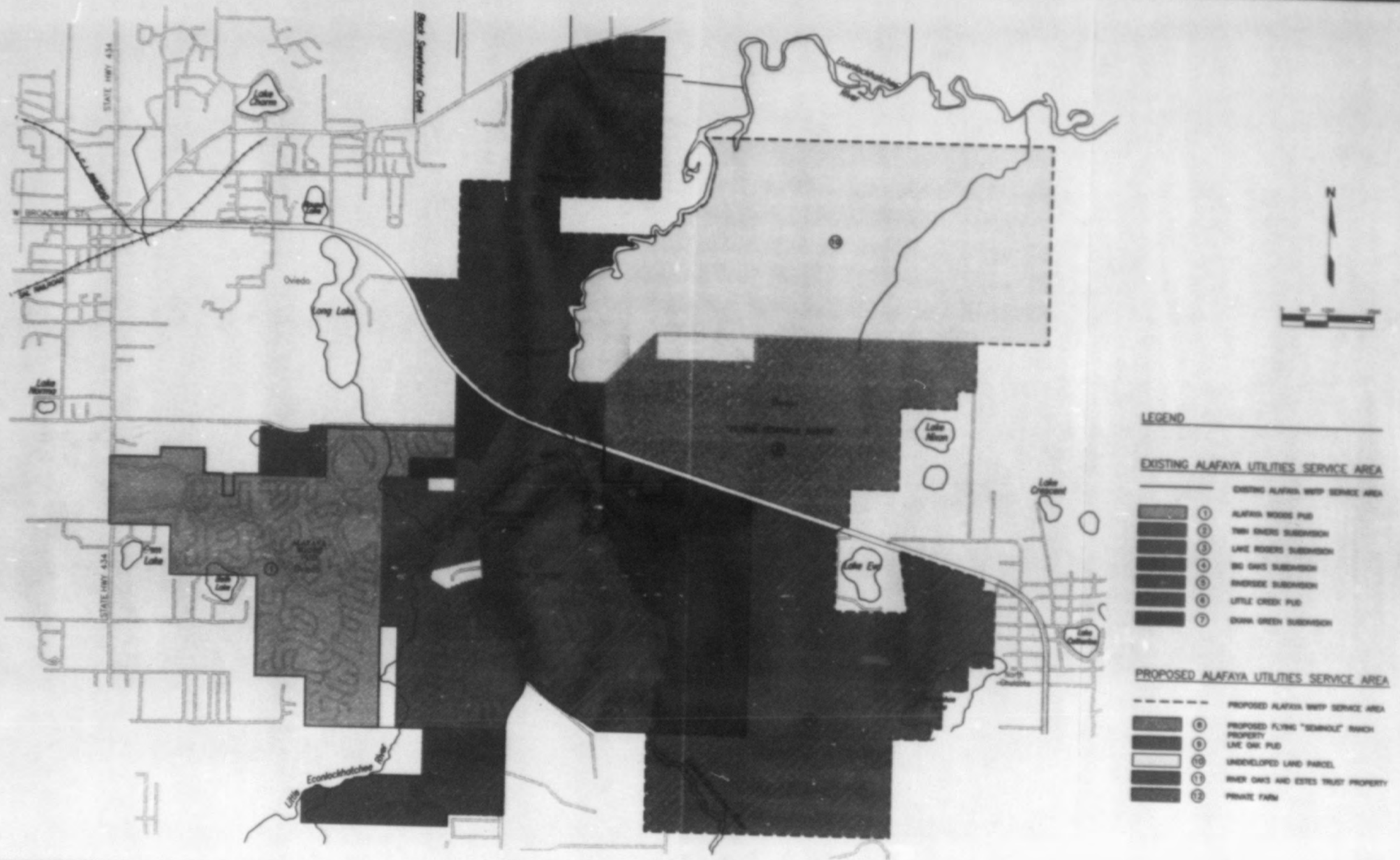
1.1 OBJECTIVE

The purpose of this report is to provide Alafaya Utilities, Inc., with information to plan for the cost effective expansion of reclaimed water facilities. This report evaluates treatment, transmission and distribution capital improvements to provide additional reclaimed water within the existing and proposed service areas. The report also provides preliminary estimates of the capital costs and annual expenditures related to the recommended improvements.

1.2 BACKGROUND

Alafaya Utilities, Inc., is an investor owned utility providing service to approximately 4,300 customers in Seminole County, Florida. The Utility currently provides central wastewater service to five (5) different developments within the service area, these developments are: 1) Alafaya Woods; 2) Twin Rivers/Riverside; 3) Big Oaks; 4) Lake Rogers; and 5) Little Creek. The Little Creek development is the most recent development within the service area and is currently in the early stages of the second phase of development. Additionally, the Utility has proposed an expansion to its service area to include currently undeveloped property which is located adjacent to the existing wastewater service area. The proposed areas include the Flying Seminole Ranch property, the Live Oak PUD, the River Oaks and Estes Trust Properties, and the currently undeveloped tract of land located north of the Flying Seminole Ranch property. Figure 1-1 illustrates the location of the existing developments within the Alafaya Utilities, Inc., wastewater service area, and the proposed expansion areas. The growth potential for residential development in areas adjacent to the existing service area is very good and this Utility is expected to continue to grow well into the late 1990's and beyond.

The Alafaya Utilities Regional WWTP has a permitted treatment capacity of 2.4 MGD, and permitted effluent disposal capacity of 1.325 MGD. The WWTP has tertiary treatment facilities and is currently permitted to dispose of 0.325 MGD of reclaimed water for spray irrigation at the Ekana Golf Course. The percolation ponds for the Alafaya Utilities Regional WWTP, which are located on the south side of Mitchell Hammock Road, are permitted for 1.0 MGD of effluent disposal capacity.



HARTMAN & ASSOCIATES, INC.
engineers, hydrogeologists, surveyors & management consultants
201 EAST PINE STREET – SUITE 1000 – ORLANDO, FL 32801
TELEPHONE (407) 539-3955 – FAX (407) 539-3790

ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
EXISTING SERVICE AREA AND
PROPOSED SERVICE AREA EXTENSION

FIGURE 1-1

Although the capacity of Alafaya Utilities Regional WWTP reclaimed water facilities is approximately 0.500 MGD, an evaluation of the facility improvements necessary to increase reclaimed water service within the existing and proposed service areas is included. It is anticipated that the permitted reclaimed water disposal capacity of the Ekana Golf Course will be reduced from 0.325 MGD to 0.100 MGD on an annual average basis upon issuance of the renewed FDEP Operating Permit.

1.3 SCOPE OF SERVICES

The scope of services for this study is to develop a plan to expand the WWTP reclaimed water treatment capacity, transmission and distribution facilities to provide additional reclaimed water supply. The following tasks were completed:

1. Evaluate the existing WWTP facilities' ability to produce reclaimed water for use in the existing and proposed service areas.

2. Evaluate the required WWTP facilities improvements and expansions to produce additional reclaimed water for use in the existing and proposed service areas.

3. Identify, quantify and evaluate non-potable water demands within the current service area and provide reclaimed water service.

4. Estimate the capital and operation and maintenance (O&M) costs associated with reclaimed water production and supply, such as chemical usage, manpower, repair costs and replacement costs.

5. Based on the evaluation, recommend an improvements program for reuse facilities to provide additional reclaimed water supply.

SECTION 2

SECTION 2
SERVICE AREA BACKGROUND

2.1 EXISTING SERVICE AREA HISTORY

Currently, the Alafaya Utilities Regional Wastewater Treatment Plant (WWTP) provides wastewater service to approximately 4,300 residential and commercial customers. Due to the Alafaya Utilities Regional WWTP being the sole wastewater utility in a high growth corridor, the wastewater service area has been expanded five times in order to match the wastewater service needs of the community. As previously discussed, the existing wastewater service area includes the Alafaya Woods Planned Unit Development (PUD), Little Creek PUD, Twin Rivers PUD, Big Oaks subdivision, Lake Rogers subdivision, The Ekana Green subdivision, Alafaya Woods Shopping Center and other small commercial tracts. Proposed future expansion of the existing wastewater service area may include property adjacent to the existing service area boundary, such as the Flying Seminole Ranch property, the Live Oak PUD, the River Oaks and Estes Trust properties, and the currently undeveloped tract of land located north of the Flying Seminole Ranch property. The current wastewater service area for the Alafaya Utilities Regional WWTP was illustrated previously in Figure 1-1. The following subsections provide a brief description of the developments served within the existing Alafaya wastewater service area.

2.1.1 Alafaya Woods

Alafaya Woods was the first area to be developed within the Alafaya Utilities, Inc., wastewater service area. Phase I of the Alafaya Woods development was begun in 1985 and consisted of 304 residential lots. There are currently 22 phases permitted for construction in Alafaya Woods consisting of 2,497 residential lots. The Alafaya Woods development also incorporates various commercial areas as well. These include Stenstrum Elementary School, two (2) lots reserved for future utility development, four (4) office lots, two commercial lots including the Alafaya Woods Shopping Center, three day care centers, a cemetery, an effluent disposal site, and several acres of greenspace. Alafaya Woods also has a multi-family community within its development boundaries. This is the Alafaya Woods Apartments which consists of 296 units. Table 2-1 presents the FDEP permitted phases within the Alafaya Woods community which have been constructed.

TABLE 2-1
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
ALAFAYA WOODS BUILDOUT SUMMARY

Description	Units
Phase I	304
Phase II	154
Phase III	126
Phase IV	129
Phase V	127
Phase VI	99
Phase VII	101
Phase VIII	88
Phase IX	83
Phase X	99
Phase XI	68
Phase XII-A	61
Phase XII-B	40
Phase XIII	0
Phase XIV	38
Phase XV	41
Phase XVI	76
Phase XVII	84
Phase XVIII	94
Phase XIX	108
Phase XX (Apartments)	296
Phase XXI	210
Phase XXII	71
TOTAL	**2,497**

2.1.2 Little Creek

Little Creek is the most recent development within the Alafaya Utilities, Inc., wastewater service area. The Little Creek development was originally permitted in 1990 for 449 residential lots. Little Creek was permitted as a five (5) phase PUD. As previously mentioned, there are 449 permitted lots within the Little Creek development. However, only 91 of these lots are currently accessible by improved roads or in other words, which have been developed. The Little Creek development contains no commercial areas and is zoned completely residential. It is the southern most development within the Alafaya Utilities, Inc., wastewater service area. The permitted phases for the Little Creek development are shown in Table 2-2. Little Creek phases 2 through 5 are now owned by Continental Illinois S & L and are currently being marketed for development.

2.1.3 Twin Rivers

The Twin Rivers Development of Regional Impact (DRI) Phase I subdivision was initially constructed in 1987 and consists of 113 residential lots. There are currently nine (9) sections permitted for construction within Twin Rivers. Sections 8 and 9, which consist of 786 lots, are presently and hereinafter referred to as Riverside. It is noted that Twin Rivers Phase 1 had reclaimed water infrastructure installed at the time of construction in 1989. The total number of lots allocated to Twin Rivers, including Riverside, is 2,274 lots. The Twin Rivers development also includes some commercial areas as well. These include Partin Elementary School, a Municipal Complex (Riverside Park), miscellaneous commercial lots including a Winn Dixie shopping complex, and a conservation tract. Table 2-3 shows the permitted development types and phases within the Twin Rivers community. Also included in the Twin Rivers DRI is the Ekana Green subdivision, formerly known as the Colony. The subdivision is currently being constructed and consists of 82 lots. At this time, all of the wastewater and reclaimed water infrastructure for the Ekana Green Subdivision is complete. In addition, the Ekana Green Subdivision is being constructed with service connections for reclaimed water at each home site.

2.1.4 Big Oaks

The Big Oaks subdivision was started in 1987 and lies directly adjacent to Mitchell Hammock Road. It is a single phase development consisting of 47 permitted lots. The Big Oaks subdivision is near build-out with 44 of the 47 lots developed. There are no commercial tracts within the Big Oaks subdivision.

TABLE 2-2
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
LITTLE CREEK PLANNED BUILDOUT SUMMARY

Description	Acreage	Units
Phase I	37.10	91
Phase II	40.40	118
Phase III	38.80	127
Phase IV	85.08	98
Phase V	16.12	18
TOTAL	**217.50**	**449**

TABLE 2-3
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
TWIN RIVERS BUILDOUT SUMMARY

Description	Acreage	Units
Phase I	33.56	113
Phase II	35.00	201
Phase IIA	9.38	60
Phase IIIA	45.50	153
Phase III	71.34	219
Phase IV-1	42.55	137
Phase IV-2	24.27	83
Phase V	34.07	103
Phase VI	57.73	181
Phase VII	42.65	140
Phase VIII (Riverside)		394
Phase IX (Riverside)		388
Phase X (The Colony)	17.00	82
Model Center		17
Commercial		1
Municipal Complex (Riverside Park)		1
School		1
Conservation		0
TOTAL		**2,274**

2.1.5 Lake Rogers

The Lake Rogers subdivision was started in 1989 and also lies directly adjacent to Mitchell Hammock Road. It is a single phase development consisting of 86 permitted lots. The Lake Rogers subdivision is also near build-out with approximately 70 completed lots receiving wastewater service. There are no commercial tracts within the Lake Rogers subdivision.

2.2 FUTURE SERVICE AREA

The proposed expansion of the Alafaya WWTP service area includes the extension of the existing wastewater service area boundary to include adjacent properties such as the Flying Seminole Ranch, the Live Oak PUD, the River Oaks and Estes Trust properties, and the currently undeveloped tract of land located north of the Flying Seminole Ranch property. By extending the existing Alafaya service area boundary to include these properties, it is estimated that the Utility could provide wastewater service to another potential 5,700 residential units. The following subsections provide a brief description of the areas are anticipated to be included in the proposed Alafaya service area. Alafaya Utilities has previously filed an application to the FPSC to amend its certificated service area to include the following properties.

2.2.1 Flying Seminole Ranch Property

The approximate location of the Flying Seminole Ranch property is north of State Road 419. The Flying Seminole Ranch property is approximately 742 acres of predominantly undeveloped land. Extension of the existing Alafaya wastewater service area to include the Flying Seminole Ranch property could potentially provide wastewater service to an estimated additional 1,300 residential units.

2.2.2 Live Oak PUD

The Live Oak PUD property is located approximately to the east, and south of the existing Alafaya wastewater service area, adjacent to the existing Riverside subdivision. The Live Oak PUD property is approximately 1,050 acres of currently undeveloped land. Extension of the existing Alafaya wastewater service area to include the Live Oak PUD property could potentially provide wastewater service to an estimated additional 1,000 residential units.

2.2.3 River Oaks and Estes Trust Properties

The approximate location of the River Oaks and Estes Trust properties are north of State Road 419, south of State Road 426, and west of the Econlockhatchee River. The River Oaks and Estes Trust properties are approximately 866 acres of predominantly undeveloped land. Extension of the existing Alafaya wastewater service area to include the River Oaks and Estes Trust properties could potentially provide wastewater service to an estimated additional 800 residential units.

2.2.4 Land Parcel Adjacent to the Flying Seminole Ranch

The approximate location of the land parcel in question is directly north of the Flying Seminole Ranch property, north of Willingham Road, and south and east of the Econlockhatchee River. The land parcel in question is approximately 1,388 acres of predominantly undeveloped land. Extension of the existing Alafaya wastewater service area to include the land parcel as described could potentially provide wastewater service to an estimated additional 2,500 residential units.

2.3 SUMMARY

The above areas that have been specifically identified for future service are directly adjacent to the current service area and will provide the sewage flow to fully utilize the capacity of the existing facilities. Extension of the service area is expected to be accomplished in an efficient and cost-effective manner as required by future development needs. Alafaya Utilities has previously filed an application to the Florida Public Service Commission (FPSC) to amend its certificated service area to include the above referenced properties. The WWTP was designed and constructed for 2.40 MGD to provide regional capacity for these areas.

SECTION 3

SECTION 3
EXISTING WASTEWATER TREATMENT FACILITIES

3.1 INTRODUCTION

Alafaya Utilities, Inc., began providing service in 1986 after the construction of facilities in 1985. They have completed several phased expansions of their facilities since that time to their current capacity. Attached is Table 3-1 which is a summary of the construction and operating permits for Alafaya Utilities, Inc., (formerly Oviedo Utilities, Inc.) that have been issued by the FDEP since its inception.

The raw wastewater flows from the gravity collection mains into wastewater pump station wet wells. There are currently 19 wastewater pump stations that the utility owns and maintains. All wastewater pump stations include a concrete wet well, two submersible pumps along with mercury float switches and necessary controls, piping, valve vault and emergency generator receptacles. The wastewater pump stations transmit wastewater through a series of force mains and gravity lines which ultimately deliver the raw wastewater to the centrally located wastewater treatment plant. There are approximately 31,430 feet of force mains all of which are PVC and vary in diameter from 4 inches to 16 inches.

Raw wastewater enters the WWTP by gravity into one of two master pump stations, one of which is located at the wastewater treatment plant site. Raw wastewater is also brought on-site via a 16-inch forcemain from the other pump station in the Twin Rivers/Riverside developments, and an 8-inch forcemain from the northeast portion of the Alafaya Woods development and the Lake Rogers development. Flow from the on-site master pump station and the off-site master pump station is then split into three (3) separate flow equalization tanks.

3.2 FLOW CHARACTERISTICS

The flow characteristics of a wastewater system consist of both qualitative and quantitative components. The qualitative components consist of the constituents, such as, $CBOD_5$, total suspended solids (TSS), nitrates (NO_3-N), as well as others. The quantitative components consist of the historical flow data measured at the WWTP.

TABLE 3-1
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
SUMMARY OF SIGNIFICANT FDEP PERMITS

Permit Number	Issued	Expires	Description
DC 59-86015	06/29/84	10/15/85	**Construct**: A 0.095 MGD step aeration, activated sludge wastewater treatment plant with disinfection by chlorination and effluent disposal to groundwater via a two (2) cell percolation pond with an area of 52,500± square feet. Construction also includes the master pump station, effluent pump station, effluent force main and associated appurtenances.
DC 59-99550	08/20/85	07/15/87	**Construct**: Modifications necessary to expand the existing facility to a 0.350 MGD step aeration sewage treatment facility. The expansion shall consist of a surge tank and 4 new percolation ponds for a total of 6 percolation ponds with a total area of 157,500 square feet.
DC 59-109932	06/26/86	05/15/88	**Construct**: Modify and expand the existing 0.350 MGD wastewater treatment plant to a 1.2 MGD step aeration wastewater treatment plant with flow equalization, disinfection by chlorination and effluent disposal to groundwater via ten (10) percolation ponds with a total area of 867,550± square feet (five (5) existing ponds -157,500± square feet and five (5) new ponds -719,050± square feet). Effluent disposal is rated at 1.2 MGD.
DC 59-133200	06/25/87	05/15/88	**Construct**: Two (2) percolation ponds with an area of 178,200± square feet each (356,400± square feet total) with a design capacity of 0.40 MGD. These two (2) ponds along with the ten (10) ponds authorized by prior permits will have a total design capacity of 1.6 MGD

TABLE 3-1 (Continued)
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
SUMMARY OF SIGNIFICANT FDEP PERMITS

Permit Number	Issued	Expires	Description
DC 59-134402	07/15/87	12/15/88	**Construct**: A 0.448 MGD wastewater effluent disposal system consisting of a sealed, 8 day capacity, wet weather holding pond and spray irrigation system for the Twin Rivers Golf Course - 114± acres wetted area (175± acres including buffer zones). Planned modifications of the Alafaya wastewater treatment plant to produce effluent suitable for disposal in areas with public access is not a part of this permit.
DC 59-142108	04/16/88	04/15/91	**Construct**: Modify and expand the existing 1.2 MGD wastewater treatment plant to a 2.4 MGD dual train step aeration wastewater treatment plant with flow equalization, disinfection by chlorination and reclaimed water discharge to groundwater via 12 percolation ponds with a total design capacity of 1.6 MGD and via spray irrigation of the Twin Rivers Golf Course - design capacity 0.448 MGD.
DC 59-153085	01/19/89	04/15/91	**Construct**: A 0.035 MGD reclaimed water reuse system consisting of a reuse pump station and 2,600± LF of 8 inch PVC reclaimed water force main from the pump station to the existing irrigation distribution system at Twin Rivers Section I for spray irrigation of 12.3± acres of residential lawns and landscaped areas with reclaimed water from the Alafaya wastewater treatment plant.
DO 59-175856	05/11/90	03/01/95	**Operate**: A 2.4 MGD design capacity dual train step aeration wastewater treatment facility, with flow equalization, 0.5 MGD tertiary filtration and a reject water holding tank. The disinfected reclaimed water is discharged to ground water via spray irrigation of the Twin Rivers Golf Course, with a design capacity of 0.448 MGD and no discharge to surface waters.

3.2.1 Historical Wastewater Quality

The review of the historical wastewater characteristics includes water quality data of the wastewater influent and effluent. Historical influent and effluent wastewater quality data was obtained from the Alafaya Utilities Regional WWTP monthly operating reports for the period of March 1992 to December 1995.

A summary of the influent wastewater characteristics including $CBOD_5$ and TSS monthly average concentrations is presented in Table 3-2. A summary of the effluent quality from the secondary treatment units prior to filtration is provided in Table 3-3. Included in Table 3-4 is a summary of the effluent quality data after filtration and chlorination. The quality data that is included in Table 3-4 characterizes the effluent that is discharged as reclaimed irrigation water at the Ekana Golf Course. A review of the effluent data from the facility indicated that during the study period, the effluent five (5) day carbonaceous biochemical oxygen demand ($CBOD_5$) and total suspended solids (TSS) for both the percolation pond effluent and reuse effluent to the golf course following filtration and chlorination consistently met the permit requirements.

3.2.2 Historical Wastewater Quantity

This subsection presents historical wastewater flows, as well as influent wastewater flow variability. Historical wastewater flow data for the Alafaya Utilities Regional WWTP was obtained for the period from March 1992 through December 1995 from the FDEP monthly operating reports. This historical data includes annual average daily flow (AADF), three (3) consecutive monthly average daily flow (TMADF), monthly average daily flow (MADF), maximum day average daily flow (MDADF) and maximum month average daily flow (MMADF). A summary of the wastewater flows, including MADF, TMADF, MDADF and the maximum day peaking factors are presented in Table 3-5. A review of the influent wastewater flow data was performed to indicate the magnitude and trend of the influent wastewater flows that the Alafaya Utilities Regional WWTP has experienced historically. The historical MMADF, AADF and maximum month peaking factor are summarized in Table 3-6 for the Alafaya Utilities Regional WWTP. A review of the maximum month average daily flows indicates that there is a general increasing trend. Presented in Table 3-7 are the effluent flows to the percolation ponds and the reuse flows which have been produced for irrigation at the Ekana Golf Course for the same period.

TABLE 3-2
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
HISTORICAL INFLUENT QUALITY

Month/Year		$CBOD_5$ (mg/l)	TSS (mg/l)
March	1992	152	163
April	1992	180	171
May	1992	176	158
June	1992	204	148
July	1992	193	161
August	1992	199	171
September	1992	199	153
October	1992	176	151
November	1992	191	161
December	1992	231	179
January	1993	215	185
February	1993	185	176
March	1993	205	178
April	1993	198	162
May	1993	163	169
June	1993	156	127
July	1993	149	179
August	1993	142	188
September	1993	306	177
October	1993	161	173
November	1993	135	124
December	1993	163	177
January	1994	187	170
February	1994	160	172
March	1994	158	124
April	1994	150	124
May	1994	155	108
June	1994	171	129
July	1994	217	174
August	1994	119	87
September	1994	114	86
October	1994	200	151
November	1994	223	146
December	1994	257	199
January	1995	217	200
February	1995	216	184
March	1995	308	253
April	1995	221	206
May	1995	208	174
June	1995	225	174
July	1995	184	192
August	1995	173	181
September	1995	200	192
October	1995	160	171
November	1995	162	151
December	1995	162	169
Average		187	164

TABLE 3-3
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
HISTORICAL EFFLUENT QUALITY
(Prior to Filtration)

Month/Year		$CBOD_5$ (mg/l)	TSS (mg/l)
March	1992	1.5	4.3
April	1992	4.0	5.0
May	1992	4.5	2.2
June	1992	8.7	3.1
July	1992	6.8	3.0
August	1992	14.5	7.0
September	1992	15.3	2.6
October	1992	11.0	16.0
November	1992	7.5	2.8
December	1992	10.6	6.8
January	1993	8.2	3.7
February	1993	8.2	3.2
March	1993	8.5	6.2
April	1993	6.4	4.2
May	1993	8.3	3.3
June	1993	9.5	3.8
July	1993	6.4	6.0
August	1993	2.8	4.5
September	1993	2.4	2.4
October	1993	1.7	2.3
November	1993	3.1	3.3
December	1993	1.6	2.2
January	1994	1.7	2.7
February	1994	1.5	2.0
March	1994	1.0	1.0
April	1994	1.0	1.0
May	1994	1.0	1.0
June	1994	1.0	1.0
July	1994	1.0	1.0
August	1994	1.2	1.0
September	1994	4.4	3.3
October	1994	4.9	2.0
November	1994	4.9	3.3
December	1994	5.5	3.6
January	1995	9.2	5.5
February	1995	4.4	3.8
March	1995	2.7	2.3
April	1995	2.8	2.4
May	1995	1.8	1.6
June	1995	1.7	2.2
July	1995	2.6	2.2
August	1995	2.4	1.4
September	1995	3.1	3.8
October	1995	1.7	1.7
November	1995	1.1	1.6
December	1995	1.6	1.5
Average		4.7	3.2

TABLE 3-4
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
HISTORICAL EFFLUENT QUALITY
(After Filtration and Chlorination)

Month/Year		$CBOD_5$ (mg/l)	TSS (mg/l)
March	1992	1.2	1.0
April	1992	1.7	1.1
May	1992	1.1	1.9
June	1992	1.6	1.8
July	1992	4.4	1.5
August	1992	5.0	1.2
September	1992	N/A	N/A
October	1992	1.3	1.0
November	1992	4.7	2.0
December	1992	11	1.0
January	1993	N/A	N/A
February	1993	8.0	1.8
March	1993	6.2	2.0
April	1993	5.0	1.3
May	1993	5.0	1.3
June	1993	6.0	1.9
July	1993	2.7	1.2
August	1993	2.8	4.5
September	1993	N/A	N/A
October	1993	1.0	3.8
November	1993	1.4	3.4
December	1994	1.4	1.6
January	1994	1.7	2.6
February	1994	2.3	1.0
March	1994	1.0	1.3
April	1994	1.0	1.0
May	1994	1.0	1.0
June	1994	1.0	1.0
July	1994	1.0	1.0
August	1994	N/A	N/A
September	1994	3.4	1.4
October	1994	4.2	2.0
November	1994	2.8	1.6
December	1995	N/A	N/A
January	1995	N/A	1.0
February	1995	3.3	2.1
March	1995	2.8	2.1
April	1995	2.6	2.0
May	1995	2.4	2.0
June	1995	1.3	2.2
July	1995	1.8	1.6
August	1995	1.5	2.1
September	1995	1.0	1.3
October	1995	1.0	1.3
November	1995	1.0	1.3
December	1995	1.0	1.4
Average		2.8	1.7

TABLE 3-5
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
PLANT MONTHLY FLOW DATA

Month/Year	Monthly Average Daily Flow (MGD)	Three-Month Average Daily Flow (MGD)	Maximum Day Average Daily Flow (MGD)	Maximum Day Peaking Factor MDADF/AADF
March, 1992	0.648	0.636	0.750	1.12
April, 1992	0.679	0.662	0.859	1.29
May, 1992	0.678	0.668	0.748	1.12
June, 1992	0.674	0.677	0.803	1.20
July, 1992	0.667	0.673	0.803	1.20
August, 1992	0.754	0.698	0.910	1.36
September, 1992	0.670	0.697	0.794	1.19
October, 1992	0.689	0.704	0.886	1.33
November, 1992	0.667	0.675	0.792	1.19
December, 1992	0.629	0.662	0.714	1.07
January, 1993	0.681	0.659	0.773	1.05
February, 1993	0.696	0.669	0.798	1.08
March, 1993	0.714	0.697	0.792	1.07
April, 1993	0.734	0.715	0.864	1.17
May, 1993	0.738	0.729	0.799	1.08
June, 1993	0.701	0.724	0.775	1.02
July, 1993	0.750	0.730	0.856	1.16
August, 1993	0.780	0.744	0.917	1.24
September, 1993	0.758	0.763	0.904	1.23
October, 1993	0.771	0.770	0.883	1.20
November, 1993	0.770	0.766	0.882	1.20
December, 1993	0.754	0.765	0.817	1.11
January, 1994	0.759	0.761	0.874	1.10
February, 1994	0.760	0.758	0.907	1.14
March, 1994	0.769	0.763	0.887	1.12
April, 1994	0.779	0.769	0.842	1.06
May, 1994	0.796	0.781	0.884	1.11
June, 1994	0.806	0.794	0.945	1.19
July, 1994	0.797	0.800	0.928	1.17
August, 1994	0.815	0.806	0.964	1.21
September, 1994	0.811	0.808	1.042	1.31
October, 1994	0.805	0.810	0.945	1.19
November, 1994	0.835	0.817	1.139	1.43
December, 1994	0.802	0.814	0.954	1.20
January, 1995	0.758	0.798	0.868	1.08
February, 1995	0.742	0.767	0.883	1.10
March, 1995	0.781	0.760	0.890	1.10
April, 1995	0.801	0.775	0.905	1.12
May, 1995	0.776	0.786	0.883	1.10
June, 1995	0.780	0.786	0.947	1.17
July, 1995	0.793	0.783	0.991	1.23
August, 1995	0.890	0.821	1.235	1.53
September, 1995	0.850	0.844	1.033	1.28
October, 1995	0.885	0.875	1.047	1.30
November, 1995	0.807	0.847	0.975	1.21
December, 1995	0.800	0.831	0.905	1.13

TABLE 3-6
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
HISTORICAL WASTEWATER FLOW DATA

Year	Maximum Month Average Daily Flow (MGD)	Annual Average Daily Flow (MGD)	Maximum Month Peaking Factor MMADF/AADF
1992[1]	0.754	0.668	1.129
1993	0.780	0.737	1.058
1994	0.835	0.795	1.051
1995	0.890	0.806	1.104
Average			**1.086**

Notes:
(1) Data for 1992 includes that from March through December.

TABLE 3-7
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
SUMMARY OF FLOWS

Month/Year	WWTP Influent ADF (MGD)	Percolation Pond Influent ADF (MGD)	Reuse System Influent ADF (MGD)
March 1992	0.648	0.626	0.140
April 1992	0.679	0.551	0.221
May 1992	0.678	0.400	0.278
June 1992	0.674	0.595	0.079
July 1992	0.667	0.393	0.274
August 1992	0.754	0.700	0.054
September 1992	0.670	0.616	0.054
October 1992	0.689	0.635	0.054
November 1992	0.667	0.566	0.101
December 1992	0.629	0.615	0.014
January 1993	0.681	0.681	0.000
February 1993	0.696	0.640	0.056
March 1993	0.714	0.642	0.072
April 1993	0.734	0.612	0.122
May 1993	0.738	0.373	0.365
June 1993	0.701	0.465	0.236
July 1993	0.750	0.722	0.028
August 1993	0.780	0.692	0.088
September 1993	0.758	0.758	0.000
October 1993	0.771	0.715	0.056
November 1993	0.770	0.698	0.072
December 1993	0.754	0.667	0.087
January 1994	0.759	0.752	0.007
February 1994	0.760	0.719	0.041
March 1994	0.769	0.669	0.100
April 1994	0.779	0.581	0.198
May 1994	0.796	0.549	0.247
June 1994	0.806	0.702	0.104
July 1994	0.797	0.663	0.134
August 1994	0.815	0.815	0.000
September 1994	0.811	0.727	0.084
October 1994	0.805	0.775	0.030
November 1994	0.835	0.753	0.082
December 1994	0.802	0.802	0.000
January 1995	0.758	0.730	0.028
February 1995	0.742	0.670	0.072
March 1995	0.781	0.617	0.164
April 1995	0.801	0.620	0.181
May 1995	0.776	0.523	0.253
June 1995	0.780	0.565	0.215
July 1995	0.793	0.728	0.065
August 1995	0.890	0.820	0.070
September 1995	0.850	0.825	0.255
October 1995	0.885	0.830	0.055
November 1995	0.807	0.609	0.198
December 1995	0.800	0.715	0.085

3.3 WASTEWATER TREATMENT FACILITIES

The following subsections provide a detailed description of each of the unit processes and treatment facilities in the existing treatment plant. As previously indicated, the current flow records indicate that the plant is treating approximately 0.800 million gallons per day (MGD) average daily flow (ADF) and 0.831 MGD three-month average daily flow (TMADF). Summarized in Table 3-8 is the design criteria for the existing facilities at the Alafaya Utilities Regional WWTP. Illustrated in Figure 3-1 is the existing site plan for the Alafaya Utilities Regional WWTP.

3.3.1 Pretreatment

The purpose of preliminary treatment is to remove large or heavy solids and inorganic materials from the wastewater which might otherwise damage or impede the performance of downstream equipment and/or treatment processes. The bar rack removes larger solids by screening, and the grit chamber provides for the removal of inorganic solids, such as sand and gravel.

The raw wastewater is pumped into three (3) separate flow equalization tanks each of which is aerated by four (4) positive displacement type blowers adjacent to the tanks. The approximate dimensions and volumes of these flow equalization tanks are shown in Table 3-8. The total flow equalization volume is approximately 211,000 gallons. Each flow equalization tank is aerated and has a manual bar screen in the influent box to remove rags and large objects.

3.3.2 Aeration

The primary objectives to the treatment of domestic sewage are to coagulate and remove the nonsettleable colloidal solids and to stabilize the organic matter. In the aeration process, dissolved oxygen (DO) is added to the basin to support the microbial activity used to decompose and stabilize the organics in the raw influent of domestic sewage.

From the flow equalization tanks, raw wastewater is pumped to one (1) or both of two (2) separate biological treatment units lying adjacent to each other at the site utilizing three (3) transfer pumps. Both of the wastewater secondary treatment units are similar in size and process flow. The raw wastewater is pumped into an influent box at the top of the plant where it passes through a bar screen and then into a peripheral launder which allows the raw wastewater to be fed at several different locations around the concentric aeration basin.

TABLE 3-8
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
EXISTING DESIGN CRITERIA

I.	FLOWS			
	A.	Design Average Day (ADF)		2.4 MGD
	B.	Design Peak Hour:		4.8 MGD
	C.	Design average influent concentrations		
		1. BOD:		200 mg/l
		2. Suspended Solids:		220 mg/l
II.	PRETREATMENT			
	A.	Influent pipes		
		1. Number:		Three (3)
	B.	Screening		
		1. Manually cleaned bar rack		
		a. Number:		Three (3)
		b. Width of openings:		1-inch
	C.	Flow Equalization Tank #1		
		1. Approximate Diameter:		20 ft.
		2. Approximate Working SWD:		10 ft.
		3. Approximate Volume:	3,142 cu. ft. =	23,500 gal.
	D.	Flow Equalization Tank #2		
		1. Approximate Diameter:		30 ft.
		2. Approximate Working SWD:		12 ft.
		3. Approximate Volume:	8,482 cu. ft. =	63,500 gal.
	E.	Flow Equalization Tank #3		
		1. Approximate Diameter:		40 ft.
		2. Approximate Working SWD:		13.2 ft.
		3. Approximate Volume:	16,588 cu. ft. =	124,000 gal.
III.	WEST WWTP AERATION			
	A.	Number of aeration tanks:		Two (2)
	B.	Water depth		14.7 feet
	C.	Tank 1 volume:		251,420 gal
	D.	Tank 2 volume:		358,410 gal
	E.	Total volume:		609,830 gal
	F.	Design solids retention time:		9 days
	G.	Design MLSS concentration:		2,600 mg/l
	H.	Detention time at ADF:		12.2 hours

TABLE 3-8 (Cont.)
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
EXISTING DESIGN CRITERIA

IV.	EAST WWTP AERATION	
	A. Number of basins:	Two (2)
	B. Water depth	14.7 feet
	C. Tank 1 volume:	291,709 gal
	D. Tank 2 volume:	350,189 gal
	E. Total volume:	641,898 gal
	F. Design solids retention time:	9 days
	G. Design MLSS concentration:	2,600 mg/l
	H Detention time at ADF:	12.5 hours
V.	WEST WWTP CLARIFICATION	
	A. Number of Units:	One (1)
	B. Dimensions	
	1. Diameter:	50.5 feet
	2. Average water depth:	13.7 feet
	3. Total volume:	27,380 cf
	4. Total volume:	204,806 gal
	5. Total surface area:	2,000 sf
	C. Detention time	
	1. @ ADF:	4.1 hours
	2. @ MDF:	2.0 hours
	D. Overflow rate	
	1. @ ADF:	600 gpd/sf
	2. @ MDF:	1,200 gpd/sf
	E. Total weir length:	120 feet
	F. Weir loading rate	
	1. @ ADF:	10,000 gpd/ft
	2. @ MDF:	20,000 gpd/ft
VI.	EAST WWTP CLARIFICATION	
	A. Number of Units:	One (1)
	B. Dimensions	
	1. Diameter:	50.5 feet
	2. Average water depth:	13.17 feet
	3. Total volume:	26,360 cf
	4. Total volume:	197,165 gal
	5. Total surface area:	2,000 sf

TABLE 3-8 (Cont.)
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
EXISTING DESIGN CRITERIA

C.	Detention time	
	1. @ ADF:	3.9 hours
	2. @ MDF:	2.0 hours
D.	Overflow rate	
	1. @ ADF:	500 gpd/sf
	2. @ MDF:	1,200 gpd/sf
E.	Total weir length:	120 feet
F.	Weir loading rate	
	1. @ ADF:	10,000 gpd/ft
	2. @ MDF:	20,000 gpd/ft
VII.	DISINFECTION	
A.	Chlorine contact tank in West WWTP	
	1. Number of units:	One (1)
	2. Dimensions	
	a. Area:	293 sf
	b. Average water depth:	11.8 feet
	3. Total volume:	3,460 cf
	4. Total volume:	25,880 gal
	5. Detention time	
	a. @ ADF:	30 min
	b. @ MDF:	15 min
B.	Chlorine contact tank in East WWTP	
	1. Number of units:	One (1)
	2. Dimensions	
	a. Area:	274 sf
	b. Average water depth:	12.2 feet
	3. Total volume:	3,342 cf
	4. Total volume:	25,000 gal
	5. Detention time	
	a. @ ADF:	30 min
	b. @ MDF:	15 min
C.	Public access chlorine contact tank	
	1. Number of units:	One (1)
	2. Dimensions	
	a. Width:	12 feet
	b. Length:	25 feet
	c. Average water depth:	7 feet
	3. Total volume:	2,100 cf

TABLE 3-8 (Cont.)
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
EXISTING DESIGN CRITERIA

4.	Total volume:	15,708 gal
5.	Detention time	
	a. @ ADF:	45 min
	b. @ MDF:	23 min

VIII. FILTRATION

A.	Number of Units:	One (1)
B.	Number of Cells:	Three (3)
C.	Bed Dimensions	
1.	Surface Area:	180 sq. ft.
2.	Depth:	Ten (10) inches

IX. SLUDGE HOLDING AND THICKENING TANK

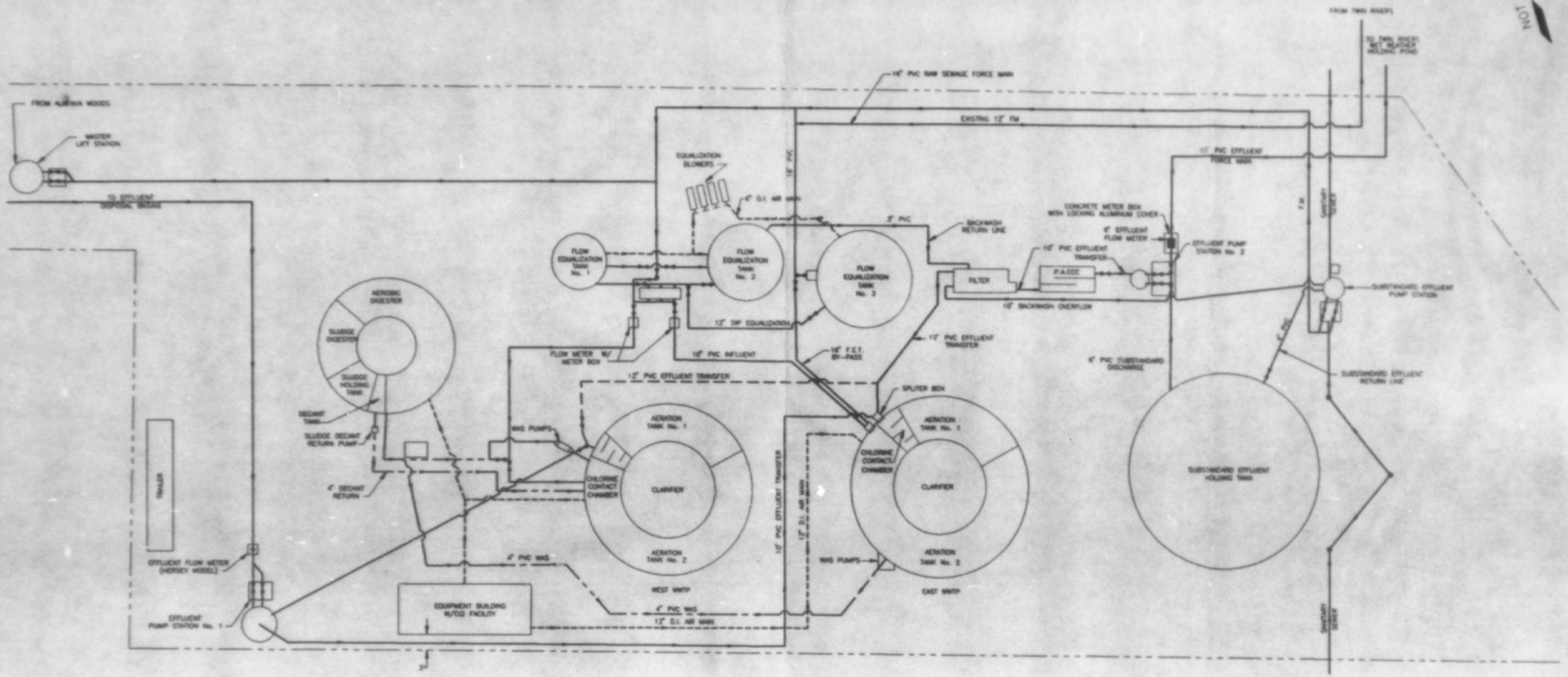
A.	Number of units:	One (1)
B.	Sidewall water depth:	15 feet
C.	Total volume:	33,480 cf
D.	Hydraulic detention time:	9.5 days

X. STANDBY POWER SOURCE

A.	Number of Units:	One (1)
B.	Type:	16 cylinder diesel engine generator
C.	Continuous power capacity:	1,200 kW

XI. SUBSTANDARD STORAGE

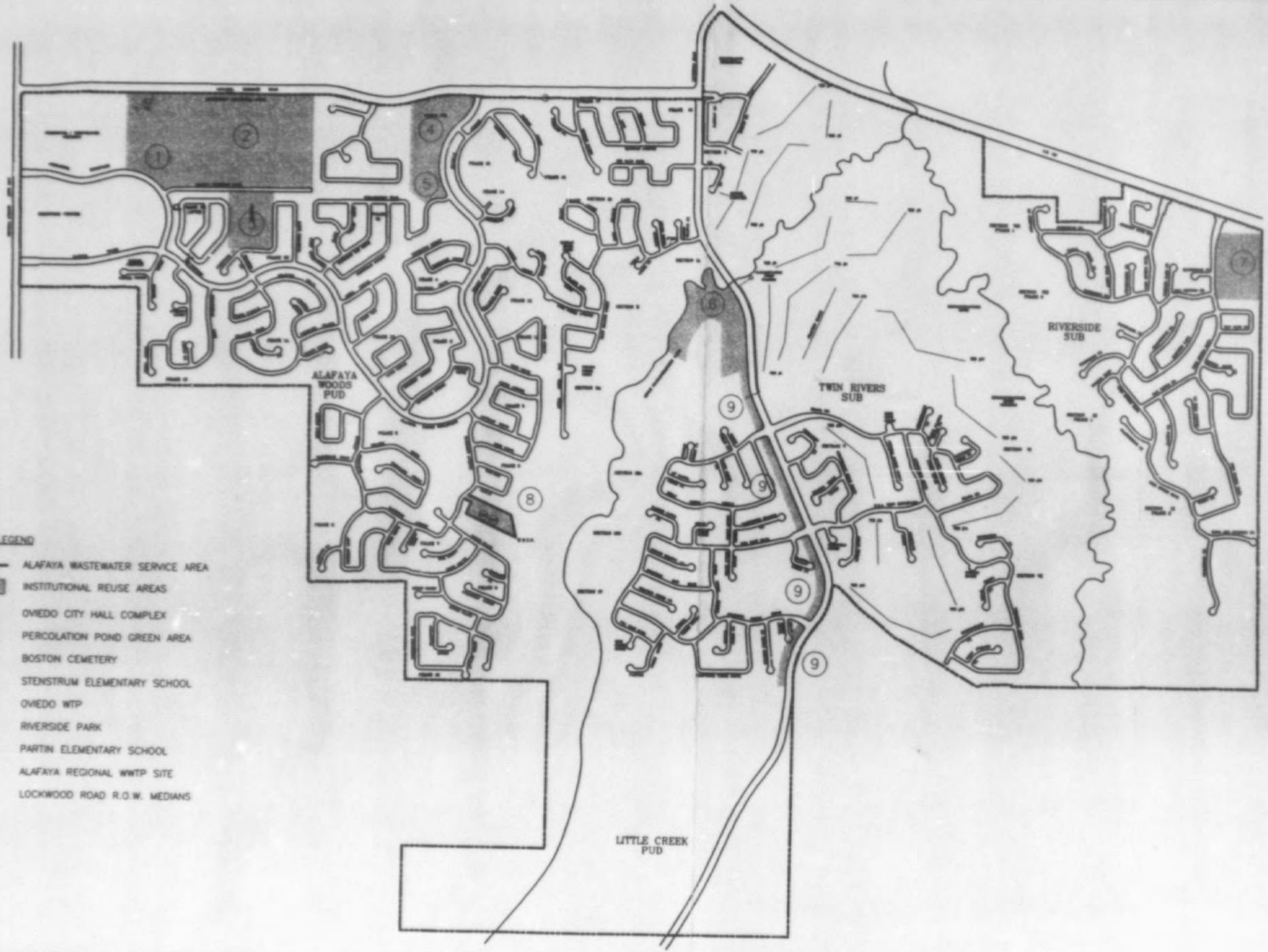
A.	Number of Units:	One (1)
B.	Volume:	1,515,000 gal
C.	Dimensions	
1.	Diameter:	116 feet
2.	Depth:	19 feet



HARTMAN & ASSOCIATES, INC.
engineers, hydrogeologists, surveyors & management consultants
201 EAST PINE STREET – SUITE 1000 – ORLANDO, FL 32801
TELEPHONE (407) 839-3955 – FAX (407) 839-3790

ALAFAYA REGIONAL WWTP
WASTEWATER REUSE STUDY
EXISTING SITE PLAN AND FLOW DIAGRAM

FIGURE 3-1



HARTMAN & ASSOCIATES, INC.
engineers, hydrogeologists, surveyors & management consultants
201 EAST PINE STREET - SUITE 1000 - ORLANDO, FL 32801
TELEPHONE (407) 839-3955 - FAX (407) 839-3790

ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
INSTITUTIONAL DEMAND AREAS

FIGURE 5-1

Each treatment unit consists of a concentric aeration basin with a sidewater depth of approximately 15 feet and a total volume of approximately 642,000 gallons. Each aeration basin is divided into two tanks with hydrostatic divider walls for use in modifying the process flow. Each treatment unit has individual drop pipes extending down into the aeration basin from an overhead air line on the perimeter wall of the internal clarifier. The diffused aeration system consist primarily of 2 inch drop lines extending into the mixed liquor solution with coarse bubble stainless steel diffusers on the ends of the laterals to the drop pipes. The incoming raw wastewater is mixed with the recycled activated sludge drawn from the bottom of the internal clarifier via an air lift located near the influent box to the aeration basin. The west WWTP aeration tank #1 volume is 251,420 gallons and has a side water depth (SWD) of 14'-8", and the tank #2 volume is 358,410 gallons. The total working volume of the west WWTP aeration basins are approximately 609,830 gallons. The east WWTP aeration tank #1 has a volume of 291,709 gallons and a SWD of 14'-8". Tank #2 has a volume of 350,189 gallons, for a total east WWTP aeration volume of 641,898 gallons. To provide the oxygen transfer and mixing for the mixed liquor suspended solids (MLSS), each basin is equipped with six (6) 75 horsepower (hp) blowers that supply air to both biological treatment units and the aerobic digester. The aeration basin was originally designed to operate at a solids retention time (SRT) of 5-15 days and at a MLSS concentration of 2,000 - 3,500 mg/l.

3.3.3 Clarification

The secondary clarifiers provide a quiescent zone for settling of the MLSS from the aeration process units. The clarified effluent flows to disinfection. Most of the settled solids are returned to the head of the treatment process as return activated sludge (RAS) to maintain the system's solids balance. In addition, a portion of the settled solids are periodically wasted to the digester to maintain a constant MLSS concentration.

The aerated mixed liquor from the annular aeration basin it is transmitted to the stilling well of the internal clarifier. From the stilling well, the mixed liquor is allowed to flow by gravity into the quiescent zone of the clarifier. The heavy sludge material settles and thickens via gravity to the bottom of the clarifier and is collected by the center pivoting sludge collection system. The clarified effluent is transmitted radially outward toward the peripheral launder with V-notch weir plates attached. The secondary treated effluent is collected in the peripheral launder and discharges through a common header to a chlorine contact basin contained in the annular portion of the treatment unit. The activated sludge is collected in a center hopper and is either air lifted

and recycled back into the aeration basin or wasted to the aerobic digester on site via external trash pumps.

There are two (2) circular clarifier basins at the Alafaya Utilities Regional WWTP. The west WWTP clarifier has a SWD of 13'-8", providing a volume of 204,806 gallons. The east WWTP clarifier has a SWD of 13'-2", providing a volume of 197,165 gallons. The clarifiers have a total surface area of 2,000 square feet (sf) and have a design overflow rate at the design average daily flow of 600 gpd/sf. The clarifiers also have a hydraulic retention time at the design average daily flow rate of approximately 3 hours. Each basin has one (1) scraper type sludge collector. The mechanism provides a continuous sludge collection assembly consisting of a collection header, risers, and bridge piping mounted on structural members and suspended on floats. Sludge is siphoned by these assemblies from the clarifier bottoms into a common sludge trough between the clarifiers, which then flows to the sludge pumps. The sludge is then recycled back to the aeration basin influent via the return activated sludge (RAS) pumps. The waste activated sludge (WAS) pumps also waste the sludge to the thickener and holding tank. The scum from the clarifiers flows to the scum pump wet well from which it also pumps to the sludge thickener and holding tank.

3.3.4 Filtration

From the internal chlorine contact basin, the clarified effluent flows by gravity to either the tertiary filters located on site or to a concrete wet well and effluent pump station to be pumped to the percolation ponds located off-site. The filtered effluent goes to the public access chlorine contact tank prior to pumping to the golf course site.

The filter uses sand filter media to remove suspended solids from the effluent. The media is approximately 10-inches deep, has an effective size of not more than 0.45 millimeters, with a maximum uniformity coefficient of 1.7. Suspended solids are separated from the media and the backwash water is pumped back to surge Tank No. 3.

3.3.5 Disinfection

The chlorine contact chamber provides a zone for the destruction of disease-causing organisms such as bacteria, viruses and anaerobic cysts. The disinfection process is typically operated by contacting the clarified effluent with a chlorine solution for a designated period of time.

The disinfection facilities at the Alafaya Utilities Regional WWTP consist of a chlorine contact basin and chlorinators. Each wastewater treatment plant has a chlorine contact chamber, and the public-access reuse system has a separate chlorine contact chamber. The west WWTP chlorine contact chamber has a sidewater depth of 11'-10", providing a volume of 25,880 gallons. It provides approximately 30 minutes of contact time at the design ADF. The east WWTP chlorine contact chamber has a SWD of 12'-2", providing a volume of 25,000 gallons. It provides approximately 30 minutes of contact time at the design ADF. The public access reuse system chlorine contact chamber is 25 feet long, 12 feet wide, and 7 feet deep, providing a volume of 15,708 gallons. Its design results in a chlorine contact time of 45 minutes.

3.3.6 Effluent Disposal

The following is a general description of the effluent disposal system for the Alafaya Utilities Regional WWTP. Alafaya Utilities, Inc., currently utilizes two (2) separate effluent disposal sites within their service area. The first site consists of twelve (12) rapid rate percolation ponds on a 67 acre parcel located on the south side of Mitchell Hammock Road near SR 434. The second site consists of slow rate public access level spray irrigation on an 18 hole golf course. The combined facilities are currently permitted for 1.325 MGD of effluent disposal, but it is anticipated that the FDEP may derate the Ekana Golf Course capacity to 0.10 MGD, reducing the overall permitted capacity of the effluent disposal system to 1.100 MGD.

3.3.6.1 Irrigation (Ekana Golf Course)

The Alafaya Utilities Regional WWTP is currently permitted to deliver 0.325 MGD of reclaimed water to the Ekana Golf Course for spray irrigation. It is anticipated that the FDEP may derate this capacity to 0.100 MGD in the near future. The reclaimed water is pumped from the effluent pump station, located adjacent to the filters and chlorine contact chamber on the plant site, to a holding pond located on the west side of Lockwood Road across from the Ekana clubhouse. The holding pond is utilized to store reclaimed water prior to irrigation of the 18 hole course. The water is pumped from the holding pond to the irrigation system by a pump station located at the holding pond site. The pump station is owned and operated by the Ekana Golf Course.

3.3.6.2 Percolation Ponds

The Alafaya Utilities Regional WWTP percolation pond effluent disposal facilities have been constructed in several phases since 1986. The first phase included construction of two (2) percolation ponds near the eastern property boundary. Four (4) additional phases of construction have been completed, each permitted by the FDEP since 1986. A total of nine (9) percolation ponds are currently permitted to dispose of 1.0 MGD. Each permit was issued with a FDEP approved Groundwater Monitoring Plan.

The percolation ponds are located approximately one mile north and 0.8 miles west of the wastewater treatment plant. The ponds range in surface area from 26,250 square feet each (Ponds 1-5) to 143,810 square feet each (Ponds 6-10) and to 178,200 square feet each (Ponds 11 and 12). The total pond surface area for the effluent disposal facilities is 1,206,700 square feet or 28 acres. Ponds 1 - 4 were recently modified to create one (1) single larger pond.

3.3.7 Sludge Holding and Thickening

The Alafaya Utilities Regional WWTP has one (1) sludge holding and thickening tank. The sludge holding and thickening tank receives a portion of the settled solids from the secondary clarifier. The thickener supernatant is returned back to the process return wet well, from which it is pumped back to the aeration basins. The tank has a diameter of 40 feet and a sidewater depth of 18 feet which equates to a total working volume of 181,700 gallons. The tank is equipped with a surface mechanical aerator to maintain aerobic conditions during sludge holding periods. The aerobic digester and the two biological treatment units are supplied air via a series of six centrifugal blowers located in a blower building adjacent to the aerobic digester.

SECTION 4

SECTION 4
PROJECTED CONDITIONS

4.1 GENERAL

The following section describes projections for wastewater flow generation for the Alafaya Utilities, Inc., wastewater service area through the year 2015.

4.2 WASTEWATER FLOW PROJECTIONS

Wastewater flow projections form the basis in the determination of the required capacity and expansion of the wastewater collection, transmission, treatment and effluent disposal facilities. It will also serve as the basis in the estimation of effluent capacity which is available to be used as reuse. The projected wastewater flow is what dictates the capital improvements program and establishes the timing of these improvements. Moreover, these improvements will be necessary in order to meet the customers' demands and meet the level of service requirements established by the Florida Public Service Commission (FPSC). Furthermore, it is recommended that the wastewater flow projections be analyzed on an annual basis and updated as necessary. Wastewater flow projections for the Alafaya Utilities wastewater system were developed using two (2) methods. Method 1 utilized a linear regression analysis of historical flows; Method 2 was based on the projected ERC flow contribution index data previously developed in the Report Titled "*Equivalent Residential Connection Flow Contribution Index Study*", Hartman & Associates, Inc., dated June, 1994.

There are three (3) specific items which have a direct influence on the quantity of wastewater that the Alafaya Utilities Regional WWTP will need to treat, which include:

- Existing and future commitments.
- Population and expansion of the wastewater collection system to areas previously not served.
- Miscellaneous (i.e., infiltration/inflow, water conservation, etc.).

The first method of flow projections was developed based on a linear regression analysis of the historical influent flow data to the plant. The annual average daily flow values for the period of

1992 to 1995 were used for this method. The assumption that this method's predictions are based on is that the Alafaya Utilities Service area will experience growth in the future comparable to that which has been experienced historically. The development potential of lands adjacent to the existing Alafaya Utilities service area further strengthens the premise of this assumption. Presented in Table 4-1 are the projected influent wastewater flows to the Alafaya Utilities Regional WWTP based on this analysis. As noted in this table, the twenty (20) year projected annual average daily flow for the planning year 2015 is approximately 1.802 MGD and is based upon providing future service in the proposed areas previously described in Section 2.2. It is noted that Alafaya Utilities has filed an application with the FPSC to incorporate these areas into its existing certificated territory.

A second method for projecting sewage flows to the Alafaya Utilities Regional WWTP was based on the projected ERC flow contribution index data previously developed in the Report "*Equivalent Residential Connection Flow Contribution Index Study*", dated June, 1994. This method of flow projection was developed by estimating the remaining Equivalent Residential Connections (ERC's) as the existing Alafaya Utilities, Inc., service area approaches build-out. The ERC's projected for each year were converted to wastewater flow quantities utilizing the FDEP approved flow index value of 175 gpd/ERC. The flow projections for Method 2 are summarized in Table 4-2. As noted in Table 4-2, the flow projections are on an annual average daily flow basis. As noted in Table 4-2, the twenty (20) year projected annual average daily flow for the planning year 2015 is approximately 1.030 MGD. It is noted that the Method 2 flow projection analysis does not include expansions within the certificated territory after December, 1995.

These two (2) methods are presented to characterize the wastewater flow increases expected at the Alafaya Utilities Regional WWTP. It is concluded that the Method 1 flow projections, which are based upon the historical growth within this service area, provide an estimation of how wastewater flow is expected to increase in this area. Additionally, it is concluded that the Method 2 projections are believed to represent the wastewater flow potential within only the existing certificated service area. As previously described in Section 3, the existing Alafaya regional wastewater treatment facilities were designed and constructed at the 2.4 MGD capacity in expectation of providing future wastewater service within the undeveloped properties adjacent to the existing service area. The existing facilities will not be utilized to their existing potential unless the service area is enlarged as originally intended. This will allow the maximum achievement of economy of scale for the benefit of both the present and future wastewater customers.

TABLE 4-1
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
WASTEWATER FLOW PROJECTIONS
(Historical Flow Based)

METHOD 1

Year	Projected Flow (AADF) (MGD)
1996	0.874
1997	0.921
1998	0.970
1999	1.018
2000	1.067
2001	1.116
2002	1.166
2003	1.215
2004	1.264
2005	1.312
2006	1.361
2007	1.411
2008	1.459
2009	1.509
2010	1.557
2011	1.606
2012	1.665
2013	1.705
2014	1.753
2015	1.802

TABLE 4-2
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
WASTEWATER FLOW PROJECTIONS

METHOD 2

Year	Projected Flow (AADF) (MGD)
1996	0.860
1997	0.869
1998	0.879
1999	0.888
2000	0.897
2001	0.906
2002	0.915
2003	0.924
2004	0.932
2005	0.941
2006	0.950
2007	0.959
2008	0.968
2009	0.977
2010	0.986
2011	0.994
2012	1.003
2013	1.012
2014	1.021
2015	1.030

SECTION 5

SECTION 5
RECLAIMED WATER SERVICE ANALYSIS

5.1 INTRODUCTION

Reclaimed water can be used in many applications such as residential, park, school and golf course spray irrigation, as well as, industrial applications such as cooling water make up at power generation facilities or process water for local industry. The focus of this analysis has been to identify and evaluate the reclaimed water spray irrigation demand that is available within the Alafaya Utilities wastewater service area and the surrounding area as well.

Presently, the Alafaya Utilities Regional WWTP has a total permitted effluent disposal capacity of 1.325 MGD. The Alafaya Utilities Regional WWTP percolation pond system, which is located on the south side of Mitchell Hammock Road, is permitted for the disposal of 1.0 MGD of secondary treated effluent from the Alafaya Utilities Regional WWTP. In addition, the plant is permitted to divert another 0.325 MGD of effluent on a monthly average daily flow basis for ultimate disposal as spray irrigation at the Ekana Golf Course. However, it is anticipated that the FDEP may derate the capacity of the golf course to 0.100 MGD. The flows diverted to the Ekana Golf course are provided additional treatment to further remove total suspended solids (TSS) to less than 5.0 mg/l and to provide high level disinfection in accordance with the FDEP Rule 62-610.460, FAC, for public access irrigation. Although annual average daily flows to Ekana Golf Course have historically been approximately 0.100 MGD, maximum monthly flows of (MMF) 0.345 MGD have been reported in the FDEP-MOR's during dry weather periods when irrigation rates increase. This leads to the conclusion that any additional reuse demands to the existing system in excess of 0.155 MGD-MMF (the difference between the 0.500 MGD capacity of the existing reuse facilities, and the 0.345 MGD-MMF dedicated to the Ekana golf course) will require improvements at the Alafaya Utilities Regional WWTP to provide the additional treatment equipment capacity. The consideration of maximum month average daily flows (MMADF) is integral in the design of reclaimed water facilities. A summary of the design capacity of the WWTP, based on the estimated influent flow of the existing certificated service area at build-out, is provided in Table 5-1.

TABLE 5-1

ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
EXISTING FLOW DESIGN SUMMARY

Description	Annual Average Daily Flow (MGD-AADF)	Maximum Month Flow (MGD-MMF)
REGIONAL WASTEWATER TREATMENT PLANT:		
Existing Regional WWTP Design Capacity	2.400	--
Current Influent Flow	0.806	0.890
Estimated Influent at Build-out[1]	1.000	1.100
EXISTING REUSE SYSTEM:		
Existing Reuse System Design Capacity	--	0.500
Ekana Golf Course Demand	0.100	0.345
Available Reuse System Capacity	--	0.155
FUTURE REUSE SYSTEM:		
Available Reuse System Design Capacity[1]	0.437	0.655
Ekana Golf Course Demand	0.100	0.345
Total Reuse Demand	**0.537**	**1.000**

(1) Estimate based on existing certificated wastewater service area.

It is estimated that the annual average daily (AADF) wastewater flow into the Alafaya Utilities Regional WWTP will reach approximately 1.00 MGD at the build-out of the existing wastewater service area. Therefore, the preliminary target design capacity of a reuse system that can be constructed without any additional influent wastewater sources at the plant is 1.00 MGD, based on the total estimated wastewater generation rate.

It is important to note that in terms of customer usage patterns, reuse demand is dynamically more similar to potable water demands than it is to the rate of incoming wastewater flow. Therefore, peak demands on the reuse system may exceed peak wastewater flows to the facility. These peak demands can be managed with either storage of reclaimed water or by supplementing the system supply with potable water. Even though some local reclaimed water systems have had to utilize potable water to supplement the large demand on the reuse system, this situation is undesirable. The design of reuse facilities within the analysis of this section will consider the effects of peak demands, and therefore will be accomplished in such a manner that ensures that there will not be a need to supplement the reuse system with alternative sources. In the case of a storage reservoir, it is typically feasible to accommodate peak days; if storage is large enough, it is possible to accommodate peak weeks. However, it is usually cost-prohibitive to meet demands in excess of a peak week in terms of system storage construction.

The raw wastewater influent flow has historically had a low maximum month to annual average daily flow ratio (less than 1.10). It is important to note that a peak wastewater supply month does not necessarily occur at the same time as the peak reuse system demand month. It is estimated for this study that the maximum month factor for a residential reuse system will be comparable to that of a potable water system. The maximum month ratio is estimated for the purposes of this study at 1.50. Based on this factor, the reuse system design capacity for a residential or commercial system would be approximately 0.437 MGD-AADF (0.655 MGD divided by 1.5). It is common for the peak factor to decrease as the capacity of the system increases. It is important to note that as the peak factor decreases, only the annual average daily flow (AADF) value will increase. In the case of this design, the maximum month flow (MMF) value must remain constant.

The following subsections of this report will identify various scenarios for providing a regional reclaimed water system supplied by the Alafaya Utilities Regional WWTP. These scenarios will consist of providing reclaimed water strictly for the purpose of spray irrigation. The different uses of reclaimed water will vary from spray irrigation at individual homes (Residential use) to the specific spray irrigation of property such as public schools, parks and roadway medians

(Institutional use). These two (2) main types of reclaimed water use will be evaluated individually and then in various combinations to find the most economical means of providing reclaimed water in the area.

The evaluation consists of identifying specific areas to supply reclaimed water for irrigation purposes. The total area and the irrigation rate are estimated for irrigation purposes only. Once the total area and the irrigation rate are estimated, quantification of the total capacity for each site will be developed. Once the total capacity for each scenario is estimated, the improvements necessary to supply this capacity and their respective capital costs will then be determined.

5.2 INSTITUTIONAL

The institutional reuse scenario identifies nine (9) areas or sites throughout the existing Alafaya Utilities service area that have the potential to use reclaimed water for irrigation purposes on their sites. Summarized in Table 5-2 are the nine (9) institutional areas identified for the purposes of this investigation. The main land use classifications that have the greatest potential to use reuse water for irrigation purposes in the service area without committing to a residential reuse program are the green areas at local parks, schools and roadway medians. Estimates of the total irrigable acreage for parks, schools, and other green areas were based on an analysis of the aerial photographs of the area. Once the total acreage was estimated, it was then possible to estimate the area that was actually irrigable. The assumptions made at this time were based on analysis of representative areas of each land classification and estimating that portion of the total acreage that was impervious and therefore not irrigable. Impervious areas subtracted from the total area included that which is paved or directly connected to stormwater runoff facilities (buildings).

Once the total irrigable acreage for a particular land classification was known, it was then possible to estimate reuse demand based on that acreage. Based on the knowledge of the area soil conditions, it is estimated that an annual average irrigation rate of approximately 1.25-inch/week is reasonable and would provide a conservative estimate for the purposes of this study. This study further estimates that participation to utilize reclaimed water for irrigation would be 100 percent at those parks and schools identified with the exception of the Oviedo WTP site, which was estimated not to participate due to regulatory restrictions. The total institutional reuse capacity summarized in Table 5-2 amounts to approximately 0.239 MGD-AADF, or 0.358 MGD-MMF of reuse capacity.

TABLE 5-2
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
INSTITUTIONAL REUSE DEMAND

No.	Site	Total Area (ac.)	Percentage Irrigable %	Irrigable Area (ac.)	Subscription Rate (%)	Reuse Area (ac.)	Irrigation Rate (inch/week)	Estimated Reuse Capacity (gpd)[2]
1	Boston Cemetery	5.3	80	4.2	100	4.2	1.25	20,366
2	Oviedo WTP	3.3	82	2.7	0	0	1.25	0
3	Stenstrum Elementary School	14.6	48	7.0	100	7.0	1.25	34,000
4.	Riverside Park	10.9	47	5.1	100	5.1	1.25	24,770
5.	Lockwood Road R.O.W. Medians	7.9	90	7.1	100	7.1	1.25	34,425
6.	Percolation Pond green area[1]	20.0	50	10.0	100	10.0	2.57	100,000
7.	Alafaya Regional WWTP Site	4.0	70	2.8	100	2.8	1.25	13,600
8.	Partin Elementary	10.1	24	2.4	100	2.4	1.25	11,660
9.	Oviedo City Hall Complex	14.2	30	4.3	0	0	1.25	0
Total Proposed Institutional Reuse Demand								**238,821**

NOTE:
(1) The actual irrigation rate is proposed due to an actual hydrogeological study of the site.
(2) Estimated Reuse Capacities are assumed to be annual average daily flow (AADF) values.

Those areas identified include green areas within the existing percolation pond site, Boston Cemetery, Stenstrum Elementary School, Riverside Park, the Alafaya Utilities Regional WWTP Site, Lockwood Road right-of-way green areas, and Partin Elementary School. The Institutional areas identified in this analysis are illustrated in Figure 5-1.

The existing treatment and effluent disposal faciiities for the reclaimed water system consist of a single three (3) cell filter rated at 0.500 MGD, a single chlorine contact basin, a 700 gpm duplex submersible pump station and a 10-inch PVC reuse transmission main that runs from the wastewater treatment plant site to the reuse storage pond located on the west side of Lockwood Road. The existing reuse effluent disposal pump station is designed for a firm (reliable) capacity of 1.0 MGD. The 10-inch effluent reuse main is estimated to have a maximum pumping capacity of 1.224 gpm, or 1.76 MGD. Other existing facilities include a section of 12-inch reuse main that runs from Section VI of Twin Rivers, under the Econlockhatchee River, to the site of the master lift station located in Riverside. This section of reuse main has been plugged for future use to provide reclaimed water service east of the river. The Econlockhatchee River crossing was permitted and constructed in anticipation of providing reclaimed water service to the areas east of the river.

Utilization of this main would be necessary to provide reuse service to the Partin Elementary School property identified in the Institutional Analysis. Since the Econlockhatchee River 12-inch reuse main crossing already exists, reuse could be provided to the Partin Elementary School site by extending the reuse transmission main from the stubbed-off river crossing section, through the Riverside subdivision, to a connection point at the school. Additionally, a section of reuse transmission main would need to be constructed from the existing reuse storage pond on Lockwood Road, along Ekana Drive in the Twin Rivers subdivision, to the stubbed-off river crossing on the west side of the Econlockhatchee River. It is noted that since the stubbed-off section of the reclaimed water river crossing already exists, providing reuse east of the Econlockhatchee River would not require additional permitting associated with construction of a river crossing.

Other existing facilities include irrigation systems along some of the right-of-way green areas in the Alafaya Woods, Twin Rivers, and Riverside subdivisions. These systems are owned and maintained by the local Homeowners' Association. The areas that currently have irrigation systems include the right-of-way and median green area at the entrances to Alafaya Woods, off Alafaya Trail and Mitchell Hammock Road, and the green areas along Lockwood Road in the Twin Rivers and Little Creek subdivisions.

These systems are supplied water by five (5) small diameter irrigation wells located throughout the service area. These irrigation systems could easily be converted to use reclaimed water if a reuse system were provided in these areas. The capital improvements necessary to provide the additional capacity identified in this analysis include improvements to expand the reclaimed water transmission and distribution facilities. These improvements will consist of the installation of a high service pumping facility at the existing storage pond site in order to facilitate supply of reclaimed water in this area. Filter and chlorine contact chamber (CCC) improvements are not necessary because the existing capacity of the filters and CCC is sufficient to meet the annual average daily demands of the golf course and provide the additional capacity necessary to provide reuse to the Institutional systems. The capacity of the on-site treatment facilities (filtration and chlorination) is more than sufficient to meet the Institutional reuse demands on an annual average basis. However, it is estimated that the existing facilities can not meet a maximum month demand for both the golf course and the institutional areas. Therefore, the reuse supply to the Institutional sites will have to be controlled during months when the golf course is utilizing flows in excess of 0.100 MGD. Otherwise, additional filtration and chlorination facilities would have to be constructed. Since the majority of the 0.239 MGD identified is the proposed spray irrigation system at the percolation pond site, it is not imperative that the reclaimed water flows be supplied on demand to all of the Institutional areas identified. The Alafaya Utilities Regional WWTP would have control of providing the maximum month demand to the golf course and other areas by refraining from disposal to the irrigation system at the existing pond site. In addition, the improvements would include minor yard piping, electrical, and control improvements associated with the off-site reuse pump station that would be required at the reclaimed water storage facility on Lockwood Road. In order to provide "public access level" reclaimed water, improvements to the treatment facilities at the Alafaya Utilities Regional WWTP must meet the requirements for Class I reliability. Table 5-3 summarizes the Class I reliability requirements as stated in the USEPA Manual MCD-05 entitled "*Design Criteria for Mechanical, Electrical and Fluid System and Component Reliability*". Since the Alafaya Utilities Regional WWTP has an alternate means of effluent disposal permitted at 1.000 MGD, the demand estimated in this scenario will not require complete compliance with Class I reliability standards.

TABLE 5-3
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
EPA CLASS I RELIABILITY REQUIREMENTS

Components	Requirements
Trash Removal or Comminution	Required.
Grit Removal	Required.
Backup Pumps	Required - Sufficient capacity of remaining pumps to handle peak flow with one (1) pump out of service.
Aeration Basin	Minimum of two (2) basins of equal volume.
Blowers	Multiple units - With largest unit out of service, remaining units able to maintain design oxygen transfer.
Final Clarifier	Multiple basins - With largest unit out of service, remaining units have capacity for at least 75 percent of design flow.
Filters	Multiple units - With largest unit out of service, remaining units have capacity for at least 75 percent design flow.
Chlorine Contact Basin	Multiple basins - With largest unit out of service, remaining units have capacity for at least 50 percent design flow.
Sludge Pumps	Sufficient capacity of remaining pumps to handle peak flow with one (1) pump out of service; backup pump may be uninstalled.
Aerobic Sludge Digestion	
Aeration Basin	Backup basin not required.
Blowers	Minimum two (2) units - Permissible for less than design oxygen transfer with one (1) unit out of service.
Air Diffusers	Multiple sections - With largest section out of service, oxygen transfer capability not measurably impaired.

TABLE 5-3 (Continued)
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
EPA CLASS I RELIABILITY REQUIREMENTS

Components	Requirements
Power Sources	Two (2) separate and independent electric power sources from either two (2) separate utility substations or one substation and one standby generator.
Facilities Requiring Standy Power	Mechanical bar screens or comminutors, main pumps, secondary treatment, final clarifier, filtration, disinfection, critical lighting and ventilation.

The preliminary capital costs identified for the Institutional scenario include those for Alafaya Utilities Regional WWTP site improvements such as off-site pumping facility and other miscellaneous improvements. This cost estimate also includes those costs associated with the transmission and distribution of the reclaimed water to the institutional sites as illustrated previously in Figure 5-1, including on-site irrigation systems at each of the sites listed in Table 5-2. Existing reuse storage includes the 3.65 MG storage pond located on Lockwood Road. This storage facility will provide adequate reuse storage for all the institutional areas identified in this analysis.

It is noted that the reject storage tank located on the Alafaya Utilities Regional WWTP site is of adequate capacity for the requirements of this scenario. Preliminary capital costs associated with constructing reuse facilities for this scenario are summarized in Table 5-4 and are estimated at approximately $1,265,800, or $5.30 per gallon of reuse capacity constructed.

5.3 RESIDENTIAL REUSE

The second scenario for a reuse system considers a residential reuse system. In this scenario, a system of transmission and distribution piping similar to a central potable water system will be installed throughout the existing service area to provide reclaimed (reuse) water to individual homes or commercial property. As stated and summarized previously in Table 5-1, without additional service area and, as such, additional wastewater flow, the reclaimed water supply for residential reuse would be designed for 0.437 MGD-AADF or 0.655 MGD-MMF.

For this scenario, estimates of the total irrigable acreage was based on an analysis of the aerial photographs and plat maps of the area. The estimated reuse capacity was based on the development of a typical residential reuse demand rate for this area. It was estimated that the average single family lot in the Alafaya Woods area is approximately 8,800 square feet in area. It was further estimated that the average single family lot has approximately 4,400 square feet of irrigable area after the total impervious area per lot was estimated and subtracted from the total area. Impervious areas include roof tops, driveways and side walks that are estimated to be directly connected to the storm sewer system. With an irrigation rate of 1.25 inches per week, the average single family residential reuse demand was calculated at approximately 500 gpd per home. This estimate is consistent with the demand rate developed by the City of Oviedo's consultant for this area.

TABLE 5-4
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
PRELIMINARY CAPITAL COST ESTIMATE
INSTITUTIONAL REUSE SCENARIO

Item Description	Total Costs ($)
10-inch PVC Reuse Main (8,090 LF @ $15.00/LF)	$121,400
8-inch PVC Reuse Main (3,896 LF @ $9.50/LF)	37,000
6-inch PVC Reuse Main (3,600 LF @ $7.50/LF)	27,000
4-inch PVC Reuse Main (6,400 LF @ $4.90/LF)	31,400
10-inch Gate Valve (11 @ $920.00)	10,100
8-inch Gate Valve (5 @ $750.00)	3,800
6-inch Gate Valve (5 @ $500.00)	2,500
4-inch Gate Valve (8 @ $260.00)	2,100
Automatic Air Release Valves (2 @ $2,500.00)	5,000
Ductile Iron Fittings (1,800 lbs @ 2.15/lb)	3,900
Terminal Blowoff Assembly (5 @ $500.00)	2,500
Audio/Video Preconstruction Record (22,000 @ $0.25/LF)	5,500
Concrete Driveway Replacement (426 SY @ $20.00/SY)	8,500
Single Service Without Crossing (7 @ $200.00/EA)	1,400
Polymer/Alum Feed System	6,000
Electrical	117,000
Yard Piping	87,000
Site Work	60,000
On-site Irrigation Systems	113,500
Reuse Pump Station with Hydropneumatic Tank	200,000
Permit Fees	6,000
Miscellaneous Roadway Bore & Jack and other Roadway Crossings	100,000
Subtotal Construction	$951,600
General Requirements @ 8.0%	76,100
Contingency @ 15%	142,700
Engineering @ 10%	95,400
Total Project Cost	**$1,265,800**

The assumption of a participation rate or subscription rate is based on a number of considerations that affect the extent to which homeowners will fully utilize a reclaimed water system once it has been constructed. Due to the relatively few operational large residential reclaimed water systems that exist, and in particular which have been operation for a long period of time, there is not a large amount of operation data available from which confirmation of a definite participation rate can be derived.

Based on our experience, and discussions with utilities operating reclaimed water systems, a 50% participation rate was chosen as a reasonable estimate for planning level calculations. Another consideration which affects the rate at which residents may connect to a reclaimed water system is the cost of a typical residential irrigation system. The cost of constructing a residential irrigation system can range from $800 to $2,500, depending on the size of the lot. It is noted that these additional costs may be a determining factor as to whether or not the typical homeowner can afford to participate, or connect to the reclaimed water system. Usage rates as high as 1,800 gpd/connection have been reported for residential reuse systems that charge a flat monthly fee with unlimited capacity. These rates tend to level off as participants normalize their irrigation practices. Normalization can occur for a number of reasons including water conservation education efforts as well as the implementation of mandatory irrigation restrictions. It is noted that the 500 gpd/connection rate was based on an irrigation rate of 1.25 inches/week. With all of these considerations it is evident how much the actual layout or extent of the construction of the system can vary depending on the actual usage per home and the participation rate within the service area. The difficulty in planning and design is due to the combination of these two (2) parameters.

Presented in Table 5-5 is a matrix of the number of actual homes that would need to be improved with reuse utilities at various participation rates, based on a fixed usage rate of 500 gpd. Also included in Table 5-5 is a matrix of the number of actual homes that would need to be improved with reuse utilities at various usage rates, based on a fixed participation rate of 50 percent. As noted in these two (2) matrices, the participation rate and usage rate both have a direct correlation to the number of homes which have to be improved with reuse utilities. The phrase "improved with reuse utilities" is defined as the total number of homes/lots that must have reuse distribution piping installed adjacent to in order to serve a specific number of homes at a proposed participation or usage rate. For the analysis in the remainder of this study, the planning level usage rate will be 500 gpd per residential home, and the participation rate will be estimated at 50 percent.

TABLE 5-5
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
MATRICES SUMMARY

Participation Rate (%)	Actual Number of Homes Connected (#)	Total Number of Homes Fitted (#)
10	846	8,460
20	846	4,230
30	846	2,820
40	846	2,115
50	846	1,692
60	846	1,410
70	846	1,209
80	846	1,058
90	846	940
100	846	846

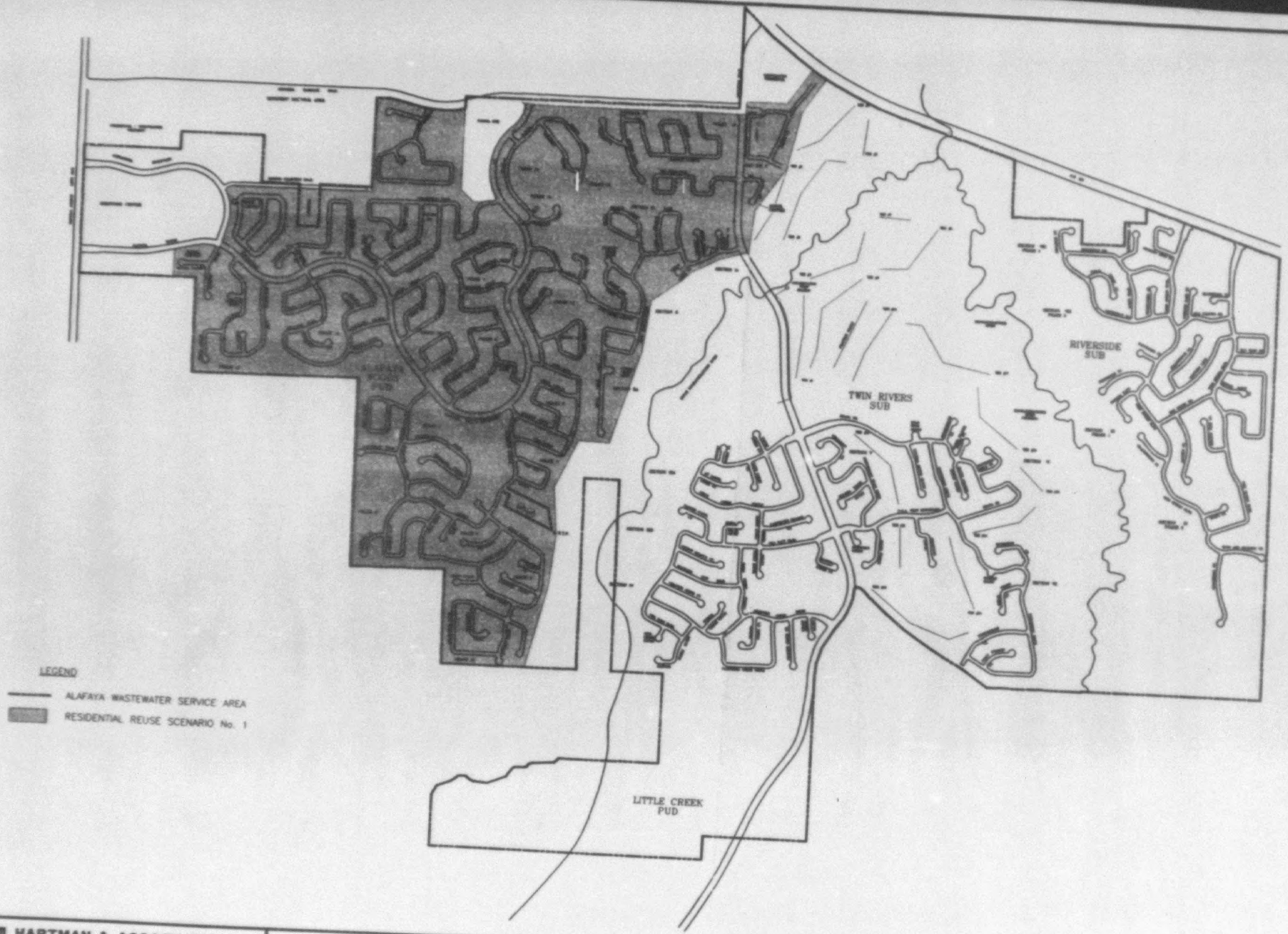
Usage Rate (gpd)	Actual Number of Homes Connected (#)	Total Number of Homes Fitted (#)
200	2,115	4,230
300	1,410	2,820
400	1,058	2,115
500	846	1,692
600	706	1,410
700	604	1,209
800	529	1,058
900	470	940
1000	423	846

5.3.1 Residential Reuse Scenario Number One

The following residential analysis considers providing reuse within the Alafaya Woods PUD up to 0.437 MGD-AADF or 0.655 MGD-MMF of reclaimed water above that which is presently dedicated to the Ekana golf course. This scenario focuses on providing public access level reclaimed water for residential irrigation within the Alafaya Woods PUD. Figure 5-2 illustrates the area of consideration for Residential Reuse Scenario Number One. This proposed scenario equates to a total reclaimed water flow from the Alafaya Utilities Regional WWTP of 1.0 MGD when the peak daily flows dedicated to the Ekana golf course are considered. It is noted that recent monthly average daily flows at the Alafaya Utilities Regional WWTP have been reported at approximately 0.800 MGD. To provide the level of residential reuse service considered in this scenario, a phased construction program based on the availability of flow treated at the Alafaya Utilities Regional WWTP may be required.

To provide reuse at a rate of 0.437 MGD-AADF within the Alafaya Woods PUD, it was estimated that approximately 846 homes could be served at the 500 gpd/connection annual average demand rate. Based on a 50 percent participation rate, this would require the construction of a reuse transmission and distribution system within the existing Alafaya Woods subdivision consisting of approximately 1,692 homes. It is noted that to provide residential reuse at this participation rate would require the construction of reuse transmission and distribution piping throughout most of the Alafaya Woods PUD area.

Layout of a transmission and distribution system was accomplished based on this participation rate so that the capital costs associated with the construction of this system could be estimated. It was estimated that this system would require approximately 100,649 LF of twelve, ten, six, and four-inch PVC reuse main. Other capital items that will be required to provide this level of residential reuse would include valves, additional filters, CCC, a reuse pumping station at the off-site storage pond, yard piping and electrical improvements. The preliminary capital cost to construct 0.437 MGD-AADF of residential reuse facilities is estimated at approximately $2,811,000, or $6.43 per gallon of reuse capacity constructed. A detailed summary of the capital cost estimate for Residential Reuse Scenario Number One at the 0.437 MGD-AADF (0.655 MGD-MMF) level of reuse is provided in Table 5-6.



HARTMAN & ASSOCIATES, INC.
engineers, hydrogeologists, surveyors & management consultants
251 EAST PINE STREET - SUITE 1000 - ORLANDO, FL 32801
TELEPHONE (407) 839-3955 - FAX (407) 839-3790

ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
RESIDENTIAL REUSE SCENARIO NUMBER ONE DEMAND AREA

FIGURE 5-2

TABLE 5-6

ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
RESIDENTIAL REUSE SCENARIO NUMBER ONE
PRELIMINARY CAPITAL COST ESTIMATE

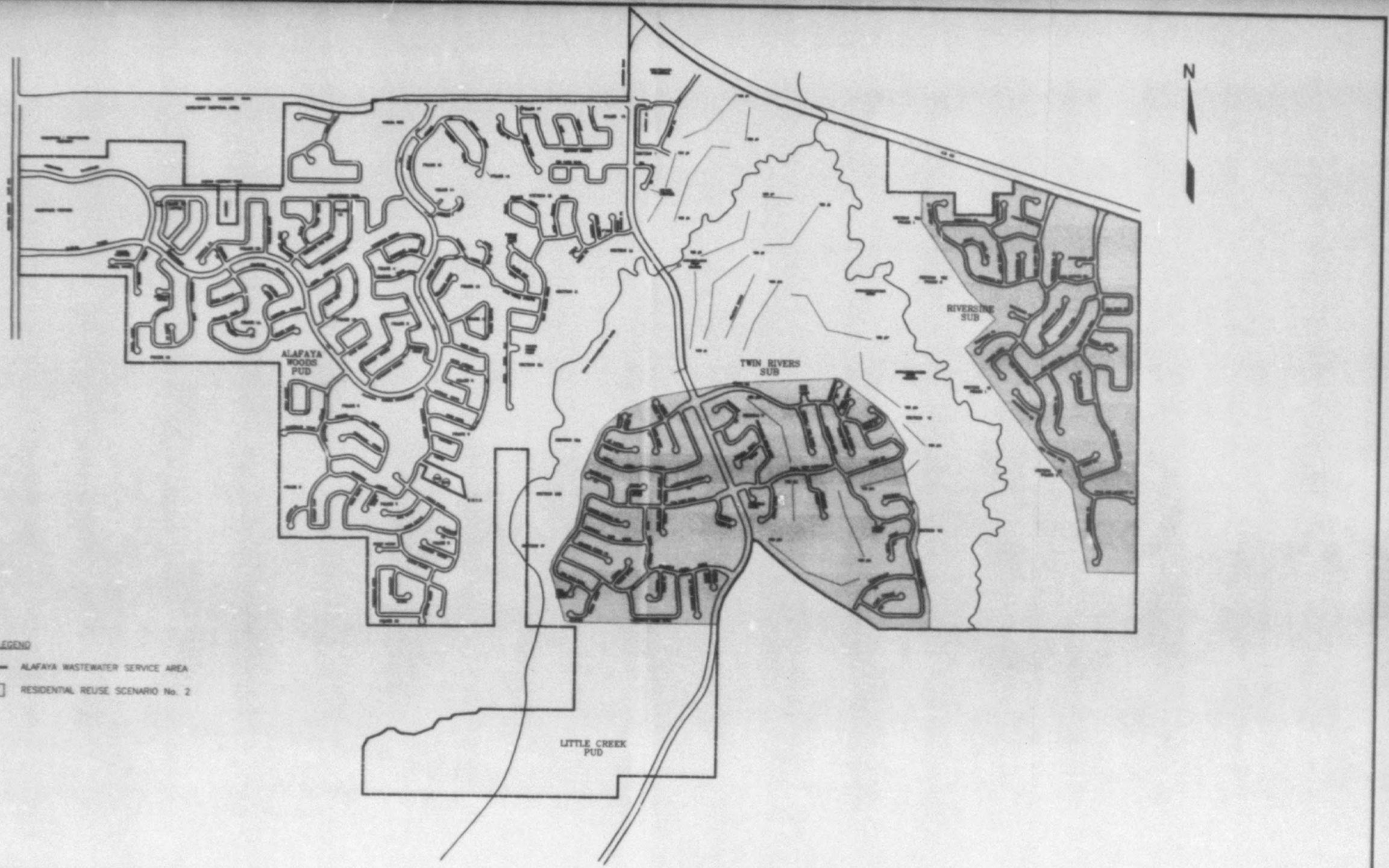
Item Description	Units	No. of Units (#)	Unit Costs ($/Unit)	Total Costs ($)
Filtration Units	SF	180	$700	$130,000
Chlorine Contact	GAL	16,000	2.3	40,000
Reuse Pump Station with Hydro Tank	LS	1	$200,000	200,000
12-inch PVC Reuse Main	LF	9,018	$16.30	147,000
10-inch PVC Reuse Main	LF	6,733	$15.00	101,000
6-inch PVC Reuse Main	LF	8,266	$7.50	62,000
4-inch PVC Reuse Main	LF	76,632	$4.90	375,500
12-inch Gate Valve	EA	12	$1,340.00	16,100
10-inch Gate Valve	EA	9	$920.00	8,300
6-inch Gate Valve	EA	11	$500.00	5,500
4-inch Gate Valve	EA	96	$260.00	25,000
Terminal Blowoff Assembly	EA	21	$500.00	10,500
Audio/Video Preconstruction Record	LF	100,649	$0.10	10,000
Single Service Without Road Crossing	EA	85	$200.00	17,000
Single Service with Road Crossing	EA	127	$340.00	43,180
Double Service Without Road Crossing	EA	158	$235.00	37,130
Double Service With Road Crossing	EA	159	$375.00	59,600
Automatic Air Release Valve	EA	2	$2,500.00	5,000
Ductile Iron Fittings	LB	19,395	$2.15	41,700
Concrete Replacement	SY	18,800	$7.00	131,600
Electrical/Instrumentation	LS	1	$87,000	74,000
Site Work	LS	1	$43,500	37,000
Yard Piping	LF	1	$65,300	55,500
Roadway Bore & Jack	EA	45	$10,000	450,000
General Requirements	LS	1	163,100	166,600
Subtotal Construction				$2,249,210
Contingency (@ 15%)				337,300
Engineering (@ 10%)				224,490
Total Project Costs				**$2,811,000**

5.3.2 Residential Reuse Scenario Number Two

This scenario focuses on providing public access level reclaimed water for residential irrigation within the Twin Rivers DRI, including the Riverside subdivision. Figure 5-3 illustrates the area of consideration for Residential Reuse Scenario Number Two. For this scenario, the assumptions and estimates concerning total irrigable acreage and the development of a typical household demand rate that were previously utilized in Section 5.3 are also valid for the analysis of this section. Specifically, the development of the average single family residential reuse demand rate of approximately 500 gpd per connection.

As with the first scenario, this analysis will consider providing residential reuse within the Twin Rivers DRI at a level of up to 0.437 MGD-AADF (0.655 MGD-MMF) of reclaimed water above that which is presently dedicated to the Ekana golf course. As was the case in the previous scenario, this equates to a total reclaimed water flow from the Alafaya Utilities Regional WWTP of 1.0 MGD when the peak daily flows dedicated to the Ekana golf course are considered. It is again noted that recent monthly average daily flows at the Alafaya Utilities Regional WWTP have been reported at approximately 0.806 MGD and that implementation of residential reuse service at this level would require a phased construction program based on the availability of flow treated at the Alafaya Utilities Regional WWTP.

To provide reuse at a rate of 0.437 MGD-AADF (0.655 MGD-MMF) within the Twin Rivers and Riverside subdivision, it was estimated that approximately 846 homes could be served at the 500 gpd/connection demand rate. Based on a 50 percent participation rate, this would require the construction of a reuse transmission and distribution system within the existing Twin Rivers subdivision consisting of approximately 1,692 homes. It is noted that to provide residential reuse at this participation rate would require the construction of reuse transmission and distribution piping throughout most of the Twin Rivers and Riverside subdivisions. Existing reuse facilities in this area include a section of 12-inch reuse main that runs from Section VI of Twin Rivers, under the Econlockhatchee River, to the approximate location at the master lift station in Riverside. The existing 12-inch reuse main was constructed during the same time period that the force main which serves Twin Rivers was constructed. The 12-inch reuse main appears on "As-Built" drawings that are on file at the City of Oviedo Engineering Department. The reuse main was plugged for future use. Other existing reuse facilities include those constructed in Twin Rivers Section 1B. These also appear on "As-Built" drawings that are on file at the City of Oviedo's Engineering Department.



HARTMAN & ASSOCIATES, INC.
engineers, hydrogeologists, surveyors & management consultants
201 EAST PINE STREET - SUITE 1000 - ORLANDO, FL 32801
TELEPHONE (407) 839-3955 - FAX (407) 839-3790

ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
RESIDENTIAL REUSE SCENARIO NUMBER TWO DEMAND AREAS

FIGURE 5-3

The facilities consist of approximately 5,760 linear feet of 4, 6, and 8-inch reuse mains that were constructed to serve approximately 98 residential units in Twin Rivers Section 1B. These facilities have been plugged in place for future use. Residential Reuse Scenario Number Three will evaluate providing reclaimed water to only those areas that have had reuse facilities installed during construction. These areas are considered separately since they have had reuse facilities installed, as compared with the other residential areas that will require distribution piping to be constructed.

Layout of a transmission and distribution system was accomplished based on this participation rate so that the capital costs associated with the construction of this system could be estimated. It was estimated that this system would require approximately 81,100 LF of twelve and four inch PVC reuse main. Other capital items that will be required to provide this level of residential reuse would include valves, additional filters, CCC, a reuse pump station, yard piping and electrical improvements. The preliminary capital cost to construct 0.437 MGD-AADF of residential reuse facilities is estimated at approximately $2,464,000, or $5.64 per gallon of reuse capacity constructed. A detailed summary of the capital cost estimate for Residential Reuse Scenario Number Two at the 0.437 MGD-AADF (0.655 MGD-MMF) level of reuse is provided in Table 5-7.

5.3.3 Residential Reuse Scenario Number Three

This scenario focuses on providing public access level reclaimed water for residential irrigation within those residential areas that have already had reuse distribution facilities installed at the time that they were constructed are anticipated to have distribution facilities installed at the time of development. Specifically, Residential Reuse Scenario Number Three will analyze providing residential reclaimed water to the Ekana Green and Little Creek Subdivisions and Flying Seminole Ranch. This scenario also focuses on providing public access level reclaimed water for residential irrigation within residential areas that will have reuse distribution utilities installed at the time that the property will be developed. Specifically, this scenario will also analyze providing residential reclaimed water to the proposed Flying Seminole Property. The areas included in Residential Reuse Scenario Number Three are illustrated in Figure 5-4. It is noted that the proposed territorial expansion has previously been applied for to the FPSC.

TABLE 5-7

ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
RESIDENTIAL REUSE SCENARIO NUMBER TWO
PRELIMINARY CAPITAL COST ESTIMATE

Item Description	Units	No. of Units (#)	Unit Costs ($/Unit)	Total Costs ($)
Filtration Units	SF	180	$700	$130,000
Chlorine Contact	GAL	16,000	$2.3	40,000
Reuse Pump Station with Hydro Tank	LS	1	$200,000	200,000
12-inch PVC Reuse Main	LF	5,100	$16.30	83,130
4-inch PVC Reuse Main	LF	76,000	$4.90	372,400
12-inch Gate Valve	EA	7	$1,340.00	9,380
4-inch Gate Valve	EA	95	$260.00	24,700
Terminal Blowoff Assembly	EA	27	$500.00	13,500
Audio/Video Preconstruction Record	LF	81,100	$0.10	8,100
Single Service Without Road Crossing	EA	85	$200.00	17,000
Single Service with Road Crossing	EA	127	$340.00	43,180
Double Service Without Road Crossing	EA	158	$235.00	37,130
Double Service With Road Crossing	EA	159	$375.00	59,600
Automatic Air Release Valve	EA	2	$2,500.00	5,000
Ductile Iron Fittings	LB	15,628	$2.15	33,600
Concrete Replacement	SY	18,800	$7.00	131,600
Electrical/Instrumentation	LS	1	$87,000	74,000
Site Work	LS	1	$43,500	37,000
Yard Piping	LF	1	$65,300	55,500
Roadway Bore & Jack	EA	45	$10,000	450,000
General Requirements	LS	1	$153,300	146,100
Subtotal Construction				$1,970,920
Contingency (@ 15%)				296,000
Engineering (@ 10%)				197,080
Total Project Costs				**$2,464,000**

The Flying Seminole Ranch Property is presently not included within the Alafaya Utilities wastewater service area. It is expected that this property may be developed as single family residential and may be included within an expanded Alafaya Utilities wastewater service area in the future. The Oviedo Land Development Code, Section 233 requires that reclaimed water pipe utilities be installed with the other underground utilities. Since these residential units will have reuse distribution mains installed, the Flying Seminole Ranch property will be considered in the analysis of this section. The total area of this property is estimated at approximately 742 acres. It is estimated that the new development could include approximately 1,300 single family residential homes. If the existing service area were expanded to include future residential development within the Flying Seminole Ranch property, wastewater generation rates at the Alafaya Utilities Regional WWTP will likewise increase according to the level of residential development.

The design demand rates originally developed in Section 5.3 would likewise need to be adjusted due to the expansion of the service area. It is estimated that the wastewater flow into the Alafaya Utilities Regional WWTP will increase by approximately 0.228 MGD due to expansion of the existing wastewater service area to include the Flying Seminole property developments. This additional influent flow would allow construction of a reuse system capacity of 1.228 MGD as opposed to 1.000 MGD-AADF estimated in Section 5.3. The targeted reuse system design capacity is then increased to 0.883 MGD-MMF (1.228 MGD minus 0.345 MGD) after consideration of flows dedicated to the Ekana Golf Course. Based on the potable water system adjustment factor of 1.5, the reuse system design capacity is estimated to be 0.588 MGD-AADF, if the service area were expanded as described above. A summary of the future estimated design capacity, based on the estimated flows developed in this section, is summarized in Table 5-8.

The residential areas that are included in the Residential Reuse Scenario Number Three differ from those presented previously in the Residential Reuse Scenario Number One and Two. Most of the residential subdivisions included in those sections were not required to install separate reuse distribution piping at the time that the developments were constructed. Therefore, providing reclaimed water for residential irrigation within those subdivisions will require the construction of reuse distribution, as well as transmission main piping. In comparison, the Ekana Green, Little Creek, and the proposed Flying Seminole Property subdivisions have, or will have, reuse distribution piping installed at the time of construction.

TABLE 5-8

ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
RESIDENTIAL REUSE SCENARIO NUMBER THREE
FUTURE FLOW DESIGN SUMMARY

Description	Annual Average Daily Flow (MGD-AADF)	Maximum Month Flow (MGD-MMF)
WASTEWATER TREATMENT PLANT:		
Existing WWTP Design Capacity	2.400	--
Current Influent Flow	0.806	0.890
Estimated Influent at Build-out[1]	1.228	1.351
EXISTING REUSE SYSTEM:		
Existing Reuse System Design Capacity	--	0.500
Ekana Golf Course Demand	0.100	0.345
Available Reuse System Capacity	--	0.155
FUTURE REUSE SYSTEM:		
Residential Reuse Design Capacity	0.456	0.684
Additional Reuse System Design Capacity	0.133	0.199
Ekana Golf Course Demand	0.100	0.345
Total Reuse Demand	**0.689**	**1.228**

(1) Estimate based on the proposed certificate extension as described in this section.

The City's requirement to install reuse lines at the time of development will allow these areas to be served with reclaimed water by constructing only the supply, storage, and transmission main facilities of a reclaimed water system. The transmission main piping will then be interconnected with the previously constructed distribution system piping within the respective subdivisions.

Reuse demand was estimated for the Ekana Green, Little Creek, and proposed Flying Seminole property subdivisions based on the total number of planned dwelling units in each of the subdivisions and a planning level 50 percent participation among homeowners to connect. Using the 500 gpd/connection reuse demand rate, it was possible to then estimate reuse demand within the respective subdivisions. Summarized in Table 5-9 is the reuse demand estimated for the Residential Reuse Scenario Number Three. As summarized in Table 5-9, the reuse demand at build out in the residential areas included in this scenario is estimated at 0.456 MGD-AADF, or 0.684 MGD-MDF.

It is noted that this demand estimation is within the reuse system demand (0.588 MGD-AADF, 0.883 MGD-MMF) developed previously in the beginning of this subsection. This estimate includes approximately 262 units will be available to participate in a residential reuse system within the Ekana Green and Little Creek subdivisions, and another 650 within the proposed Flying Seminole Ranch area.

Since the Econlockhatchee River 12-inch reuse main crossing already exists, reuse could be provided to the estimated 1,300 residential units that are planned to be constructed on the Flying Seminole Ranch property by extending the reuse transmission main from the stubbed-off river crossing section, through the Riverside subdivision, to a connection point at the new development. Additionally, a section of reuse transmission main would need to be constructed from the reuse storage site on Lockwood Road, along Ekana Drive through the Twin Rivers subdivision, to the stubbed-off river crossing on the west side of the Econlockhatchee River. It is noted that since the stubbed-off section of the reclaimed water river crossing already exists, providing reuse east of the Econlockhatchee River would not require additional permitting associated with construction of a river crossing. Reuse service to the Little Creek subdivision could be accomplished by extending the reuse transmission main south on Lockwood Road, to the connection point of the existing reuse distribution utilities at Little Creek.

TABLE 5-9
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
RESIDENTIAL REUSE SCENARIO NUMBER THREE
REUSE DEMAND SUMMARY

No.	Site	Area (ac.)	Irrigable %	Irrigable Area (ac.)	Subscription Rate (%)	Reuse Area (ac.)	Irrigation Rate (inch/week	Estimated Reuse Capacity (gpd)
1	Ekana Green Subdivision (Formerly the Colony)	17.0	50	8.5	50	4.3	1.25	20,500
2	Little Creek	217	21	45.6	50	22.8	1.25	110,500
3	Proposed Flying Seminole Ranch Property Subdivision	682	19.7	134	50	67.1	1.25	325,000
	Total Proposed Reuse Demand							**456,000**

GJR/dt/mb/R-A-2/5-9.tab
HAI #95-099.01/030196

The capital improvements necessary to provide the additional capacity identified in this analysis include improvements to expand the reclaimed water treatment filtration facilities by approximately 1.00 MGD up to a total capacity of 1.50 MGD. The additional reclaimed water treatment facilities include a new chlorine contact chamber and on-site effluent transfer pump modifications by approximately 0.500 MGD up to 1.00 MGD. Additionally, a new high-service pumping facility to provide the required 1.0 MGD design pumping capacity will be constructed at the Lockwood Road reuse storage site. Filter and chlorine contact chamber (CCC) improvements are necessary because the majority of the existing capacity of the filters and CCC is basically dedicated to the Ekana Golf Course. In addition, minor yard piping, electrical, and control improvements associated with the filter and chlorine contact chamber expansions would be required. The proposed improvements would consist of two (2) similar three (3) cell filtration unit comparable to that which currently exists. The proposed units would be designed based on the same loading criteria as the existing filter units (2.0 gpm/sf at ADF). The filter improvements will consist of all minor yard piping, backwash and mudwell pumping equipment, control valves, site work and electrical improvements. In addition, the proposed improvements would consist of a 32,000 gallon prefabricated steel chlorine contact chamber following in the process. In order to provide "public access level" reclaimed water, improvements to the treatment facilities at the Alafaya Utilities Regional WWTP must likewise meet the requirements for Class I reliability. Previously summarized in Table 5-3 are the Class I reliability requirements as stated in the USEPA Manual MCD-05 entitled "*Design Criteria for Mechanical, Electrical and Fluid System and Component Reliability*". Since the Alafaya Utilities Regional WWTP has an alternate means of effluent disposal permitted at 1.00 MGD, the demand estimated in this scenario will not require compliance with Class I reliability standards.

Preliminary capital costs associated with constructing reuse facilities for Residential Reuse Scenario Number Three are estimated at approximately $1,631,000, or $3.57 per gallon of reuse demand estimated in this scenario. The capital costs identified for this scenario include those for Alafaya Utilities Regional WWTP site improvements such as new filters, CCC, electrical, yard piping, and other miscellaneous costs as summarized in Table 5-10.

TABLE 5-10

ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
RESIDENTIAL REUSE SCENARIO NUMBER THREE
PRELIMINARY CAPITAL COST ESTIMATE

Item Description	Units	No. of Units (#)	Unit Costs ($/Unit)	Total Costs ($)
Filtration Units	SF	360	$700	$252,000
Chlorine Contact	GAL	16,000	$2.3	40,000
Reuse Pump Station with Hydro Tank	LS	1	$200,000	200,000
Effluent Transfer Pump Modifications	LS	1	$65,000	65,000
12-inch PVC Reuse Main	LF	7,558	$16.30	123,200
10-inch PVC Reuse Main	LF	3,687	$15.00	55,300
4-inch PVC Reuse Main	LF	4,367	$4.90	21,400
12-inch Gate Valve	EA	10	$1,340.00	13,400
10-inch Gate Valve	EA	5	$920.00	4,600
4-inch Gate Valve	EA	6	$260.00	1,560
Terminal Blowoff Assembly	EA	4	$500.00	2,000
Audio/Video Preconstruction Record	LF	15,600	$0.10	1,560
Automatic Air Release Valve	EA	2	$2,500.00	5,000
Ductile Iron Fittings	LB	2,418	$2.15	5,200
Concrete Replacement	SY	228	$7.00	1,600
Electrical/Instrumentation	LS	1	$87,000	87,000
Site Work	LS	1	$43,500	43,500
Yard Piping	LF	1	$65,300	65,300
Roadway Bore & Jack	EA	22	$10,000	220,000
General Requirements	LS	1	$77,700	97,000
Subtotal Construction				$1,304,620
Contingency (@ 15%)				195,800
Engineering (@ 10%)				130,580
Total Project Costs				**$1,631,000**

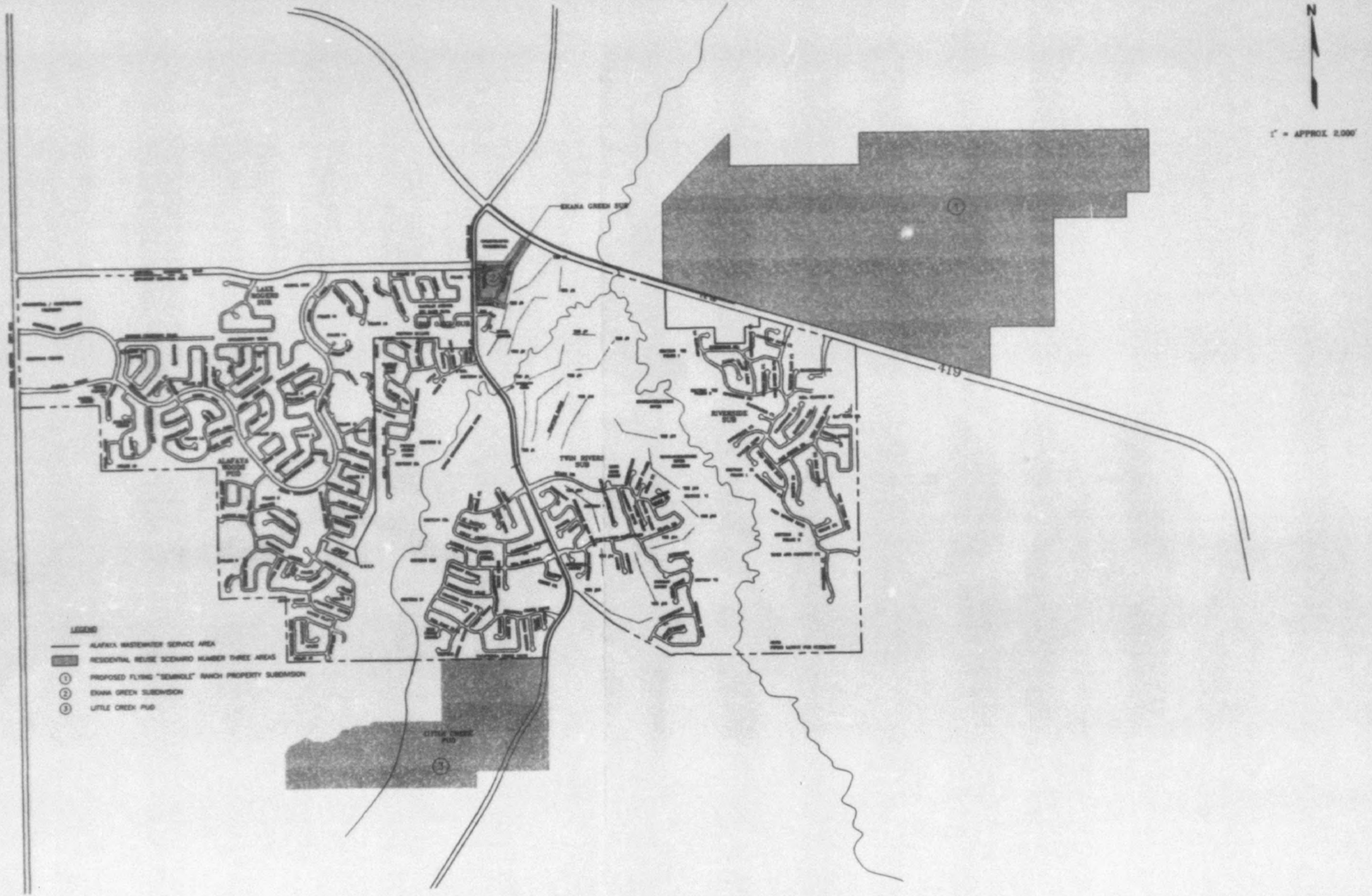
This cost estimate also includes those costs associated with the transmission of the reclaimed water to the sites as illustrated previously in Figure 5-3. It is estimated that additional storage may need to be provided for implementation of this scenario. Existing reuse storage includes the 3.65 MG storage pond located on Lockwood Road. This storage facility may provide adequate reuse storage for the Ekana Green, Little Creek, and Flying Seminole property subdivisions, if these subdivisions are connected to the reuse system. It is noted that the reject storage tank located on the Alafaya Utilities Regional WWTP site is of adequate capacity for the requirements of this scenario.

5.3.4 Residential Reuse Scenario Number Four

The last scenario focuses on providing public access level reclaimed water for residential developments within the extended Alafaya Utilities Regional WWTP service area.

Like Residential Scenario Number Three, this scenario focuses on providing public access level reclaimed water for residential irrigation within existing and proposed residential areas that will have reuse distribution utilities installed at the time that the property is developed. Specifically, this scenario will analyze providing residential reclaimed water to the proposed Flying Seminole Property, the Live Oak PUD, the River Oaks and Estes Trust property, and the undeveloped parcel north of the Flying Seminole Ranch property. The areas included in Residential Reuse Scenario Number Four are illustrated in Figure 5-5.

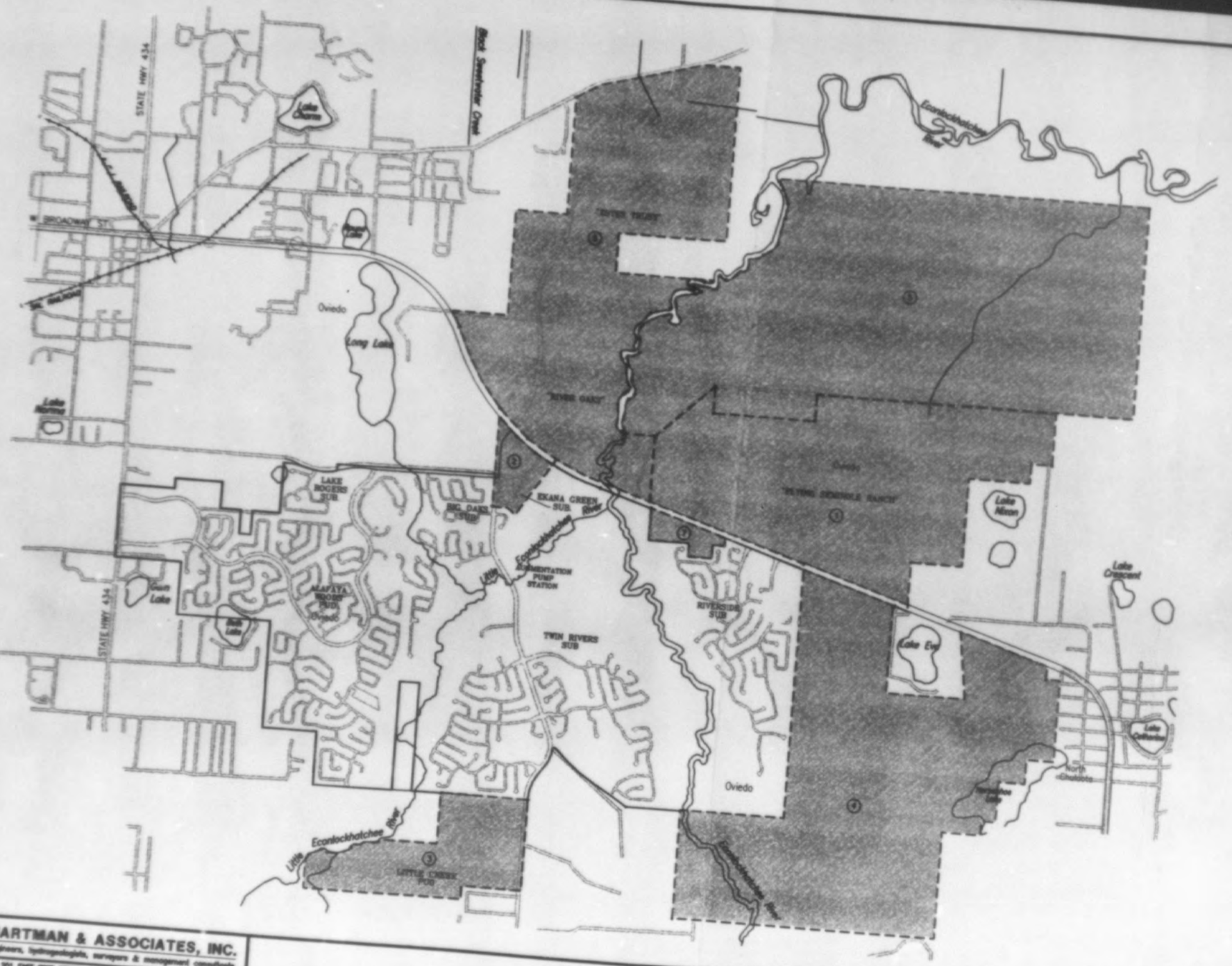
The Flying Seminole Ranch Property, the Live Oak PUD, the River Oaks and Estes Trust property, and the undeveloped parcel north of the Flying Seminole property are presently not included within the Alafaya Utilities, Inc., wastewater service area. It is possible that these properties may be developed as single family residential, and may be included within an expanded Alafaya Utilities, Inc., wastewater service area in the future. As mentioned previously, the Oviedo Land Development Code, Section 233 requires that reclaimed water pipe facilities be installed with the other underground facilities. Since any residential units that are constructed in the proposed areas will have reuse distribution mains installed, these areas will be considered in the analysis of this section. The total area of these properties is estimated at approximately 4,046 acres. It is estimated that the new development could include approximately 5,600 new single family residential homes. If the existing service area were expanded to include future residential development within the proposed wastewater service extension areas, wastewater generation rates at the Alafaya Utilities Regional WWTP will likewise increase according to the level of residential development.



HARTMAN & ASSOCIATES, INC.
engineers, hydrogeologists, surveyors & management consultants
201 EAST PINE STREET - SUITE 1000 - ORLANDO, FL 32801
TELEPHONE (407) 839-3855 - FAX (407) 839-3790

ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
RESIDENTIAL REUSE SCENARIO NUMBER THREE DEMAND AREAS

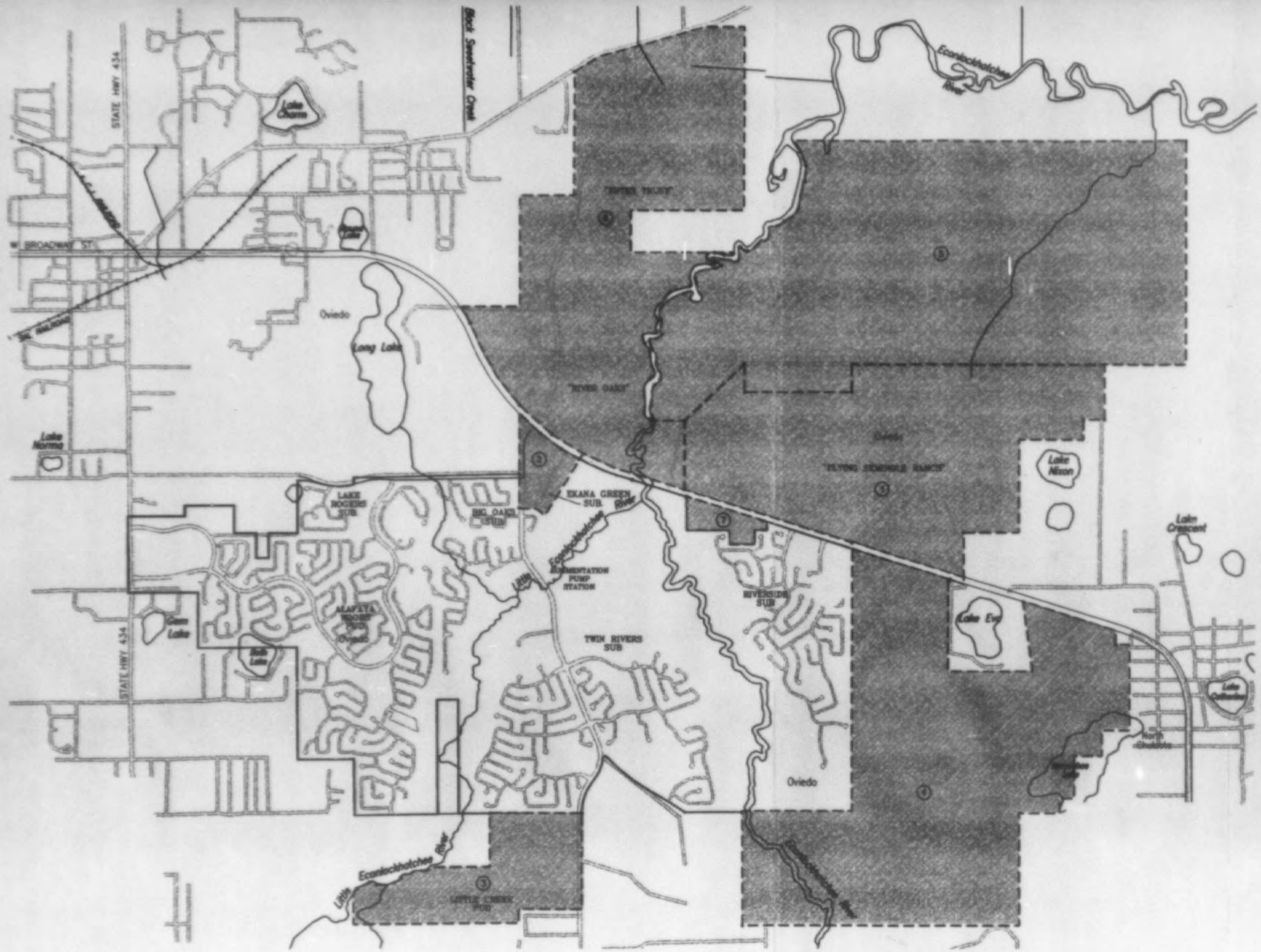
FIGURE 5-4



HARTMAN & ASSOCIATES, INC.
engineers, hydrogeologists, surveyors & management consultants
201 EAST PINE STREET - SUITE 1050 - ORLANDO, FL 32801
TELEPHONE (407) 539-3955 - FAX (407) 539-3795

ALAFAYA UTILITIES,INC.
WASTEWATER REUSE STUDY
RESIDENTIAL REUSE SCENARIO NUMBER FOUR DEMAND AREAS

FIGURE



HARTMAN & ASSOCIATES, INC.
engineers, hydrogeologists, surveyors & management consultants
301 EAST PINE STREET - SUITE 1000 - ORLANDO, FL 32801
TELEPHONE (407) 539-3955 - FAX (407) 539-3790

ALAFAYA UTILITIES,INC.
WASTEWATER REUSE STUDY
RESIDENTIAL REUSE SCENARIO NUMBER FOUR DEMAND AREAS

FIGURE 5-5

The design demand rates originally developed in Section 5.3 and Subsection 5.3.3, would likewise need to be adjusted due to the expansion of the wastewater service area to include the proposed areas. It is estimated that the wastewater flow into the Alafaya Utilities Regional WWTP could increase by approximately 1.0 MGD, due to expansion of the existing wastewater service area to include the proposed areas. It is noted that the proposed territorial expansion has previously been applied for to the FPSC. This additional influent flow would allow construction of a reuse system with a capacity of approximately 2.00 MGD, as opposed 1.00 MGD. It is noted that the expanded customer base that will result due to the extension of the existing wastewater service area will significantly reduce the individual customers cost burden for wastewater and reuse service. A summary of the future design capacity based on the estimated flows developed in this section, is summarized in Table 5-11.

As previously described in Subsection 5.3.3, the residential areas that are included in the Residential Reuse Scenario Number Four also differ from those presented in the Residential Reuse Scenario Number One and Two.

Most of the subdivisions included in the Residential Reuse Scenario Numbers One and Two areas were not required to install separate reuse distribution piping at the time that the developments were constructed. Therefore, providing reclaimed water for residential irrigation within those subdivisions will require the construction of reuse distribution, as well as transmission main piping. In comparison, the existing and proposed subdivisions in Residential Reuse Scenario Number Three and Four have, or will have, reuse distribution piping installed at the time of construction. The requirement to install reuse lines at the time of development will allow these areas to be served with reclaimed water by constructing only the supply, storage, and transmission main facilities of a reclaimed water system. The transmission main piping will then be interconnected with the previously constructed distribution system piping within the respective subdivisions.

Reuse demand was estimated for the Ekana Green, Little Creek, and proposed property subdivisions based on the planned number of units in each of the subdivisions, and the assumption that there will be 50 percent participation among homeowners to connect. Using the 500 gpd/connection reuse demand rate, it was possible to then estimate reuse demand within the respective subdivisions.

TABLE 5-11

ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
RESIDENTIAL REUSE SCENARIO NUMBER FOUR
FUTURE FLOW DESIGN SUMMARY

Description	Annual Average Daily Flow (MGD-AADF)	Maximum Month Flow (MGD-MMF)
WASTEWATER TREATMENT PLANT:		
Existing WWTP Design Capacity	2.400	--
Current Influent Flow	0.806	0.890
Estimated Influent at Build-out[1]	2.000	2.200
EXISTING REUSE SYSTEM:		
Existing Reuse System Design Capacity	--	0.500
Ekana Golf Course Demand	0.100	0.345
Available Reuse System Capacity	--	0.155
FUTURE REUSE SYSTEM:		
Residential Reuse Design Capacity	1.531	2.297
Available Reuse System Design Capacity	1.103	1.655
Ekana Golf Course Demand	0.100	0.345
Total Reuse Demand	**1.203**	**2.000**

(1) Estimate based on the proposed certificate extension as described in this section.

Summarized in Table 5-12 is the reuse demand estimated for the Residential Reuse Scenario Number Four. As summarized in Table 5-12, the reuse demand at build out in the residential areas included in this scenario is estimated at 1.531 MGD-AADF, or 2.296 MGD-MMF. This analysis includes the estimation that approximately 262 units will be available to participate in a residential reuse system within the Ekana Green and Little Creek subdivisions, and another 2,800 within the proposed areas.

The existing effluent disposal facilities for the reclaimed water system consist of a single three (3) cell filter rated at 0.500 MGD, a single chlorine contact basin, a 700 gpm duplex submersible pump station and a 10-inch PVC reuse transmission main that runs from the wastewater treatment plant site to the reuse storage pond located on the west side of Lockwood Road. The pump station is designed for a firm capacity (reliability) of 1.0 MGD. The 10-inch effluent reuse main has a maximum pumping capacity of 1,224 gpm, or 1.76 MGD.

Other existing reuse facilities that would be utilized include the section of 12-inch reuse main that runs from Section VI of Twin Rivers, under the Econlockhatchee River, to the master lift station located in Riverside, and Twin Rivers Section 1, Ekana Green, and Little Creek. Since the Econlockhatchee River 12-inch reuse main crossing already exists, reuse could be provided to the estimated 4,900 residential units that are to be constructed in the proposed areas east of the Econlockhatchee River by extending the reuse transmission main from the stubbed-off river crossing section, through the Riverside subdivision, to a connection point at the new developments. Additionally, a section of reuse transmission main would need to be constructed from the reuse storage site on Lockwood Road, along Ekana Drive through the Twin Rivers subdivision, to the stubbed-off river crossing on the west side of the Econlockhatchee River. It is noted that since the stubbed-off section of the reclaimed water river crossing already exists, providing reuse east of the Econlockhatchee River would not require additional permitting associated with construction of a river crossing. Reuse service to the Little Creek subdivision could be accomplished by extending the reuse transmission main south on Lockwood Road, to the connection point of the existing reuse distribution facilities at Little Creek. To provide reuse within the proposed River Oaks and Estes Trust property, the transmission main would need to be extended north on a proposed section of Lockwood Road, that will be constructed north from State Road 419 to State Road 426.

TABLE 5-12
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
RESIDENTIAL REUSE SCENARIO NUMBER FOUR
REUSE DEMAND SUMMARY

No.	Site	Area (ac.)	Irrigable %	Irrigable Area (ac.)	Subscription Rate (%)	Reuse Area (ac.)	Irrigation Rate (inch/week	Estimated Reuse Capacity (gpd)
1	Ekana Green Subdivision (Formerly the Colony)	17	50	8.5	50	4.3	1.25	20,500
2	Little Creek	217	21	45.6	50	22.8	1.25	110,500
3	Proposed Flying Seminole Ranch Property Subdivision	742	19.5	145	50	72.5	1.25	325,000
4	Live Oak PUD	1,050	10	104	50	52	1.25	250,000
5	Undeveloped Land Parcel (north of Flying Seminole Ranch)	1,388	5	64.5	50	129	1.25	625,000
6	River Oaks and Estes Trust Property	866	2.5	21	50	41	1.25	200,000
	Total Proposed Reuse Demand							**1,531,000**

GJR/dt/mb/R-A-2/5-12.tab
HAI #95-099.01/030196

The capital improvements necessary to provide the additional capacity identified in this analysis include improvements to expand the reclaimed water treatment filtration facilities by approximately 1.500 MGD, up to a total capacity of approximately 2.40 MGD, and other reclaimed water treatment facilities including a new 16,000 gallon chlorine contact chamber and expansion of on-site effluent transfer pump capacity by approximately double the existing capacity (700 gpm duplex). Additionally, a new high-service pumping facility to provide the required 2.0 MGD design pumping capacity will be constructed at the Lockwood Road reuse storage site. In addition, minor yard piping, electrical, and control improvements associated with the filter and chlorine contact chamber expansions would be required. The proposed improvements would consist of three (3) additional triple cell filtration units comparable to that which currently exists. The proposed units would be designed based on the same loading criteria as the existing filter units (2.0 gpm/sf at ADF). The filter improvements will consist of all minor yard piping, backwash and mudwell pumping equipment, control valves, site work and electrical improvements. In addition, the proposed improvements would consist of an additional 16,000 gallon prefabricated steel chlorine contact chamber following in the process.

Preliminary capital costs associated with constructing reuse facilities for Residential Reuse Scenario Number Four are estimated at approximately $3,990,000, or $2.60 per gallon of reuse demand estimated in this scenario. The capital costs identified for this scenario include those for Alafaya Utilities Regional WWTP site improvements such as new filters, CCC, electrical, yard piping, and other miscellaneous costs as summarized in Table 5-13. This cost estimate also includes those costs associated with the transmission of the reclaimed water to the sites as illustrated previously in Figure 5-5. It is estimated that additional storage may need to be provided for implementation of this scenario. Existing reuse storage includes the 3.65 MG storage pond located on Lockwood Road. This storage facility provides adequate wet weather storage for the reuse system design of this scenario. Likewise, it is noted that the reject storage tank located on the Alafaya Utilities Regional WWTP site is of adequate capacity for the requirements of this scenario.

TABLE 5-13

ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
RESIDENTIAL REUSE SCENARIO NUMBER FOUR
PRELIMINARY CAPITAL COST ESTIMATE

Item Description	Units	No. of Units (#)	Unit Costs ($/Unit)	Total Costs ($)
Filtration Units	SF	540	$700	$378,000
Chlorine Contact	GAL	16,000	$2.3	40,000
Reuse Pump Station with Hydro Tank	LS	1	$200,000	200,000
Effluent Transfer Pump Modifications	LS	1	$100,000	100,000
16-inch DIP Reuse Main	LF	13,296	$31.00	412,200
12-inch PVC Reuse Main	LF	51,356	$16.30	837,000
10-inch PVC Reuse Main	LF	14,374	$15.00	215,600
16-inch Gate Valve	EA	17	$1,400.00	23,800
12-inch Gate Valve	EA	65	$1,340.00	87,100
10-inch Gate Valve	EA	18	$920.00	16,600
Terminal Blowoff Assembly	EA	8	$500.00	4,000
Audio/Video Preconstruction Record	LF	79,026	$0.10	7,900
Automatic Air Release Valve	EA	4	$2,500.00	10,000
Ductile Iron Fittings	LB	36,275	$2.15	78,000
Concrete Replacement	SY	228	$7.00	1,600
Electrical/Instrumentation	LS	1	$87,000	141,000
Site Work	LS	1	$43,500	72,000
Yard Piping	LF	1	$65,300	108,000
Roadway Bore & Jack	EA	22	$10,000	220,000
General Requirements	LS	1	$77,700	236,000
Subtotal Construction				$3,191,800
Contingency (@ 15%)				479,000
Engineering (@ 10%)				319,200
Total Project Costs				**$3,990,000**

SECTION 6

SECTION 6
SUMMARY

6.1 CONCLUSIONS

It is concluded that the construction of a reclaimed water system to serve residential customers is more economically attractive if large portions of the reclaimed systems are constructed during the development of the specific property to be served. Therefore, it is concluded that the expansion of the existing Alafaya Utilities Service area to include the proposed service extension areas including the Flying Seminole Ranch property, the Live Oak PUD, the River Oaks and Estes Trust, and the undeveloped parcel north of the Flying Seminole property is extremely beneficial to making a reuse system in this area a reality. It can be inferred from the analysis of this study that any other reuse scenario which includes a combination of serving existing or proposed developments with reuse distribution mains (Ekana Green subdivision and Little Creek and proposed extension areas), and developments without reuse distribution mains (Alafaya Woods, Twin Rivers and Riverside), would be more cost-effective than Residential Scenario One or Two, but less cost-effective than Residential Scenario Four. The distinction which sets Residential Scenario Four apart from the other scenarios is the relative economic attractiveness of its estimated capital cost index. Also, the development of Residential Reuse Scenario Number Four proves the relative economies of scale and service will positively benefit the Public, the Utility, and the environment. With regard to economy of scale, the reclaimed water system design in this scenario resulted in a cost per gallon of capacity constructed index of $2.60 at 1.531 MGD-AADF. This is approximately $1.00/per gallon less than the next closest scenario (Residential Scenario Number Three), but is for a system that has approximately three (3) times the capacity for effluent disposal. Table 6-1 summarizes the scenarios and their respective costs.

With regard to economy of service, the Residential Scenario Four system design includes a number of advantages when compared to the next closest scenario. First, the expanded customer base resulting from extending the existing service area as described for this scenario will lower the per gallon cost for wastewater and reclaimed water service. Secondly, the Alafaya treatment plant was originally designed with significant facilities so that a reuse system could be included in the process operations in anticipation of providing expanded reclaimed water service to the Oviedo area.

TABLE 6-1
ALAFAYA UTILITIES, INC.
WASTEWATER REUSE STUDY
REUSE SCENARIO COST SUMMARY

Scenario (#)	Estimated Reuse Demand (MGD-AADF)	Available Reuse Demand (MGD-MMF)	Golf Course Demand (MGD-MMF)	Total Reuse (MGD-MMF)
Institutional - 1	0.239	0.155	0.345	0.500
Residential - 1	0.437	0.655	0.345	1.000
Residential - 2	0.437	0.655	0.345	1.000
Residential - 3	0.456	0.883	0.345	1.228
Residential - 4	1.531	1.655	0.345	2.000

Scenario (#)	Estimated Capital Costs ($)	Cost Index[1] ($/gpd)	Cost Index[2] ($/gpd)
Institutional - 1	1,265,800	5.30	--
Residential - 1	2,811,000	6.43	4.29
Residential - 2	2,464,000	5.64	3.76
Residential - 3	1,631,000	3.57	1.85
Residential - 4	$3,990,000	2.60	1.74

(1) Based on the annual average daily flow (AADF)
(2) Based on the maximum month flow (MMF)

As with most any wastewater utility system, the closer the actual influent flow is to the design capacity of the Alafaya Utilities Regional WWTP, the more efficient is the utilization of the treatment facilities. Likewise, the larger the reclaimed water system, the greater the beneficial use of the Alafaya Utilities Regional WWTP effluent, as compared to other non-beneficial systems of effluent disposal. This point is especially important in areas such as Oviedo, that have been designated water use caution areas with regard to the areas public water supply. By utilizing the greatest capacity of reclaimed water in a beneficial manner, the less of an impact there is on the areas potable water supply.

Residential Reuse Scenario Number Four includes reclaimed water facility improvements and construction of a reuse transmission main to the Ekana Green and Little Creek subdivisions, and the proposed Flying Seminole Ranch property, the Live Oak PUD, River Oaks and Estes Trust property, and the undeveloped parcel north of the Flying Seminole Ranch property. The subsequent cost analysis includes consideration of providing reuse to these subdivisions. Approximately 5,700 residential units are estimated to be built within these proposed areas. The analysis was developed based on reuse distribution mains being installed at the time of construction, as required in the Oviedo Land Development Code, Section 233. For implementation of the Residential Reuse Scenario Number Four, the Alafaya Utilities, Inc., will need to construct additional filtration, chlorine contact, and high-service pumping facilities to meet the minimum requirements for supply of the approximate 1.531 MGD-AADF of residential reclaimed water service identified in this scenario. In addition, approximately 79,000 linear feet of ductile iron (DIP) and PVC transmission main was included in this design. The transmission main is necessary to transport the reclaimed water to the respective distribution systems. It is noted that the existing 12-inch Econlockhatchee River crossing was previously permitted and constructed in anticipation of providing reuse to the areas east of the river. The existing 12-inch reclaimed water transmission main will greatly reduce both capital costs and permitting tasks related to the construction of a similar river crossing in today's regulatory environment. Capital costs for constructing reuse for the Residential Reuse Scenario Number Four is estimated at $3,990,000, or $2.60 per gallon of reuse capacity constructed, based upon an annual average daily flow.

Residential Reuse Scenario Number Three includes reclaimed water facility improvements and construction of a reuse transmission main to the Ekana Green and Little Creek subdivisions and the proposed Flying Seminole Ranch property subdivisions. The subsequent cost analysis includes consideration of providing reuse to these subdivisions. Approximately 1,824 residential units are

estimated to be built within these proposed areas. The analysis was developed based upon reuse distribution mains installed at the time of construction, as required in the Oviedo Land Development Code, Section 233. For implementation of the Residential Reuse Scenario Number Three, the Alafaya Utilities, Inc., will need to construct additional filtration, chlorine contact, and high-service pumping facilities to meet the minimum requirements for supply of the approximate 0.500 MGD-AADF of residential reclaimed water service identified in this scenario. Additionally, this scenario includes transmission main facilities. Capital costs for constructing reuse for the Residential Reuse Scenario Number Three is estimated at $1,631,000 or $3.57 per gallon of reuse capacity constructed.

With regard to the Residential Reuse Scenario Numbers One and Two considered in this analysis, implementation at any level would be quite costly for the level of reuse constructed unless participation rates approached 100 percent. Unit capital costs were estimated at $6.43 and $5.64, respectively, per gallon of capacity constructed for Residential Reuse Scenario Numbers One and Two. It is noted that actual participation rates may vary from that estimated for this analysis and therefore, greatly affect the design and cost of the residential reuse system in the areas.

With regard to the facility improvements necessary to implement the level of reuse identified in the Institutional Reuse Scenario, this analysis concludes that it is more costly on a per unit basis to pursue the improvements identified in that scenario. On a cost per gallon of reuse capacity constructed, the Institutional Reuse Scenario expansion was estimated at approximately $5.30 per gallon of reuse capacity constructed. In addition, this scenario does not provide sufficient demand for the full utilization of the existing Alafaya Utilities Regional WWTP facilities. It is noted that the actual loading rates at the institutional sites could be higher and, as such, the actual demand rates may be higher than those estimated for this study. This scenario does not provide the utility with the best method of effluent disposal, as evaluated in this analysis. Constructing an institutional reuse system at this scale for the sake of effluent disposal is not necessary at this time due to any regulatory or capacity related constraints.

6.2 RECOMMENDATIONS

The recommendations and contents of this report provide Alafaya Utilities, Inc., with:

- the required information to plan for a cost-effective expansion of reclaimed water facilities;

- the maximum utilization of its existing wastewater treatment plant facilities; and

- the provisions of reclaimed water and wastewater services to its existing and future customers at rates competitive with similar utilities in Florida.

The Alafaya Utilities Regional WWTP is currently permitted for 2.40 MGD secondary treatment of domestic sewage. The WWTP also has 0.50 MGD of tertiary treatment facilities (filtration and disinfection), but is currently only permitted for 0.325 MGD of reclaimed water disposal by spray irrigation at the Ekana Golf Course. The recent draft copy of the pending operating permit for the Alafaya WWTP issued by the local office of the Florida Department of Environmental Protection (FDEP) indicates that the disposal capacity at the Ekana Golf Course will be reduced to 0.10 MGD on an annual average basis. The Alafaya Utilities Regional WWTP is also currently permitted for 1.0 MGD of effluent disposal at the percolation pond site. This reduction in the overall effluent disposal capacity, along with the need to alleviate the demand on ground water aquifers, has accelerated the Utility's consideration of the implementation of commercial and/or residential reclaimed water systems.

For implementation of the Residential Reuse Scenario Number Four, an additional 1.50 MGD of filter treatment capacity, and an additional 0.500 MGD treatment capacity for chlorine contact and on-site effluent pumping will be required. Additionally, a 2.0 MGD reuse pump station will need to be constructed at the Lockwood Road reuse storage site. In addition, a transmission main that would transport the reclaimed water to the various residential areas identified in this scenario would also need to be constructed. It is noted that the existing 12-inch Econlockhatchee River crossing was permitted and constructed in anticipation of providing reuse to the areas east of the river. When considering this program based on the assumption that it will provide residential irrigation reclaimed water service to the Ekana Green subdivision, Little Creek, and proposed service extension areas, without having the costs associated with construction of reuse distribution facilities, it provides an attractive scenario in terms of capital cost-effectiveness per unit of reclaimed water capacity constructed. It should also be noted that the feasibility of providing reuse at the level identified in Residential Reuse Scenario Number Four relies upon factors such as the future expansion of the Alafaya Utilities, Inc., service area, in particular, and the ability to serve future developments such as those in the service extension area.

As noted, the addition of the extension areas including the Flying Seminole Ranch property, the Live Oak PUD, River Oaks and Estes Trust property, and the undeveloped property north of Flying Seminole Ranch property to the existing service area will contribute the additional sewage flow to make the entire program much more cost-effective. It should also be noted that the inclusion of the Flying Seminole Ranch, as well as any other proposed residential development areas, into the Alafaya Utilities service area will be the best use of the existing wastewater facilities. The existing wastewater service area could be expanded to include these additional residential developments that would contribute another 1.40 MGD of wastewater flow before the Alafaya Utilities Regional WWTP capacity is exceeded. In addition, the plant site would allow for the expansion of the existing Alafaya Utilities Regional WWTP beyond the existing 2.4 MGD capacity. Any future expansion of the existing wastewater treatment facilities would make providing wastewater treatment, as well as reuse service more economically feasible than the construction of new separate facilities. These additional areas will be constructed with reclaimed water distribution piping, as required in the Oviedo Land Development Code, Section 233, which insures that there will always be sufficient effluent disposal capacity with the additional raw sewage flow. The Alafaya Utilities Regional WWTP has ample treatment capacity for wastewater flows from the extension service area properties.

Based on the analysis of this report, it is recommended that the Utility proceed with the expansion of its certificated service area as originally planned. It is also recommended that the Utility proceed with the facility expansions as required for implementation of Residential Reuse Scenario Number Four. It is our opinion that the implementation of this scenario will provide the best scenario in terms of cost-effectiveness, utilization of facilities, and benefit to the existing and future customers. Of course, the economic feasibility of these proposed facilities and implementation of this plan, including the capital improvements, will be directly impacted and dependent upon the future actions of the Florida PSC with regards to user rates and service availability charges. However, when compared to other similar systems already in service and approved by the PSC, it would appear that the economics of the recommended alternative as set forth in this report for Alafaya Utilities would be both viable and economically feasible.