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Black & Veatch Corporation

Kissimmee Utility Authority
Ten Year Site Plan

B&V Project 024489.0019
April 1, 1999

990005

Mr. Joseph D. Jenkins
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, FL 32399-0850

Subject: Kissimmee Utility Authority 1999 Ten-Year Site Plans

Dear Joe:

Enclosed please find twenty-five (25) copies of the 1999 Ten-Year Site Plan for Kissimmee Utility Authority as required by 25.22.071 Florida Administrative Code. Should you or your staff have any questions, please give me a call at 913-458-7432 or Robert Miller at 407-933-7777.

Sincerely yours,

BLACK & VEATCH

Myron Rollins

MR/jlw
Enclosures

cc: Robert Miller

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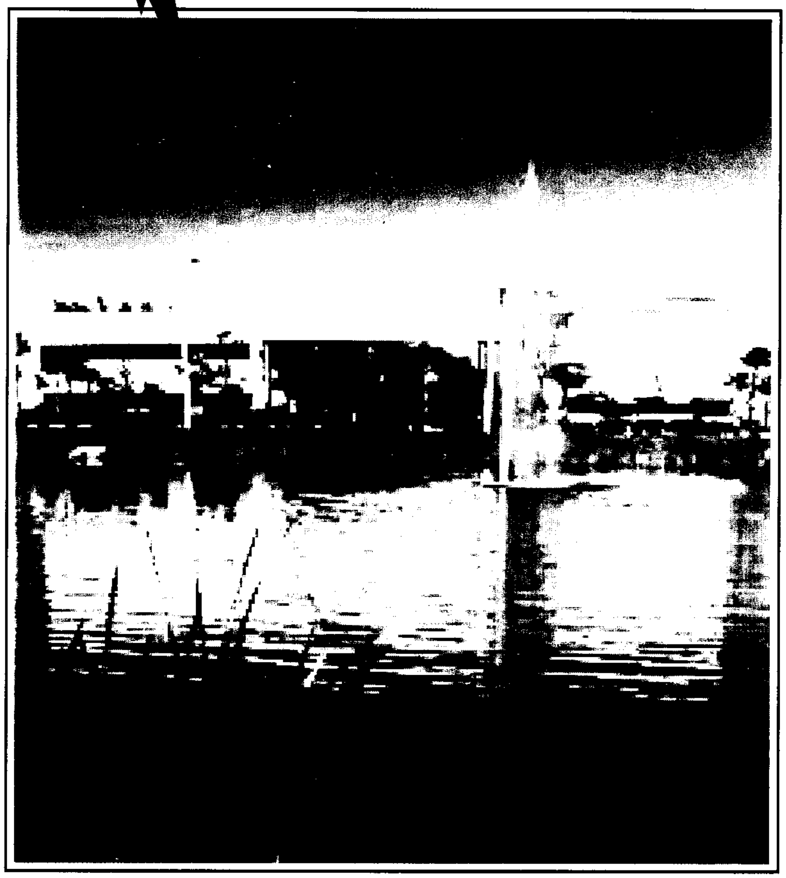

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1.0 Executive Summary

This report documents the 1998 Kissimmee Utility Authority (KUA) Ten-Year Site Plan (TYSP) pursuant to Florida Administrative Codes (FAC) 25-22.070 through 25-22.072. The TYSP provides the information required by this rule. The TYSP is divided into seven main sections: Description of Existing Facilities, Forecast of Electric Power Demand and Energy Consumption, Conservation and Demand-Side Management, Forecast of Facilities Requirements, Environmental and Land Use Information, Environmental Impacts, and Mitigation Measures. Schedules required by the FPSC have been included in Appendix A following Section 8.0.

1.1 Description of Existing Facilities

Section 2.0 of the TYSP details KUA's existing generating and transmission facilities. The section includes a historical overview of KUA's electric system, description and table of existing power generating facilities, existing power purchase information, and maps showing service area and transmission lines. KUA's existing generating facilities and purchases provide KUA approximately 289 MW (net) during winter and 274 MW (net) during summer.

1.2 Forecast of Electrical Power Demand and Energy Consumption

Section 3.0 of the TYSP presents the load forecast summary for KUA's system. KUA is projected to remain a summer peaking system. A 4.9 percent annual summer peak demand growth rate is projected for 1999 through 2008. This growth rate is significantly lower than KUA's historical annual growth rate of 6.7 percent during the last 10 years.

Net energy for load is projected to grow at an average annual rate of 4.2 percent over the next 10 years compared to 6.4 percent over the last 10 years. In addition to the base case load forecast, projections were developed for high and low load growth scenarios based on high and low population estimates published by the Bureau of Economic and Business Research (BEBR).

1.3 Conservation and Demand-Side Management

Section 4.0 provides descriptions of KUA's existing conservation and demand-side management (DSM) programs and additional programs that have been evaluated. Over 80 DSM measures were analyzed based on the generic Central Florida Technology Database using the Comprehensive Market Planning and Analysis System (COMPASS) model. With the exception of direct load control, the cost-effectiveness of the evaluated alternatives was determined to be marginal.

1.4 Forecast of Facilities Requirements

Section 5.0 integrates the electrical demand and energy forecast with the conservation and DSM forecast to determine the facilities requirements for a 20 year planning horizon (1999-2018).

Fuel price projections are provided with a description of the applied forecast methodology. Fuel price forecasts are provided for coal, natural gas, No. 2 oil, No. 6 oil, and nuclear.

Generating unit alternatives listed in Section 5.0 were screened based on stated economic conditions and power system modeling software. EGEAS optimal expansion planning software, which compares the cumulative present worth revenue requirement (CPWRR) of various unit addition scenarios, was used to identify KUA's least-cost capacity expansion plan. PROSYM production costing software was used to develop annual fuel usage and total system production cost forecasts. The forecast of fuel usage is presented in the Appendix A and schedules.

1.5 Environmental and Land Use Information

Section 6.0 details existing environmental and land use information at the Cane Island dsite including geology, physiography, soils, climate, air quality, hydrology, vegetation, wildlife and endangered species, wetland boundaries, land use and recreation information, socioeconomic data, noise, transportation, and cultural resources.

1.6 Environmental Impacts

Section 7.0 describes the effects that may occur to the natural and cultural characteristics listed in Section 6.0 of the Cane Island site as a result of the construction and operation of the proposed Cane Island Unit 3.

1.7 Mitigation Measures

Section 8.0 summarizes major mitigation measures associated with each resource area listed in Section 6.0.

2.0 Description of Existing Facilities

2.1 Historical Background

The first recorded mention of electric lights--in what was then called Kissimmee City--was made during a City Council meeting on December 17, 1891. An Electric Light Committee was formed and notified the Council that a plan had been prepared showing the location of proposed lights for the town. However, to implement the plan, requests for 300 lights would be required to secure the first electric light plant in the area.

During the ensuing years, electric light discussions persisted. On April 9, 1892, a proposal was made that a bond issue for $23,000 be implemented to provide for a public works department and electric lights. On April 18, 1893, a ballot was taken and this bonding request was approved by a vote of 41 to 5.

On December 4, 1900, Kissimmee City entered into a contract with W. C. Maynard, a citizen of the town, doing business as Kissimmee Light Co. The contract with Mr. Maynard gave him the exclusive right and franchise to erect and maintain an electric light plant in Kissimmee City for a period of twenty years.

Initially, Kissimmee Light Co. agreed to supply consumers electricity at a cost of 3¢ per night for each sixteen candle power incandescent light and $7.50 per month for arc lights of standard power.

During a Council meeting on June 28, 1901, a resolution was passed and Kissimmee City purchased Kissimmee Light Co. from Maynard for $4,293.59. A Committee was then appointed by the City Council to manage the company.

2.1.1 History In The Making

The decades that span the 1900s to the 1980s were spent laying the operational groundwork and infrastructure KUA heavily relies on today. The utility's initial purchase was a 15 kilowatt generator in 1901. In the twenties, three diesel engines were added to the system providing electricity to approximately 200 customers. The thirties marked the pioneer connection between St. Cloud and Kissimmee, while during the forties and fifties the utility worked diligently to increase the distribution capacity. The seventies were monumental in its importance when Kissimmee and St. Cloud intertied with the rest of the continental United States through Florida Power Corporation at Lake Cecile.

From 1972 to 1982, the utility experienced multiple management changes, including five Utility Directors. In 1982, James C. Welsh, current President & General Manager, replaced Don Hornak as Utility Director. As KUA settled in with a new Director, many accomplishments were realized: KUA became owners in the St. Lucie nuclear power plant from Florida Power & Light; a 50 MW combined cycle unit was installed marking KUA's first entry into gas turbine technology and a reentry into the steam electric generation business after many years of sole dependence on diesel type units.

2.1.2 A New Beginning

The year 1983 marked the turning point in the making of what KUA is today. During 1983, the City Commission established an Ad-Hoc Committee to explore the concept of making the electric utility department of the City into a separate authority. The Committee also investigated the best way to manage the utility. The conclusion was that the authority would best be run by an independent board consisting of individuals with strong business backgrounds.

In 1984, the Ad-Hoc Committee presented its recommendation of making the electric utility department of the City into a separate authority. Subsequently, the City Commission reappointed the Ad-Hoc Committee members to a Charter Committee. This latter committee had the difficult task of developing a charter for the utility. In 1985, the City Commission approved the charter, subject to a vote of the people of the City of Kissimmee. A month later, voters accepted the Kissimmee Utility Authority Charter by a 2 to 1 margin.

2.1.3 KUA Today

Today, KUA is a municipal electric utility under the direction of a 6-member board of directors. In addition, KUA acts as a billing and customer service agent for the Water and Sewer and Refuse Departments of the City of Kissimmee. Its service area covers the City of Kissimmee and some unincorporated areas, totaling approximately 85 square miles.

The primary goal of KUA is to provide reliable electric service to its customers at the lowest possible cost in the best environmentally acceptable method. In order to accomplish this, KUA has diversified its power supply resources which are based on KUA's own generation, off-site generation through joint participation projects and through long- and short-term purchase power contracts.

2.2 Kissimmee Utility Authority

2.2.1 General

The Kissimmee Utility Authority (KUA) is a body politic organized and legally existing as part of the government of the City of Kissimmee. On October 1,1985, the City of Kissimmee transferred ownership and operational control of the electric generation, transmission, and distribution system to KUA. KUA has all the powers and duties of the City of Kissimmee to construct, acquire, expand, and operate the system in an orderly and economic manner.

2.2.2 Load and Electrical Characteristics

KUA's load and electrical characteristics have many similarities to other Peninsular Florida utilities. Except during years with extreme winter weather conditions, KUA's system peak demand occurs during the summer months. KUA's system peak demand during 1998 was 233 MW.

KUA's historical and projected peak demands, for the period 1989 through 2018, are presented in Table 2-1. Further details of KUA's load and electrical characteristics are contained in Section 3.0, Forecast of Electrical Power Demand and Energy Consumption.

KUA is a member of the Florida Municipal Power Pool (FMPP), along with Orlando Utilities Commission (OUC), the Florida Municipal Power Agency (FMPA) All Requirements Project, and the City of Lakeland. FMPP operates as an hourly energy pool. Commitment and dispatch services for FMPP are provided by OUC. Each member of the FMPP retains the responsibility of adequately planning its own system to meet native load and Florida Reliability Coordinating Council (FRCC) reserve requirements.

Table 2-1
Summary of Load Forecast

Year	Winter Peak Demand (MW)			Summer Peak Demand (MW)		
	Base	High	Low	Base	High	Low
1989	148	---	---	141	---	---
1990	200	---	---	151	---	---
1991	147	---	---	157	---	---
1992	158	---	---	169	---	---
1993	158	---	---	183	---	---
1994	173	---	---	180	---	---
1995	196	---	---	195	---	---
1996	218	---	---	206	---	---
1997	198	---	---	216	---	---
1998	180	---	---	233	---	---
1999	235	252	200	244	262	208
2000	242	267	202	252	278	210
2001	264	303	212	274	315	220
2002	286	340	222	296	352	231
2003	304	374	230	315	387	238
2004	318	400	235	329	414	244
2005	334	430	241	345	444	250
2006	343	450	243	355	465	252
2007	353	470	245	365	486	254
2008	362	492	246	375	509	255
2009	372	515	248	385	533	257

Table 2-1
Summary of Load Forecast

Year	Winter Peak Demand (MW)			Summer Peak Demand (MW)		
	Base	High	Low	Base	High	Low
2010	382	539	250	396	557	259
2011	392	562	250	406	582	259
2012	403	587	250	417	608	259
2013	413	613	251	428	634	260
2014	424	640	251	439	663	260
2015	435	668	251	451	692	260
2016	446	697	250	462	722	259
2017	457	726	248	474	752	257
2018	469	757	247	486	784	256

2.2.3 Generation Resources

KUA owns and operates or has ownership interest in generating units comprising several technologies, including nuclear, coal-fired, diesel, simple cycle, and combined cycle. Table 2-2 provides a summary of KUA's existing generating resources. The following paragraphs describe KUA's generating assets and ownership interests in detail.

KUA owns and operates eight diesel generating units ranging in age from 16 to 40 years. Each of these diesel units is located at the Roy B. Hansel Generating Station in Kissimmee. Six of these diesel units are fueled by natural gas while the remaining two burn No. 2 oil. The total nameplate capacity of the eight diesels is 18.35 MW. In addition, KUA owns and operates a natural gas fired (with No. 2 oil as backup) combined cycle plant, which is also located at the Hansel site. This plant consists of a 35 MW (nameplate) combustion turbine which provides waste heat for two 10 MW (nameplate) steam turbine generators. The total nameplate generating capability at the Hansel site is approximately 73.35 MW.

KUA and FMPA are both 50 percent joint owners of Cane Island Units 1 and 2. Unit 1 is a simple cycle General Electric LM6000 aero-derivative combustion turbine with a nameplate rating of 42 MW. Unit 2 is a one-on-one General Electric Frame 7EA combined cycle with a nameplate rating of 120 MW. KUA's 50 percent ownership share of the Cane Island Units is 81 MW (nameplate).

KUA owns a 0.6754 percent interest, or 6 MW (nameplate), in the Florida Power Corporation's (FPC) Crystal River Nuclear Unit 3, located in Citrus County, Florida. KUA also has a 4.8193 percent ownership interest, or 22,300 kW (nameplate), in the Orlando Utilities Commission's (OUC) Stanton Energy Center Unit 1 and a 12.2 percent, or 10 MW (nameplate), of OUC's Indian River Combustion Turbine Project Units A and B.

Table 2-2
Kissimmee Utility Authority Existing Generating Facilities

Plant	Unit No.	Location	Type	Fuel		Commercial In-Service (Month/Year)	Expected Retirement (Month/Year)	Generator Maximum Nameplate (MW)	Net Capability		Fuel Transportation	
				Primary	Alternate				Summer (MW)	Winter (MW)	Primary	Alternate
Hansel	8	Osceola County 27,T25S/R29E	IC	NG	FO2	02/59	-/98	3.00	3	3	PL	TK
	14		IC	NG	FO2	02/72	01/02	2.07	2	2	PL	TK
	15		IC	NG	FO2	02/72	01/02	2.07	2	2	PL	TK
	16		IC	NG	FO2	02/72	01/02	2.07	2	2	PL	TK
	17		IC	NG	FO2	02/72	01/02	2.07	2	2	PL	TK
	18		IC	NG	FO2	02/72	01/02	2.07	2	2	PL	TK
	19		IC	FO2	---	02/83	01/13	2.50	3	3	TK	---
	20		IC	FO2	---	02/83	01/13	2.50	3	3	TK	---
	21		CT	NG	FO2	02/83	01/13	35.00	28	32	PL	TK
	22		ST	WH	---	02/83	01/13	10.00	10	10	---	---
	23		ST	WH	---	02/83	01/13	10.00	10	10	---	---
Plant Total								73.35	67	71		
Crystal River	3	Citrus County 33,T17S/R16E	N	UR	---	03/77	Unknown	890.46	6[1]	6[1]	TK	---
Plant Total								890.46	6	6		
Stanton Energy Center	1	Orange County 13,14,23,24 /R31E/T23S and 18,19 /T23S/R32E	ST	BIT	---	07/87	Unknown	464.58	21[2]	21[2]	RR	---
Plant Total								464.58	21	21		
Indian River	A	Brevard County 12/T23S/R35E	CT	NG	FO2	07/89	Unknown	41.40	4.5[3]	5.5[3]	PL	TK
	B		CT	NG	FO2	07/89	Unknown	41.40	4.5[3]	5.5[3]	PL	TK
Plant Total								82.80	9	11		

Table 2-2 (Continued)
Kissimmee Utility Authority Existing Generating Facilities

Plant	Unit No.	Location	Type	Fuel		Commercial In-Service (Month/Year)	Expected Retirement (Month/Year)	Generator Maximum Nameplate (MW)	Net Capability		Fuel Transportation	
				Primary	Alternate				Summer (MW)	Winter (MW)	Primary	Alternate
Cane Island	1	Osceola County	CT	NG	FO2	11/94	Unknown	42.00	15(4)	20(4)	PL	TK
	2	29,32/R28E	CT	NG	FO2	06/95	Unknown	80.00	34(4)	40(4)	PL	TK
	2	/T25S	ST	WH	---	06/95	Unknown	40.00	20(4)	20(4)	---	---
Plant Total								162	69	80		
System Total as of January 1, 1999									172	189		

Notes:
(1)KUA's 0.6754 percent portion of joint ownership.
(2)KUA's 4.8193 percent ownership portion.
(3)KUA's 12.2 percent portion of joint ownership.
(4)KUA's 50 percent ownership portion.

2.2.4 Purchase Power Resources

KUA is a member of the Florida Municipal Power Agency (FMPA), a legal entity organized in 1978 and existing under the laws of Florida. During 1983, FMPA acquired an 8.8060 percent (73.9 MW) undivided ownership interest in St. Lucie Unit 2 on behalf of KUA and 15 other members of the FMPA. KUA's entitlement share of this unit, based on a power purchase contract and adjusted for transmission losses, is 6.9 MW. FMPA has also entered into a Reliability Exchange Agreement with FPL under which half of KUA's entitlement share of capacity and energy will be supplied from St. Lucie Unit No. 1 and half from Unit No. 2.

In addition to the above resources, KUA purchases electric power and energy from other utilities. KUA has a contract to purchase 20 MW of firm capacity from OUC through December 2003. This contract also provides for supplemental purchases up to an additional 50 MW if the capacity is available from OUC. For planning purposes, KUA is planning to purchase 30 MW of this supplemental capacity for 1998 and 1999 and 40 MW in 2000. KUA has a 1.80725 percent (7.9 MW) entitlement share of Stanton 1 through the FMPA Stanton 1 Project and a 7.6628 percent (33.3 MW) share of Stanton 2 through the FMPA Stanton 2 Project. The Stanton 2 percentage includes recently acquired Homestead and Lake Worth shares totaling 3.8314 percent. Table 2-3 presents KUA's purchase power resources.

2.2.5 Transmission and Interconnections

KUA is a member of the Florida Reliability Coordinating Council (FRCC). The FRCC has established an energy broker system which provides economic interchange of electric energy between member utilities, including KUA. KUA has purchased and sold energy through this broker system, and intends to continue such transactions whenever conditions are favorable. Currently, these economy transactions are conducted through FMPP.

Table 2-3
KUA's Purchase Power [1]

CY	Utility/Unit (MW)					Annual Total
	St. Lucie 1 & 2	Stanton 1[2]	Stanton 2[3]	OUC[4]	Unspecified Purchases [5]	
1999	6.9	7.9	33.3	50	0	98.1
2000	6.9	7.9	33.3	60	0	108.1
2001	6.9	7.9	33.3	20	30	98.1
2002	6.9	7.9	33.3	20	0	68.1
2003	6.9	7.9	33.3	20	0	68.1
2004	6.9	7.9	33.3	0	0	48.1
2005	6.9	7.9	33.3	0	0	48.1
2006	6.9	7.9	33.3	0	0	48.1
2007	6.9	7.9	33.3	0	0	48.1
2008	6.9	7.9	33.3	0	0	48.1
2009	6.9	7.9	33.3	0	0	48.1
2010	6.9	7.9	33.3	0	0	48.1
2011	6.9	7.9	33.3	0	0	48.1
2012	6.9	7.9	33.3	0	0	48.1
2013	6.9	7.9	33.3	0	0	48.1
2014	6.9	7.9	33.3	0	0	48.1
2015	6.9	7.9	33.3	0	0	48.1
2016	6.9	7.9	33.3	0	0	48.1
2017	6.9	7.9	33.3	0	0	48.1
2018	6.9	7.9	33.3	0	0	48.1

Notes:
(1) No reserves are supplied by the selling utility. KUA provides for 15 percent reserves.
(2) KUA share of Stanton 1 through FMPA Stanton 1 Project is 1.80725 percent.
(3) KUA share of Stanton 2 through FMPA Stanton 2 Project is 7.6628 percent. Total percentage represents KUA's original purchase percentage plus sum of recently acquired Homestead and Lake Worth purchase percentages equal to 3.8314 percent.
(4) 20 MW Schedule D and 30 MW short-term purchase in 1998, 1999, and 40 MW in 2000.
(5) 30 MW firm purchase for first half of 2001, contingent on convention center load.

KUA has direct transmission interconnections with: (i) FPC, delivered at 69 kV from the FPC Lake Bryan substation and at 230 kV at OUC's Taft substation; (ii) OUC (two lines and an auto-transformer), delivered at 230 kV at OUC's Taft substations; (iii) the City of St. Cloud, Florida, at KUA's 69 kV interconnection with St. Cloud's transmission facilities; and (iv) TECO, one 230 kV circuit through the interconnection with the Osceola and Lake Jewell circuits.

Electric power and energy supplied from KUA-owned generation and purchased capacity is delivered through 230 kV and 69 kV transmission lines to eight distribution substations. KUA provides electric service to retail customers primarily by 13.2 kV feeder circuits from the distribution substations.

2.2.6 Service Area

KUA serves a total area of approximately 85 square miles, including the City's ten square mile area near the center. As of February 1, 1999, KUA served approximately 44,869 electric customers. Of these, 36,872 were residential, 6,984 were general service non-demand, and the remaining 1,013 were general service demand. KUA's electric service area, shown on Figure 2-1, is entirely located in Osceola county.

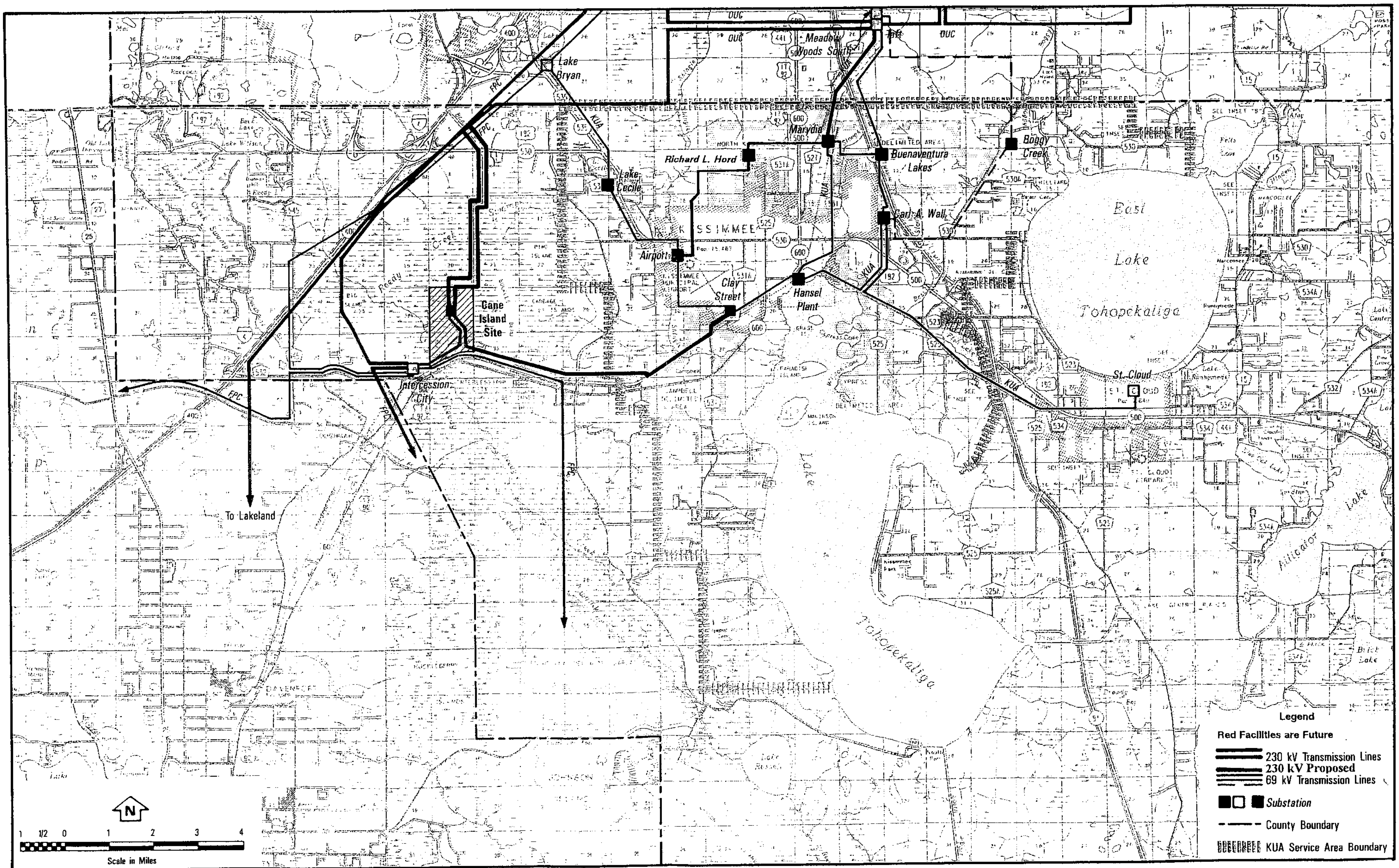


Figure 2-1
Service Area Map

3.0 Forecast of Electrical Power Demand and Energy Consumption

KUA conducts detailed long-term electric load and energy forecasts for annual planning purposes using econometric techniques. KUA's detailed forecast is developed on a fiscal year basis. KUA's fiscal year ends in September.

The following sections discuss each of the forecast areas. The information presented has been converted from KUA's fiscal year forecast to a calendar year basis except where specifically noted and is aggregated as required by FRCC.

3.1 Forecast Modeling Approach

Econometric forecast models were used to project monthly sales by customer class. The econometric models and associated statistical relationships were developed for forecasting annual changes in customer class electricity usage as a function of demographic influencing factors such as temperature, population, and income. The models used were developed based on identifiable, statistical relationships between historical, economic, weather, and electric system data.

The statistical estimating technique used in the development of the models was multiple least squares linear regression. This method is used to determine the linear relationship between a dependent variable, such as energy usage, and multiple independent econometric variables based on changes in the values of the variables through time. Implicit in the model development is the assumption that customer class energy usage will be affected by the same key factors in the future as in the past. The following equation represents this linear relationship:

$$Y = a + \sum_{i-1}^{n} [b_i * X_i] + e$$

where:
- Y = dependent variable (predicted)
- a = constant term
- b_i = coefficient terms
- X_i = independent variables
- e = error term

The calculated equation minimizes the sum of the squared errors between the actual and predicted values of the dependent variable.

An important consideration in regression analysis is the selection of variables. Independent variables explain changes in the dependent variable. Therefore, sufficient historical data for both dependent and independent variables must be available to produce a reliable regression equation. Also, to forecast values of the dependent variable, the independent variables must have the potential to be projected into the future.

All regression equations were tested using five primary statistical measures. The first measure is the adjusted R^2, the coefficient of determination corrected for reduced degrees of freedom due to inclusion of additional independent variables in the regression equation. The coefficient of determination (perfect = 1.0) is the proportion of variability in the dependent variable that is explained by the independent variables. The second measure is the F statistic, which is a test of whether there is a significant linear relationship between the dependent variable and the entire set of independent variables. The F-test is performed by determining the calculated F statistic (F_{CALC}) and comparing this value with the corresponding value of the F distribution (F_{DIST}). The third measure is the T statistic, which is a test for multi-collinearity of the independent variables. This test is performed by determining the calculated T statistic (T_{CALC}) and comparing this value with the corresponding value of the T distribution (T_{DIST}). The fourth measure is the Durbin-Watson (DW) statistic, which is a test for serial correlation of adjacent error terms. The fifth, and final, measure is the Bayesian Information Criterion (BIC). The BIC serves as a guide to the selection of the number of terms in an equation by placing a penalty on additional coefficients.

3.2 Econometric Data and Projections

This section describes the data sources used in the development of the econometric variable projections for the forecast period. As in previous forecasts, economic and population forecasts from the Bureau of Economic and Business Research (BEBR) were included in the analysis as econometric variables.

3.2.1 Historical Data

A careful compilation of historical data was developed to formulate a reliable econometric model for forecasting electricity sales. Monthly historical sales data were compiled for each major customer classification for the period of January 1985 through September 1998. Additional data including temperature, population, employment, households, real personal income and total housing starts was also compiled. The econometric data used was obtained from BEBR data applicable to the MSA in which Kissimmee is located. MSAs are Metropolitan Statistical Areas defined by the census bureau for various regions within each state. Kissimmee is located within the Orlando MSA. The Orlando MSA also includes Orange and Seminole Counties. Although some variance in general MSA versus Kissimmee data can be expected, the homogeneous nature of the surrounding region provided well aligned trend relationships between historical electricity use and the econometric variables selected for the forecast.

3.2.2 Econometric Projections

The BEBR has estimated that, during the next fifteen years, employment will grow at an average annual rate of 2.2 percent, down from 3.5 percent from 1980 through 1995. Real personal income is estimated to grow at an average annual rate of 3.0 percent, down from 4.1 percent from 1980 through 1995. In general, the slower percentage growth rates of employment and income for Florida are related to a slowing annual population growth rate. Florida's average annual population growth rate is forecast to be 1.6 percent from 1995 through 2010, down from 2.5 percent from 1980 through 1995. Although Osceola County economic and population forecasts show slower growth, Osceola County's annual growth rate continues to exceed the surrounding counties.

3.3 Forecasting Assumptions

The first key assumption included in the load forecast analysis is related to regional weather patterns. Because predicting future weather patterns is not possible, normal weather conditions were assumed for the load forecast model. Monthly average temperatures for the last 10 years were used as a representation of normal weather. For weather projections, the weather for every month of the forecast period was set equal to that month's 10-year average of monthly temperatures for the historical period. The same methodology was applied uniformly to all other weather-related variables used in the analysis.

The second key assumption of significance to the 1998 sales forecast is the inclusion of an estimated annual rate increase of 1.0 percent for all rate classes to be implemented in April 1999. This assumption was based on information provided by the Finance Department. At the time, it was hoped that the rate increase could be avoided altogether.

3.4 Sales Forecast

3.4.1 Residential Sales

To forecast residential electricity sales, annual forecasts of residential electricity use per customer and number of customers were developed using ordinary least-squares multiple regression models. The product of residential service customers and electricity use per customer forecasts yielded total annual residential electricity sales.

3.4.1.1 Residential Customers. In the development of the 1999 econometric model for residential customers, Osceola County population (POPA) estimates were used as a potential explanatory variable. Based on KUA's statistical evaluation, POPA outperformed Osceola County total housing starts (TS) in representing the fluctuations in Residential customers. Autoregressive (AR) factors were introduced to minimize the effects of serial correlation. In effect, the AR variable incorporates the residual from previous observations into the regression model for the current observation. The resulting equation is shown in Table 3-1. Results of statistical tests for the equation are listed in Appendix B.

3.4.1.2 Residential Energy Use Per Customer. Residential electricity use per customer was based on the relationship between historical income per household and the previous year's real price of electricity.

3.4.1.3 Weather Impacts. Temperature and billing data were adjusted to compensate for different reporting periods. The degree days were shifted from calendar month to billing month to more accurately reflect the relationship between temperature and energy consumption. An example of this shifting is described as follows:

A customer has his electric meter read on billing cycle 2. In February, billing cycle 2 corresponds with a meter reading date of February 2nd. Sales to this customer are billed in February, but primarily occur in January. If the remainder *of February is bitterly cold, the corresponding degree days are not reflected in the customer's February bill. As a result, error is introduced.*

By aligning the sales and degree days, the model became more responsive to changes in temperature. The resulting equation, showing the results of multiple regression on the independent variables, is listed in Table 3-1.

3.4.2 General Service Non-Demand Forecast

The model for the general service non-demand rate classification comprises forecasts for a number of customers and energy sales and includes temporary service and KUA rate classifications.

3.4.2.1 General Service Non-Demand Customers. Osceola County total housing starts was used as the basis for forecasting the number of general service non-demand customers. The resulting equation, developed to forecast the number of general service non-demand customers, is shown in Table 3-1.

Table 3-1
Sales Forecast Equations

RSCUSTT = 249.017*POPA + 0.454*_AUTO[-1] + 0.437*AUTO[-2]

RSCUSTT	:Total Residential Customers
POPA	:Total Population in Osceola County
_AUTO[-1]	:First Order Auto-Regressive Term
_AUTO[-2]	:Second Order Auto-Regressive Term

RSUPC = - 4.537*PRICERES[-9] +18.328*INCPERHH + 1.328*BM_CDD + 2.263*BM_HDD + 0.503*BM_CDD[-1] + 0.844*BM_HDD[-1] + 0.237*_AUTO[-1]

RSUPC	:Residential Use Per Customer
PRICERES	:Residential Real Price of Electricity
INCPERHH	:Real Personal Income Per Household
BM_CDD	:Billing Month Adjusted Cooling Degree Days
BM_HDD	:Billing Month Adjusted Heating Degree Days
_AUTO[-1]	:First Order Auto-Regressive Term

GSNCUSTT= 146.836*TS + 0.994*_AUTO[-1]

GSNCUSTT	:Total General Service Non-Demand Customers
TS	:Cumulative Housing Starts in Osceola County
_AUTO[-1]	:First Order Auto-Regressive Term

Table 3-1 (Continued)
Sales Forecast Equations

GSNKWHT = - 46121.984*PRICEGSN(-12) + 6354.826*RYTOT + 5830.158*BM_CDD + 1260818.308*RATECHNG + 0.799*_AUTO[-1]

GSNKWHT	:Total General Service Non-Demand Energy Sales
PRICEGSN	:General Service Non-Demand Real Price of Electricity
RYTOT	:Real Personal Income Osceola County
BM_CDD	:Billing Month Adjusted Cooling Degree Days
RATECHNG	:Represents Rate Reclassification of October 1990
_AUTO[-1]	:First Order Auto-Regressive Term

3.4.2.2 General Service Non-Demand Electricity Sales. The general service non-demand model for annual electricity sales is primarily driven by the real price of electricity and real personal income. Weather is also a strong influence on general service non-demand sales. In addition, the model includes a variable to reflect the impact of the October 1990 rate change on customers and sales. The resulting equation, used to forecast the energy sales in kilowatt-hours for the general service non-demand customer class, is shown in Table 3-1.

3.4.3 General Service Demand Forecast

For the purposes of this load forecast, general service demand comprises GSD, GSDT, GSLD, Interruptible, and Contract Rate classifications. General service demand represents approximately 30% of total energy sales with approximately 730 customers. Because general service demand represents such a large percentage of total energy consumption, assumptions and models used to forecast have a significant impact on the overall energy forecast.

The number of customers in the general service demand rate classification (GSD) has continued to decline over the course of the last several years. The initial, and most abrupt, decrease occurred as a result of a shift in rate classification (October 1990) which encouraged the migration of smaller GSD customers to the non-demand classification (GSND). However, the decline did not stop there. In fact, over the past 5 years the net gain in customers is 3.

Generally, the general service demand class is a more diversified mix of customers, and are typically fewer in number. Because of this, the class is also less amenable to statistical methods.

The general service demand customer forecast was derived using an exponential smoothing model. The historical series for general service non-demand customers does not increase linearly and uniformly or vary with seasons or regularity. The exponential smoothing model forecasts level 740 customers with no projected increase over the forecast horizon.

The forecast of no growth is reasonable given the unexplained variation in general service demand customers. Though the net gain is customers over the past 5 years is 3, the fluctuations in customers have been as great as 9% in 3 months. This size of a drop in general service demand is certainly suspicious. Without understanding the reasons behind data volatility it is difficult to forecast. Meetings with key personnel have brought no additional insight to this situation, and until it is better understood, forecasting no customer growth for general service demand customers is recommended.

Using OLS, a model was prepared for general service demand energy sales. The final model fit the historical data well, but when used to forecast, it produced unreasonable results. Because a model for general service demand customers had already been determined, the OLS model for general service demand energy sales was theoretically indicating that the use per customer would double over the forecast horizon. This conclusion is unreasonable.

KUA's Manager of Distribution and Planners from the City of Kissimmee were subsequently consulted regarding future large customer expansions. In addition to the information provided by City Planners and KUA Staff, a review of the energy sales growth rates in general service demand shows the smallest increase in energy sales to be approximately 1%. Based on conversations with KUA Staff and City Planners and review of past performance, an annual energy sales increase of 1% is recommended for the forecast horizon. It is important to note that the World Expo Center energy sales are in addition to this projected annual growth of 1%.

3.4.4 Outdoor Lighting Forecast

Street lighting, vapor lighting, and outdoor lighting were combined into one class for forecasting purposes. This year the best prediction of future outdoor lighting is simply a linear trend. Because outdoor lighting's contribution to total energy sales is stable and represents less than 0.8%, this method of forecasting is both acceptable and relatively accurate.

3.5 Net Energy for Load and Peak Demand Forecast

3.5.1 Net Energy For Load

During the past several years, net energy for load (NEL) was projected by applying an efficiency factor of 95 percent to the projection of total sales. During 1997, an attempt was made to develop an econometric model for NEL using the relationship of NEL to total sales and certain monthly variables. After further review, it was decided that the econometric model did not provide significant accuracy to the projection of NEL and KUA returned to the 95 percent efficiency factor methodology. Tables 3-2 through 3-4 presents KUA's Base, High and Low Case NEL forecasts. Net energy for load is projected to grow at an average annual rate of 4.2 percent from 1999 through 2008 compared to 5.4 percent from 1989 through 1998.

3.5.2 Peak Demand Forecast

The forecast of peak load was prepared using average winter and summer load factors of 52 percent and 50 percent, respectively. Previous attempts to model peak load have been unsuccessful due to a lack of data. The estimate of peak load conditions is very dependent on weather and customer equipment. Although relatively reliable temperature data is available, peak load is also sensitive to other variables such as cloud cover, humidity and barometric pressure.

Table 3-5 presents KUA's winter and summer base-, high-, and low-case peak demand forecasts. A 4.9 percent annual summer peak demand growth rate is projected for 1999 through 2008. This growth rate is lower than KUA's historical annual growth rate of 5.7 percent during the last 10 years.

3.6 High and Low Sensitivities

In addition to the base-case load forecast, projections were developed for high- and low-load growth scenarios based on high and low population estimates published by the Bureau of Economic and Business Research (BEBR).

The high and low load forecast sensitivities were developed based on changes in the independent economic variables, specifically, the BEBR's high and low population forecast. The economic forecast provided by BEBR is projected to 2010, and BEBR's long-term population forecast is projected to 2020. The BEBR economic forecast was used through 2010. To develop economic data beyond 2010, the economic data were adjusted by using their rate of change with respect to population in the Base Case, and maintaining that ratio in the High and Low Cases.

Table 3-2
1999 Base Case Load Forecast
Annual Summary of Historical and Projected Data
Includes World Expo Center

Calendar Year	Residential		General Service Non-Demand		General Service Demand		Street and Outdoor Light MWh/Yr	Total Customer Accounts	Total KUA Sales MWh/Yr	Net Energy for Load MWh/Yr
	Average Accounts Billed	Sales MWh/Yr	Average Accounts Billed	Sales MWh/Yr	Average Accounts Billed	Sales MWh/Yr				
1985	18,425	192,917	2,157	29,292	533	157,295	809	21,115	380,314	418,577
1986	19,857	215,330	2,279	30,337	609	182,789	837	22,745	429,294	455,520
1987	21,294	232,646	2,453	31,400	705	206,688	933	24,452	471,668	510,589
1988	22,588	251,281	2,963	39,023	769	235,617	2,508	26,320	528,430	556,720
1989	25,225	289,480	3,641	48,424	831	255,166	1,925	29,696	594,996	652,052
1990	28,002	323,415	4,071	55,392	883	277,828	1,696	32,956	658,333	698,045
1991	29,014	325,317	5,272	77,954	785	273,274	4,685	35,071	681,232	720,749
1992	30,128	341,341	5,912	92,305	744	270,110	4,962	36,784	708,719	744,554
1993	31,553	368,681	6,270	102,383	730	283,910	5,045	38,553	760,022	801,113
1994	32,699	386,879	7,000	115,804	719	295,446	5,546	40,418	803,676	840,949
1995	34,053	425,452	7,280	126,557	718	299,255	6,237	42,051	857,503	915,227
1996	35,015	447,161	7,409	133,175	741	304,952	6,724	43,164	892,013	943,404
1997	35,603	448,428	7,858	126,005	749	339,106	7,211	44,210	920,752	970,415
1998	36,622	501,879	8,015	130,481	732	358,495	7,818	45,370	998,675	1,046,909
1999	37,970	494,342	8,316	156,698	740	362,080	8,532	47,026	1,021,655	1,075,426
2000	39,347	515,756	8,614	164,985	740	372,126	9,189	48,701	1,062,058	1,117,956
2001	40,568	539,964	8,919	174,827	740	400,109	9,812	50,227	1,124,714	1,183,909

Table 3-2
1999 Base Case Load Forecast
Annual Summary of Historical and Projected Data
Includes World Expo Center

	Residential		General Service Non-Demand		General Service Demand					
Calendar Year	Average Accounts Billed	Sales MWh/Yr	Average Accounts Billed	Sales MWh/Yr	Average Accounts Billed	Sales MWh/Yr	Street and Outdoor Light MWh/Yr	Total Customer Accounts	Total KUA Sales MWh/Yr	Net Energy for Load MWh/Yr
2002	41,797	565,241	9,237	185,281	740	423,060	10,427	51,774	1,184,010	1,246,327
2003	43,062	591,529	9,567	196,133	740	447,145	11,041	53,369	1,245,849	1,311,420
2004	44,364	618,871	9,910	207,404	740	475,758	11,654	55,014	1,313,688	1,382,830
2005	45,672	646,624	10,265	218,845	740	481,716	12,267	56,678	1,359,453	1,431,003
2006	46,850	671,937	10,623	229,326	740	485,559	12,880	58,213	1,399,703	1,473,372
2007	48,035	697,634	10,982	239,956	740	489,441	13,493	59,757	1,440,526	1,516,343
2008	49,248	724,161	11,343	250,928	740	493,362	14,106	61,331	1,482,558	1,560,587
2009	50,492	751,544	11,705	262,256	740	497,322	14,719	62,937	1,525,842	1,606,150
2010	51,754	779,555	12,069	273,847	740	501,322	15,332	64,562	1,570,057	1,652,692
2011	52,979	807,142	12,438	285,252	740	505,361	15,945	66,157	1,613,701	1,698,633
2012	54,224	835,391	12,818	296,932	740	509,441	16,557	67,782	1,658,323	1,745,603
2013	55,497	864,485	13,210	308,974	740	513,562	17,170	69,447	1,704,194	1,793,888
2014	56,800	894,451	13,613	321,394	740	517,724	17,783	71,153	1,751,354	1,843,531
2015	58,121	925,080	14,025	334,106	740	521,928	18,396	72,886	1,799,511	1,894,223
2016	59,415	955,419	14,431	346,697	740	526,173	19,009	74,586	1,847,300	1,944,527
2017	60,729	986,462	14,846	359,597	740	530,462	19,622	76,315	1,896,144	1,995,942
2018	62,072	1,018,380	15,272	372,886	740	534,793	20,235	78,085	1,946,295	2,048,732

Table 3-3
1999 High Case Load Forecast
Annual Summary of Historical and Projected Data
Includes World Expo Center

Calendar Year	Residential		General Service Non-Demand		General Service Demand		Street and Outdoor Light MWh/Yr	Total Customer Accounts	Total KUA Sales MWh/Yr	Net Energy for Load MWh/Yr
	Average Accounts Billed	Sales MWh/Yr	Average Accounts Billed	Sales MWh/Yr	Average Accounts Billed	Sales MWh/Yr				
1985	18,425	192,917	2,157	29,292	533	157,295	809	21,115	380,314	418,577
1986	19,857	215,330	2,279	30,337	609	182,789	837	22,745	429,294	455,520
1987	21,294	232,646	2,453	31,400	705	206,688	933	24,452	471,668	510,589
1988	22,588	251,281	2,963	39,023	769	235,617	2,508	26,320	528,430	556,720
1989	25,225	289,480	3,641	48,424	831	255,166	1,925	29,696	594,996	652,052
1990	28,002	323,415	4,071	55,392	883	277,828	1,696	32,956	658,333	698,045
1991	29,014	325,317	5,272	77,954	785	273,274	4,685	35,071	681,232	720,749
1992	30,128	341,341	5,912	92,305	744	270,110	4,962	36,784	708,719	744,554
1993	31,553	368,681	6,270	102,383	730	283,910	5,045	38,553	760,022	801,113
1994	32,699	386,879	7,000	115,804	719	295,446	5,546	40,418	803,676	840,949
1995	34,053	425,452	7,280	126,557	718	299,255	6,237	42,051	857,503	915,227
1996	35,015	447,161	7,409	133,175	741	304,952	6,724	43,164	892,013	943,404
1997	35,603	448,428	7,858	126,005	749	339,106	7,211	44,210	920,752	970,415
1998	37,683	513,078	8,144	134,829	725	359,331	7,829	46,552	1,015,068	1,064,164
1999	43,118	554,011	9,012	178,489	743	362,474	8,484	52,873	1,103,459	1,161,536
2000	45,932	595,477	9,634	194,321	765	384,061	9,072	56,330	1,171,757	1,245,194
2001	48,293	639,476	10,205	212,121	785	436,313	9,661	59,284	1,244,189	1,365,866

Table 3-3
1999 High Case Load Forecast
Annual Summary of Historical and Projected Data
Includes World Expo Center

Calendar Year	Residential Average Accounts Billed	Residential Sales MWh/Yr	General Service Non-Demand Average Accounts Billed	General Service Non-Demand Sales MWh/Yr	General Service Demand Average Accounts Billed	General Service Demand Sales MWh/Yr	Street and Outdoor Light MWh/Yr	Total Customer Accounts	Total KUA Sales MWh/Yr	Net Energy for Load MWh/Yr
2002	50,677	686,468	10,799	231,365	805	479,344	10,250	62,280	1,320,777	1,481,504
2003	53,169	736,595	11,427	251,981	825	520,221	10,839	65,420	1,401,646	1,599,618
2004	55,780	790,121	12,091	274,078	844	563,906	11,428	68,715	1,487,210	1,725,825
2005	58,468	845,921	12,792	297,333	863	589,683	12,016	72,123	1,576,049	1,836,795
2006	61,033	899,778	13,522	319,979	881	598,744	12,605	75,436	1,662,201	1,927,481
2007	63,676	956,260	14,291	343,770	900	607,687	13,195	78,867	1,752,007	2,022,013
2008	66,433	1,016,078	15,105	369,081	918	616,526	13,783	82,455	1,846,563	2,121,547
2009	69,309	1,079,428	15,964	396,017	936	625,273	14,372	86,209	1,946,186	2,226,413
2010	72,270	1,145,470	16,861	424,325	954	633,938	14,960	90,085	2,049,790	2,335,469
2011	75,157	1,211,192	17,747	452,554	971	642,528	15,549	93,875	2,152,918	2,444,026
2012	78,132	1,280,070	18,671	482,209	989	651,050	16,138	97,791	2,260,562	2,557,335
2013	81,225	1,352,660	19,643	513,628	1,006	659,509	16,727	101,873	2,373,620	2,676,343
2014	84,439	1,429,163	20,666	546,923	1,023	667,912	17,316	106,128	2,492,409	2,801,384
2015	87,743	1,508,665	21,729	581,808	1,040	676,261	17,904	110,512	2,615,735	2,931,201
2016	90,978	1,587,928	22,783	616,684	1,057	684,562	18,493	114,818	2,738,762	3,060,704
2017	94,304	1,670,713	23,879	653,223	1,074	692,816	19,082	119,257	2,866,930	3,195,617
2018	97,752	1,757,586	25,027	691,796	1,091	701,029	19,671	123,870	3,001,176	3,336,929

Table 3-4
1999 Low Case Load Forecast
Annual Summary of Historical and Projected Data
Includes World Expo Center

Calendar Year	Residential		General Service Non-Demand		General Service Demand		Street and Outdoor Light MWh/Yr	Total Customer Accounts	Total KUA Sales MWh/Yr	Net Energy for Load MWh/Yr
	Average Accounts Billed	Sales MWh/Yr	Average Accounts Billed	Sales MWh/Yr	Average Accounts Billed	Sales MWh/Yr				
1985	18,425	192,917	2,157	29,292	533	157,295	809	21,115	380,314	418,577
1986	19,857	215,330	2,279	30,337	609	182,789	837	22,745	429,294	455,520
1987	21,294	232,646	2,453	31,400	705	206,688	933	24,452	471,668	510,589
1988	22,588	251,281	2,963	39,023	769	235,617	2,508	26,320	528,430	556,720
1989	25,225	289,480	3,641	48,424	831	255,166	1,925	29,696	594,996	652,052
1990	28,002	323,415	4,071	55,392	883	277,828	1,696	32,956	658,333	698,045
1991	29,014	325,317	5,272	77,954	785	273,274	4,685	35,071	681,232	720,749
1992	30,128	341,341	5,912	92,305	744	270,110	4,962	36,784	708,719	744,554
1993	31,553	368,681	6,270	102,383	730	283,910	5,045	38,553	760,022	801,113
1994	32,699	386,879	7,000	115,804	719	295,446	5,546	40,418	803,676	840,949
1995	34,053	425,452	7,280	126,557	718	299,255	6,237	42,051	857,503	915,227
1996	35,015	447,161	7,409	133,175	741	304,952	6,724	43,164	892,013	943,404
1997	35,603	448,428	7,858	126,005	749	339,106	7,211	44,210	920,752	970,415
1998	36,130	491,988	7,872	125,114	689	341,610	7,829	44,691	966,543	1,013,085
1999	35,052	441,336	7,577	131,090	586	285,688	8,484	43,214	866,599	912,210
2000	34,999	444,813	7,628	132,684	590	290,770	9,072	43,217	874,486	923,517
2001	35,038	451,120	7,693	135,425	596	304,550	9,661	43,326	886,715	948,166

Table 3-4
1999 Low Case Load Forecast
Annual Summary of Historical and Projected Data
Includes World Expo Center

Calendar Year	Residential		General Service Non-Demand		General Service Demand		Street and Outdoor Light MWh/Yr	Total Customer Accounts	Total KUA Sales MWh/Yr	Net Energy for Load MWh/Yr
	Average Accounts Billed	Sales MWh/Yr	Average Accounts Billed	Sales MWh/Yr	Average Accounts Billed	Sales MWh/Yr				
2002	35,141	457,844	7,759	138,245	602	317,323	10,250	43,502	899,720	972,277
2003	35,316	464,739	7,826	141,056	608	329,121	10,839	43,750	913,114	995,533
2004	35,520	471,744	7,893	143,859	615	342,008	11,428	44,027	926,794	1,020,042
2005	35,738	478,059	7,949	146,354	622	350,812	12,016	44,309	939,635	1,039,203
2006	35,967	480,491	7,946	147,309	629	354,389	12,605	44,542	947,187	1,047,153
2007	36,160	482,385	7,936	148,028	637	358,082	13,194	44,732	954,083	1,054,411
2008	36,139	484,224	7,926	148,722	644	361,879	13,783	44,709	961,001	1,061,694
2009	36,091	486,002	7,915	149,392	652	365,769	14,372	44,658	967,928	1,068,985
2010	36,043	487,071	7,894	149,789	661	369,741	14,960	44,597	973,955	1,075,330
2011	35,997	484,758	7,819	148,886	669	373,787	15,549	44,484	975,374	1,076,823
2012	35,915	481,981	7,737	147,805	677	377,902	16,138	44,329	976,220	1,077,713
2013	35,649	479,166	7,656	146,727	686	382,079	16,727	43,991	977,092	1,078,632
2014	35,360	476,315	7,576	145,653	695	386,313	17,316	43,630	977,990	1,079,577
2015	35,073	472,658	7,484	144,293	703	390,600	17,904	43,261	977,850	1,079,429
2016	34,788	465,030	7,331	141,463	712	394,936	18,493	42,832	972,316	1,073,604
2017	34,464	456,993	7,172	138,499	721	399,318	19,082	42,357	966,286	1,067,257
2018	33,923	449,066	7,016	135,614	730	403,743	19,671	41,670	960,487	1,061,153

Table 3-5
Summary of Load Forecast

Year	Winter Peak Demand (MW)			Summer Peak Demand (MW)		
	Base	High	Low	Base	High	Low
1999	235	252	200	244	262	208
2000	242	267	202	252	278	210
2001	264	303	212	274	315	220
2002	286	340	222	296	352	231
2003	304	374	230	315	387	238
2004	318	400	235	329	414	244
2005	334	430	241	345	444	250
2006	343	450	243	355	465	252
2007	353	470	245	365	486	254
2008	362	492	246	375	509	255
2009	372	515	248	385	533	257
2010	382	539	250	396	557	259
2011	392	562	250	406	582	259
2012	403	587	250	417	608	259
2013	413	613	251	428	634	260
2014	424	640	251	439	663	260
2015	435	668	251	451	692	260
2016	446	697	250	462	722	259
2017	457	726	248	474	752	257
2018	469	757	247	486	784	256

3.7 Major Additional Loads

The developers of the World Exposition Center (Expo Center) are planning a major commercial development on an 800-acre site in the northwest quarter of KUA's service territory in Osceola County. The construction of this world-class, mixed-used facility is currently in the planning stages and was, at one point, expected to be operational in 2000.

Phase I of the current plan, slated to be completed by the first part of 2000, includes a 2.4 million square foot exposition hall, 1.3 million square foot outside parking area, and 8.6 million square foot parking garage. Phase 1A, scheduled to be completed by the first part of 2001, includes a 1.0 million square foot hotel, 1.3 million square foot County convention center, and 79,000 square feet of commercial office space.

Phase II of construction is projected to be completed during 2002-2004 in stages after Phase I and Phase IA are operational. Phase II facilities include three resort hotels totaling 1.6 million square feet, two office buildings totaling 0.5 million square feet, a 1.0 million square foot retail and entertainment complex, a public safety facility, and 2.0 million square feet of additional parking.

Complete build-out of this facility may require an estimated $1.1 billion. The total employment projection for the project and supporting industries is nearly 30,000 jobs with an estimated annual payroll of $700 million.

At this time, the World Expo Center team is still engaged in planning and negotiating, and plans to build are not yet certain. However, if completed in accordance with current plans, the peak demand and energy requirements of the Expo Center will significantly impact KUA's current system demand and least-cost planning methodology. Accordingly, KUA has conducted a detailed consumption analysis to determine the potential peak demand and energy use of this facility. Due to the lack of data on facilities of this magnitude, demand and energy consumption per square foot from similar-use facilities were used as planning-level estimates.

The Table 3-6 shows the Base, High and Low Case annual peak demand and energy forecasts for the World Expo Center. For the current forecast, this project has been delayed one year from the original construction plans. This assumption is based on delays which have already taken place, and seem likely to continue on into 1999.

Table 3-6
World Exposition Center Load Forecast
Annual Peak Demand and Energy

Year	Low Forecast		Base Forecast		High Forecast	
	Peak (MW)	Energy (MWh)	Peak (MW)	Energy (MWh)	Peak (MW)	Energy (MWh)
2001	8.0	11,420	13.2	25,700	19.9	44,710
2002	15.1	21,912	25.8	45,904	39.6	79,406
2003	19.8	30,038	34.9	62,320	55.1	108,389
2004	22.0	40,458	39.1	94,490	61.6	146,796
2005	24.8	47,608	44.5	97,360	70.8	168,906
2006-2018	24.8	47,608	44.5	97,360	70.8	168,906

Source: 1998 Cane Island 3 Need for Power Application Table 1B.5-3, delayed one year.

4.0 Conservation and Demand-Side Management

KUA considers conservation and demand-side management (DSM) an integral component in managing the efficiency of its electric system and providing choice to its customers. In response to Florida Public Service Commission (FPSC) Docket 930555-EG, KUA performed a cost-effectiveness analysis for over 80 proposed DSM measures. The results of the analysis indicated that, except for residential load control, no DSM measures were cost-effective. KUA submitted their findings for FPSC review. KUA's submission and FPSC's response are shown in Appendix C.

4.1 Current Conservation and DSM Programs

Although KUA's DSM analysis identified only one cost-effective measure, KUA is committed to conservation and load management programs. KUA's conservation programs were originally established for the City of Kissimmee under the Florida Energy Efficiency and Conservation Act (FEECA) program. KUA is no longer classified as a FEECA utility. The following is a list of conservation programs outlined in KUA's submission to the Florida Public Service Commission:

- Residential energy audit.
- Commercial and industrial energy analysis.
- Fixup program - KUA will assist or arrange to have installed in residences:
  - Electrical outlet gaskets.
  - Solar screen/reflective film.
  - Water heater jackets.
  - Water flow restrictors.
  - Weatherstripping.
  - Caulking.
  - Energy conserving lamps.
  - Duct tape.
  - Pool timers.
  - Clock thermostats.
  - Water heater thermostat set-back.

- Hot water pipe insulation.
- Water heater timers.
- Ceiling insulation.
- High-pressure sodium street lighting/private area lighting conversion (from mercury vapor and incandescent).
- Water heater conversion from resistance heating to:
  - Dedicated heat pump water heaters.
  - Natural gas.
  - Solar.
  - Air conditioning/heat pump.
- Elimination of electric strip heating.
- Public awareness programs.
- Natural gas.
- Cogeneration plans.

KUA's energy conservation specialist performs approximately 600 free audits annually advising customers on the appropriate conservation programs to implement.

4.1.1 Residential Load Management (SAVE)

KUA currently offers a residential direct load control program which has been in place since 1992. This program is called Shifting Adds Value To Energy (SAVE). SAVE is designed to cycle residential air conditions, electric water heaters, and electric space heaters to reduce KUA's system peak demand. The SAVE program was administered to over 6,000 customers by the end of 1998. The program is voluntary for all residential customers. For participating in the program, customers receive a monthly credit on their bills. KUA installs load control receivers on eligible equipment, and transmits radio signals to cycle equipment for peak demand reduction. The SAVE program provides a utility controlled process that ensures direct capacity value to KUA while minimizing impacts to the customer's lifestyle. There are no significant reductions in energy consumption from this program. Table 4-1 shows KUA's historical and forecasted estimate of peak demand reductions resulting from this load management program.

Table 4-1
KUA Load Management Impact

Year	Average Active Customers	Low Case Load Management Impact (MW)	Base Case Load Management Impact (MW)	High Case Load Management Impact (MW)
1993	1,914	-	3.16	-
1994	5,040	-	8.32	-
1995	7,213	-	11.90	-
1996	7,648	-	12.62	-
1997	7,261	-	11.98	-
1998	-	12.06	12.53	13.02
1999	-	11.92	13.00	14.14
2000	-	11.88	13.45	15.11
2001	-	11.93	13.89	15.97
2002	-	12.00	14.34	16.82
2003	-	12.09	14.79	17.72
2004	-	12.17	15.25	18.67
2005	-	12.26	15.72	19.68
2006	-	12.28	16.19	20.66
2007	-	12.27	16.66	21.68
2008	-	12.27	17.13	22.74

Source: 1998 Need for Power Application

4.1.1.1 Delivery Strategy. The approach for delivering the program is based on two design components: (i) promoting the program to existing customers through bill inserts and general media and (ii) granting bill credits for participants based on the number and type of appliances being controlled. A schedule reflecting bill credits is presented in Table 4-2.

Table 4-2 Credits - SAVE Program			
Load Management Credit			
Appliance	Control Period	Monthly Credit	With Water Heater Control
Water Heater	Year Round	$2.50	--
Central AC (15 minutes per 1/2 hour)	April-October	$4.50	$7.00
Central heating (15 minutes per 1/2 hour)	November-March	$4.50	$7.00

4.1.1.2 Implementation Activities. Because KUA has operated the program since 1992, current implementation activities focus on ongoing installation and maintenance of load switches, and updating and maintaining tracking systems to monitor participation.

4.2 Additional Conservation and DSM Programs

With the exception of direct load control, the cost-effectiveness of the evaluated DSM programs was marginal. Three marginally cost-effective DSM resources, however, were transferred into EGEAS from the COMPASS analysis. These are described below.

4.2.1 Residential Appliance Efficiency

The Residential Appliance Efficiency Program is designed to encourage the specification and installation of energy-efficient appliances such as high efficiency central air conditioners, heat pumps, and pool pumps.

Promotion of these high efficiency residential appliances helps to reduce residential cooling loads, which contribute to KUA's system peak. Additionally, since the useful lifetime estimates of these appliances are relatively long (15 years or greater), this program serves to address "lost opportunities," particularly in the new construction market.

The program is targeted to residential homeowners in the replacement and new construction market. Customers include those who currently have standard air conditioners, heat pumps, and/or pool pumps. When applicable equipment requires replacement, customers become candidates for upgrade to high efficiency systems.

4.2.2 Commercial Cooling

The Commercial Cooling Program is designed to use customer and trade ally information and education to encourage the specification and installation of energy-efficient cooling systems in the commercial markets.

The promotion of these high efficiency commercial systems helps to reduce commercial cooling loads which contribute to KUA's system peak. Additionally, since the useful lifetime estimates of these systems are relatively long (15 years or greater), this program serves to address "lost opportunities," particularly in the new construction market.

Although difficult to estimate, KUA's energy and summer demand are reduced with this program.

4.2.3 Residential Fix-Up

This program is designed to make residential dwellings more efficient, focusing on the thermal envelope. This includes the following measures for existing residential buildings:

- Ceiling insulation.
- Duct leak repair (also for new homes).
- Hot water saving measures.

Duct leak repair is recommended for new homes because inspections often reveal installation problems that cause significant inefficiencies.

Although difficult to estimate, this program achieves energy savings and some peak reduction in both the summer and winter.

5.0 Forecast of Facilities Requirements

5.1 Florida Municipal Power Pool

KUA is a member, along with the Orlando Utilities Commission (OUC), City of Lakeland, and the All-Requirements Project of the Florida Municipal Power Agency (FMPA), of the Florida Municipal Power Pool (FMPP). The four utilities operate as one large control area. All FMPP capacity resources, totaling approximately 2,300 MW, are committed and dispatched together from the OUC operations center.

The FMPP does not provide for the sharing of planning reserves among its members. Each member is required to provide their own reserves and a member of the FMPP can withdraw from FMPP with 1 year written notice. Therefore, KUA must ultimately plan on a stand-alone basis.

5.2 Need for Capacity

This section addresses the need for additional electric capacity to serve the needs of KUA's electric customers in the future. The need for capacity is based on KUA's load forecast, reserve margin requirements, existing generating and purchase power capacity, scheduled retirements of generating units, and expiration of purchase power contracts. Based on the results of the capacity balance analysis of KUA's existing resources, KUA is expected to experience a capacity deficit of approximately 18 MW in 2004 and growing to approximately 80 MW in 2009. The estimated deficit is based on the base-case summer peak demand forecast. Table 5-1 presents the results of the capacity balance analysis.

Table 5-1
KUA Capacity Balance

Year	Existing/ Committed Generation (1)	Existing Purchases	Summer Peak Demand (MW)			DSM Impacts (MW)			Reserve Margin		
			Base	High	Low	Base	High	Low	Base	High	Low
1999	175.8	98.1	244	262	208	13.0	14.1	11.9	18.6%	10.5%	39.7%
2000	175.8	108.1	252	278	210	13.5	15.1	11.9	19.0%	8.0%	43.3%
2001	296.7	68.1	274	315	220	13.9	16.0	11.9	40.3%	22.0%	75.3%
2002	294.2	68.1	296	352	231	14.3	16.8	12.0	28.6%	8.1%	65.4%
2003	294.2	68.1	315	387	238	14.8	17.7	12.1	20.7%	-1.9%	60.4%
2004	294.2	48.1	329	414	244	15.3	18.7	12.2	9.1%	-13.4%	47.7%
2005	294.2	48.1	345	444	250	15.7	19.7	12.3	3.9%	-19.3%	44.0%
2006	294.2	48.1	355	465	252	16.2	20.7	12.3	1.0%	-23.0%	42.8%
2007	294.2	48.1	365	486	254	16.7	21.7	12.3	-1.7%	-26.3%	41.6%
2008	294.2	48.1	375	509	255	17.1	22.7	12.3	-4.4%	-29.6%	41.0%
2009	294.2	48.1	385	533	257	17.6	23.9	12.3	-6.8%	-32.8%	39.9%
2010	294.2	48.1	396	557	259	18.1	25.1	12.3	-9.4%	-35.6%	38.8%
2011	294.2	48.1	406	582	259	18.6	26.2	12.2	-11.6%	-38.4%	38.7%
2012	237.2	48.1	417	608	259	19.0	27.4	12.1	-28.3%	-50.9%	15.6%
2013	237.2	48.1	428	634	260	19.5	28.7	12.0	-30.2%	-52.9%	15.0%

Table 5-1
KUA Capacity Balance

Year	Existing/ Committed Generation [1]	Existing Purchases	Summer Peak Demand (MW)			DSM Impacts (MW)			Reserve Margin		
			Base	High	Low	Base	High	Low	Base	High	Low
2014	237.2	48.1	439	663	260	20.1	30.1	11.9	-31.9%	-54.9%	15.0%
2015	237.2	48.1	451	692	260	20.6	31.5	11.8	-33.7%	-56.8%	14.9%
2016	237.2	48.1	462	722	259	21.1	32.8	11.6	-35.3%	-58.6%	15.3%
2017	237.2	48.1	474	752	257	21.6	34.3	11.5	-36.9%	-60.2%	16.2%
2018	237.2	48.1	486	784	256	22.1	35.8	11.3	-38.5%	-61.9%	16.6%

(1) Includes Cane Island 3.

5.2.1 Load Forecast

KUA's 1999 load forecast, described in Section 3.0, was used to determine the need for capacity. A summary of the load forecast is shown in Table 5-2. The peak demands presented in Table 5-2 exclude demand reductions achieved through KUA's conservation and demand-side management programs further described in Section 4.0.

5.2.2 Reserve Requirements

KUA has adopted a 15 percent reserve margin for capacity planning in accordance with FAC 25-6.035. A 15 percent reserve margin is typical for utilities in Florida and throughout the Southeast.

5.2.3 Existing Generating Capacity

KUA's current generating capacity, as outlined in Section 2.0, consists of the Hansel and Cane Island Plants, which provide KUA 136 MW during the summer increasing to 261 MW in 2001 with the introduction of the third Cane Island unit. In addition, KUA's joint ownership share of capacity installed at the Stanton Energy Center, Crystal River and Indian River provides 36 MW of capacity during the summer.

5.2.4 Existing Purchases

KUA is a member of the FMPA, a legal entity organized in 1978 and existing under the laws of Florida. During 1983, FMPA acquired an 8.8060 percent (73.9 MW) undivided ownership interest in St. Lucie Unit 2 on behalf of KUA and 15 other members of the FMPA. KUA's entitlement share of this unit, based on a power purchase contract and adjusted for transmission losses, is 6.9 MW. FMPA has also entered into a Reliability Exchange Agreement with FPL under which half of KUA's entitlement share of capacity and energy will be supplied from St. Lucie Unit No. 1 and half from Unit No. 2.

Table 5-2
Summary of Load Forecast
Gross MW

Year	Winter Peak Demand (MW)			Summer Peak Demand (MW)		
	Base	High	Low	Base	High	Low
1999	235	252	200	244	262	208
2000	242	267	202	252	278	210
2001	264	303	212	274	315	220
2002	286	340	222	296	352	231
2003	304	374	230	315	387	238
2004	318	400	235	329	414	244
2005	334	430	241	345	444	250
2006	343	450	243	355	465	252
2007	353	470	245	365	486	254
2008	362	492	246	375	509	255
2009	372	515	248	385	533	257
2010	382	539	250	396	557	259
2011	392	562	250	406	582	259
2012	403	587	250	417	608	259
2013	413	613	251	428	634	260
2014	424	640	251	439	663	260
2015	435	668	251	451	692	260
2016	446	697	250	462	722	259
2017	457	726	248	474	752	257
2018	469	757	247	486	784	256

In addition to the above resources, KUA purchases electric power and energy from other utilities. KUA has a contract to purchase 20 MW of firm capacity from OUC through December 2003. This contract also provides for supplemental purchases of up to 50 MW if the capacity is available from OUC. KUA also has a contract with OUC to purchase up to 50 MW of capacity from the Stanton 2 plant ending in December 2000. KUA has a 1.80725 percent (7.9 MW) entitlement share of Stanton 1 through the FMPA

Stanton 1 Project and a 7.6628 percent (33.3 MW) share of Stanton 2 through the FMPA Stanton 2 Project. The Stanton 2 percentage includes recently acquired Homestead and Lake Worth shares totaling 3.8314 percent. Table 5-3 presents KUA's purchase power resources.

5.2.5 Retirements

KUA has scheduled the following units for retirement:

Unit	Type	Net Summer Capacity	Retirement Date
Hansel 8	Diesel	3	01/02
Hansel 14-18	Diesel	10	01/02
Hansel 19-20	Diesel	6	01/13
Hansel 21-23	Combined Cycle	48	01/13

In 1998, Hansel Unit 8 will be 39 years old and will be approaching the end of its reliable economic life. KUA will continue to operate Hansel Unit 8 until it has a major failure or until maintenance costs become prohibitive, but for planning purposes, the unit will be considered to be available for service until 2002 when a decision will be made concerning retirement. The other units are scheduled for retirement after 30 years corresponding to their expected reliable economic lifetime.

5.3 Fuel Price Forecast and Availability

The forecast presents KUA's analysis of fuel prices and current market projections based on the Standard and Poor South Atlantic Regional fuel price forecast study, which was completed in February of 1999 for KUA by DRI. The fuel price forecast includes coal, natural gas, and No. 2 fuel oil. The forecast for coal and nuclear was based on the forecast used in KUA's Need For Power application for Cane Island 3 which was approved by the Commission in 1998.

Table 5-4
Delivered Fuel Price Forecast--Base Case
($/MBtu)

Year	Coal	No. 6 Oil	No. 2 Oil	Nuclear	Natural Gas(1)
1998	1.72	2.69	3.04	0.54	2.25
1999	1.73	2.67	2.96	0.56	2.23
2000	1.76	2.76	3.17	0.57	2.45
2001	1.79	2.90	3.34	0.58	2.50
2002	1.83	3.04	3.53	0.60	2.60
2003	1.87	3.17	3.72	0.61	2.69
2004	1.91	3.33	3.93	0.63	2.78
2005	1.96	3.50	4.15	0.65	2.87
2006	2.00	3.66	4.39	0.66	2.98
2007	2.03	3.83	4.63	0.68	3.09
2008	2.08	4.02	4.88	0.70	3.23
2009	2.12	4.20	5.13	0.71	3.35
2010	2.18	4.38	5.39	0.73	3.48
2011	2.22	4.59	5.64	0.75	3.63
2012	2.26	4.81	5.91	0.77	3.77
2013	2.31	5.02	6.18	0.79	3.94
2014	2.37	5.24	6.46	0.81	4.11
2015	2.43	5.48	6.73	0.83	4.28
2016	2.49	5.74	6.99	0.85	4.45
2017	2.54	6.00	7.24	0.87	4.63
2018					

(1) Commodity only.

5.4 Description of Generation Capacity Addition Alternatives

This section presents the schedule, cost, and operating characteristics for alternatives for adding generation to KUA's system. To meet the additional capacity requirements, six alternatives are considered. All alternatives are assumed to be installed at Cane Island except the coal unit which will be at a new site. Each option will be described in a separate subsection below. The schedules for the alternatives are presented in Section 2.0 and the estimated cost and performance of the alternatives are presented in Section 3.0. For all but the first alternative of installing a 2x1 sized steam turbine for Cane Island 3 and last alternative of a coal unit, new combustion turbines will need to be purchased. No delays have been assumed for combustion turbine delivery that could result from factory backlog.

Many of the alternatives presented are larger than can be fully utilized by KUA and would require participation by the Florida Municipal Power Agency (FMPA) or others.
New units that have more than 75 MW of steam capacity or add additional steam capacity to the Cane Island site will require certification under the Florida Electrical Power Plant Siting Act, Sections 403.501-403.518, Florida Statues.

Generating unit alternatives that are currently being considered for capacity expansion include the following:

- Pulverized coal.
- Combined cycle.
- Simple cycle combustion turbine.

5.4.1 Westinghouse 1x1 501G Combined Cycle

The first alternative is to install a Westinghouse 1x1 501G combined cycle unit. This option keeps Cane Island 3 as originally planned and sites a separate combined cycle unit, (Cane Island 4). It is assumed that this option needs to be certified under the Florida Electrical Power Plant Siting Act and it is estimated to take 18 months for licensing comprised of 3 months to prepare the application, and 15 months to obtain

Table 2-1
1x1 Combined Cycle (G-Class)

	Months	Schedule
Alternative 1	48	
Capacity Bidding	7	
Site Certification	18	
Design	12	
Construction	24	

certification after filing. The design schedule is essentially the same as for Unit 3, with an additional 2 months added to the construction schedule. The Capacity Bidding Process is estimated to take 7 months. Licensing will take 18 months and the design and construction is assumed to take 29 months. There will be an overlap of 2 months in the capacity bidding and licensing processes, a 5-month overlap in licensing, and design and a 5-month overlap in design and construction. Table 2-2 presents the estimated schedule for this alternative.

5.4.2 F-class 1x1 Combined Cycle

To install a completely new 1x1 F-class combined cycle, all the assumptions from the previous section are considered. The only difference is the construction time, which will be shortened by two months. This alternative needs to be certified under the Power Plant Siting Act. Table 2-3 presents the estimated schedule for a new 1x1 F-Class combined cycle.

Table 2-2
1x1 Combined Cycle (F-Class)

	Months	Schedule
Alternative 2	46	
Capacity Bidding	7	
Site Certification	18	
Design	12	
Construction	22	

5.4.3 Simple Cycle F-Class Combustion Turbine

Simple cycle combustion turbine projects do not require certification under the Power Plant Siting Act. Certification under the Power Plant Siting Act is not required because this option does not add steam generation to the existing plant. However, the existing site certification needs to be modified which will take 12 months. The design and construction is estimated to take 22 months. An overlap of 7 months in design and construction and a 5-month overlap in design and licensing modification are assumed. Table 2-4 presents the estimated schedule for a new simple cycle F-Class combustion turbine addition.

Table 2-3
Simple Cycle (F-Class)

	Months	Schedule
Alternative 3	29	
MSC*	12	
Design	12	
Construction	17	

*Modification to the Site Certification

5.4.4 GE LM-6000 Simple Cycle Combustion Turbine

For this option, amending of the existing site certification is required which is estimated to take 12 months. Certification under the Power Plant Siting Act is not required because this option does not add steam generation to the existing plant. The design and construction is estimated to be 4 months shorter than the simple cycle F-Class design and construction due to the size difference. It is estimated to take a total of 18 months for the design and construction. An overlap of 7 months in design and construction in addition to a 5-month overlap in design and licensing modification are assumed. Table 2-5 below presents the schedule for a new LM-6000 simple cycle combustion turbine.

Table 2-4 Simple Cycle (LM-6000)		
	Months	**Schedule**
Alternative 4	25	
MSC*	12	
Design	10	
Construction	13	
*Modification to the Site Certification		

5.4.5 GE 7EA Simple Cycle Combustion Turbine

All the assumptions for installation of a LM-6000 (Subsection 2.5) are true for the 7EA simple cycle combustion turbine. The total time needed for license modification, design, and construction is estimated to be 25 months. Table 2-6 presents the estimated schedule.

Table 2-5 Simple Cycle (7EA)		
	Months	**Schedule**
Alternative 5	25	
MSC*	12	
Design	10	
Construction	13	
*Modification to the Site Certification		

5.4.6 250 MW Coal Unit

The installation of a 250 MW coal unit at a new site requires certification under the Power Plant Siting Act. It is estimated to take 34 months to complete the design and construction. The licensing is assumed to take 18 months. The capacity bidding process is estimated at 7 months. A 1-month overlap in licensing and capacity bidding process, a 5-month overlap in licensing and design, and a 19-month overlap in design and construction are assumed. The total time needed is estimated to be 54 months and is presented in Table 2-7.

Table 2-6 Coal Unit		
	Months	**Schedule**
Alternative 6	54	
Capacity Bidding	7	
Site Certification	18	
Design	24	
Construction	30	

5.5 Economic Evaluation of Alternatives

5.5.1 Economic Parameters and Evaluation Criteria

This section presents the assumptions applied for economic parameters and projections of prices used in the Ten-Year Site Plan. The assumptions stated in this section are applied consistently throughout. Subsection 5.7.1.1 outlines the basic economic assumptions while Subsection 5.5.1.2 discusses the evaluation criteria.

5.5.1.1 Economic Parameters.

5.5.1.1.1 Escalation rates. A 2.5 percent general inflation rate is assumed. A 3.0 percent annual escalation rate is used for operation and maintenance (O&M)costs. A 2.5 percent annual escalation rate is used for capital costs.

5.5.1.1.2 Bond Interest Rate. The bond interest rate is assumed to be 5.5 percent.

5.5.1.1.3 Present worth discount rate. The base case present worth discount rate is equal to the bond interest rate of 5.5 percent. A 10 percent present worth discount rate is used for sensitivity analysis.

5.5.1.1.4 Interest during construction. Interest during construction is assumed equal to bond interest rate of 5.5 percent.

5.5.1.1.5 Fixed charge rate. The fixed charge rate is 9.4 percent. The fixed charge rate was developed based on a 30 year bond term including principal and interest, a 12-month debt service reserve fund, interest earnings credit based on the bond interest rate, a 2.9 percent bond issuance fee, and 1.0 percent for property insurance.

5.5.1.2 Evaluation Criteria. Economic evaluation is conducted over a 20 year period from 1998 through 2017. The economic evaluation is based on the cumulative present worth of annual costs for capital costs, non-fuel O&M costs, fuel costs, and purchase power demand, energy, and transmission costs. Costs that are common to all expansion alternatives, such as demand charges for existing firm purchases, conservation and demand side management, existing transmission and distribution system costs, and administrative and general costs are not included. Capital costs for new generating units are for the year of commercial operation.

5.5.2 Economic Evaluation

Evaluation of the generating unit alternatives was performed using the EGEAS optimal generation expansion model. EGEAS evaluates all combinations of generating unit alternatives and selects the alternatives that provide the lowest cumulative present worth revenue requirements. PROSYM, an hourly-chronological production costing program, was used to obtain the detailed system costs and unit performance of expansion plans selected by EGEAS.

Based on the cost and performance of the generating alternatives presented in Section 5.5, an expansion plan consisting of the installation of 131 MW of a combined cycle generating unit during 2004 resulted in the lowest overall system operating cost.

6.0 Environmental and Land Use Information

A description of existing environmental conditions at the Cane Island site is presented in this section. Cane Island Units 1 and 2 are in commercial operation at the site. Unit 1 is a 42 MW (nameplate) simple cycle combustion turbine. Unit 2 is a 120 MW (nameplate) combined cycle. The site is suitable for approximately 1,000 MW of capacity.

6.1 Geology, Physiography, and Soil

The geology, physiography, and soils of the Cane Island site are described below.

6.1.1 Geology

The site is located on the Florida Peninsula which has existed as part of a much broader plateau since the Early Cretaceous period. This plateau now consists of the present peninsula and a broad submerged shelf extending the length of the state and out into the Gulf of Mexico.

Pre-Oligocene sediments on the plateau were calcium and magnesium carbonates and evaporites. Little or no quartz sands or clay minerals were deposited. Most of the structural activity in the region occurred during the Oligocene epoch. The Post-Oligocene disturbances changed the depositional environments on the plateau: clastic sediments were deposited over the carbonate plateau. Miocene and younger sediments were deposited in a wide variety of environments.

Peninsular Florida and the adjacent continental shelves have been tectonically stable throughout the Mesozoic and Cenozoic eras. Regional subsidence of the very thick, shallow marine sediments has been the dominant movement. The site is located within Seismic Risk Zone 0 of the Uniform Building Code.

6.1.2 Physiography

The Cane Island site is in the Mid-Peninsular Zone physiographic division of Florida. The site lies within the Osceola Plain section just east of the Lake Wales Ridge section.

The Osceola Plain is a broad terrace bounded by the Lake Wales Ridge to the west and the Eastern Valley to the east, both of which are marine scarps. The Osceola Plain has very little relief and generally has an elevation of 60 to 70 feet above the National Geodetic Vertical Datum.

6.1.3 Soils

The higher elevations of southern Cane Island are excessively drained Chandler sand which has a normal water table depth of more than 72 inches. There is no flood hazard. Permeability is very rapid in the upper 62 inches and rapid below that depth. The organic matter content and natural fertility are low.

6.1.3.1 Satellite Sand. Satellite sand is a somewhat poorly drained soil which has a water table at a depth of 10 to 40 inches for periods of two to six months in most years and below a depth of 40 inches in dry seasons. Available water capacity is very low throughout this soil; permeability is very rapid in all layers. The natural fertility of the soil is low, and organic matter content is very low. This soil is located on the northern portion of Cane Island.

6.1.3.2 Norcoossee Fine Sand. Norcoossee fine sands are moderately well drained and typically have a water table at a depth of 24 to 40 inches for four to six months in most years. It recedes to a depth of more than 60 inches in extended dry periods. The available water capacity is very low in the surface and subsurface layers, low in the subsoil, and rapid in the substratum. The soil's natural fertility and organic matter content are low. This soil is located between the Chandler sands and the Pompano fine sands described below.

6.1.3.3 Immokalee Fine Sand. The Immokalee fine sands are found between the Satellite sands and the Pompano fine sands as described below. It is a poorly drained soil. The water table is at a depth of less than 10 inches for two months in most years, and within a depth of 10 to 40 inches for eight months or more in most years. Permeability is rapid at the surface and subsurface layers, moderate to moderately rapid in the subsoil, and rapid below. Available water capacity is low in the surface layer, very low in the subsurface layer, medium in the subsoil, and very low in the substratum. Natural fertility and organic matter content of the soil are low.

6.1.3.4 Pompano Fine Sand. The Pompano fine sand, depressional, is a soil of the wetlands onsite. It is a poorly drained soil, and it is covered with standing water for 6 to 12 months most years. Permeability is very rapid throughout, and available capacity is very low. The soil's natural fertility and organic matter content are low.

6.2 Climate

The Cane Island site typically experiences long, warm, humid summers and dry winters. The average annual rainfall is approximately 53 inches.

The heaviest rainfall occurs during the period of June through September and accounts for about 57 percent of the annual total rainfall during an average year. There is a 50 percent chance of measurable rainfall on any given day during the summer rainy season. During the summer, warm, moist air from the Atlantic Ocean or the Gulf of Mexico covers the Cane Island site almost continually. When this very unstable air rises high in the atmosphere by convection heat from land surfaces, late afternoon showers occur. Although such showers are generally local and of short duration, rain can be very heavy with 2 to 3 inches falling in one or two hours. Large numbers of thunderstorms form that vary widely in size and intensity and move across the land at a moderate speed. These storms usually have intense lightning activity. Hail occasionally falls during thunderstorms, but the hailstones usually are small and cause little damage.

Daylong rains are rare and usually associated with a tropical storm. Summer thunderstorms generally are more intense than rains in the winter and early spring. More than 7 inches of rain in a 24-hour period can be expected sometime during the year in about one year in 10.

Tropical storms can cause high winds and heavy rainfall at the Cane Island site, but winds reach hurricane force only one year in 20. These storms can occur anytime during June through mid-November, but are most common in August and September. Flooding, as a result of the storms, can cause considerable damage to crops and structures.

Freezing temperatures occur several times during the winter. Such low temperatures occur during the night and seldom last two to three nights in succession.

There is little variation in summer temperatures because temperatures are moderated by breezes and frequent formation of cumulus clouds. During June, July, and August, the average daily maximum temperature is about 91° to 93° F, and the average daily minimum is approximately 70° to 72° F. Temperatures above 100° F are rare. During July and August, the temperature typically is higher than 90° F about 25 days of each month.

Prevailing winds in the Cane Island area generally are southerly in the spring and summer, and northerly in the winter. Wind velocities usually range from 8 to 15 miles per hour during the day and drop to about 5 miles per hour at night. The highest wind speeds usually occur during April and the lowest during August.

6.3 Air Quality

Air quality at the Cane Island site is considered good. Osceola County is currently designated as attainment or unclassifiable for all criteria pollutants. The criteria pollutants are sulfur dioxide, nitrogen dioxide, carbon monoxide, particulate matter less than 10 microns, ozone, and lead.

6.4 Hydrology

The following subsections describe the surface and ground water conditions of the Cane Island site.

6.4.1 Surface Water

Most of Osceola County is drained through numerous intermittent streams, creeks, lakes, closed depressions, and grassy prairies. The principal surface drainages in the area are the Kissimmee River to the west and the St. Johns River to the east. A number of large creeks including Crabgrass Creek, Bull Creek, Reedy Creek, and Canoe Creek flow into these rivers. Reedy Creek crosses the southwest corner of the site.

There are extensive wetlands adjacent to Cane Island. These wetland communities are described in Subsection 6.5.1. The results of previous wetland delineation surveys are described in Subsection 6.8.1.

6.4.2 Ground Water

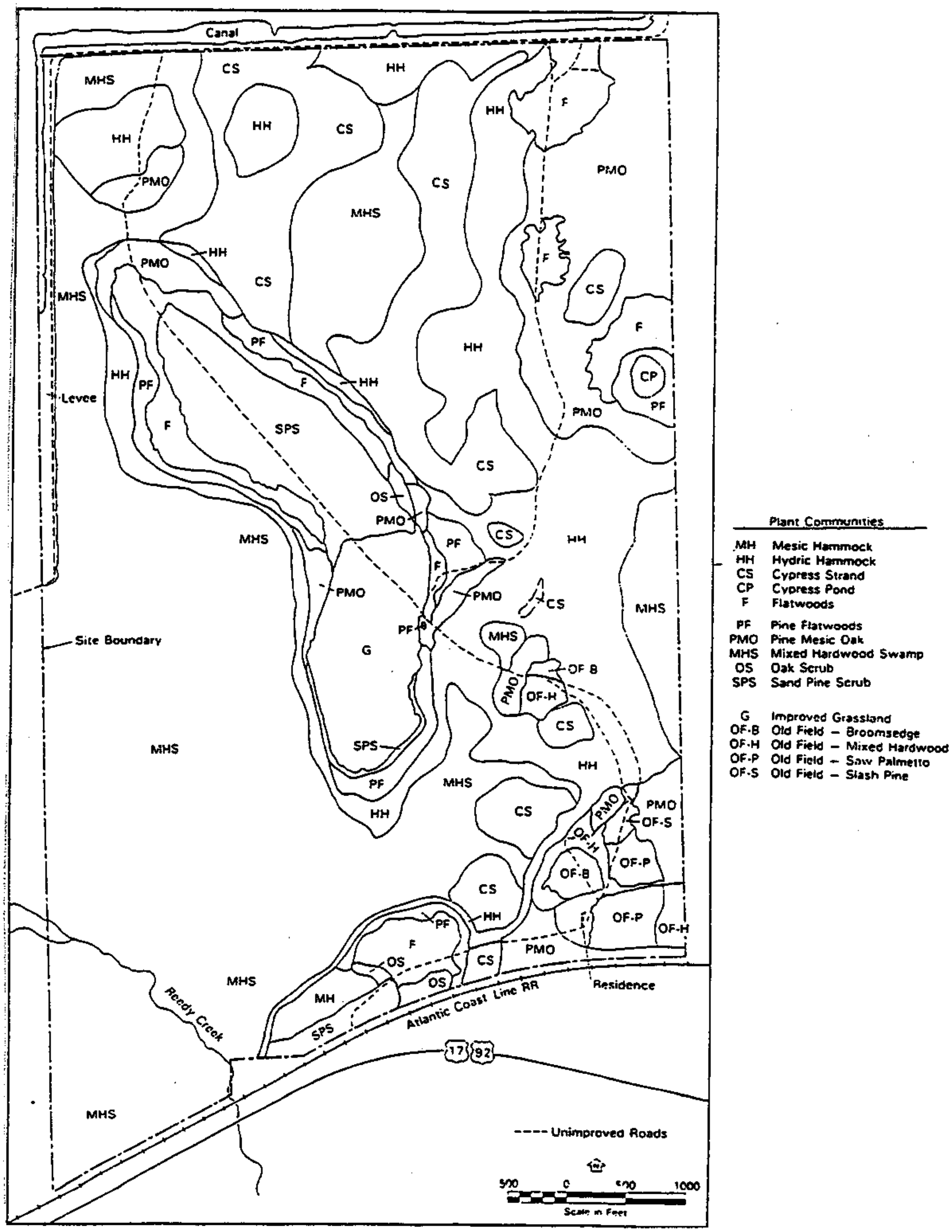
The Floridan Aquifer is the principal source of all groundwater in central Florida. Shallow aquifers that overlie the Floridan Aquifer, including the surficial sands and the upper region of the Hawthorn Formation, are secondary sources.

Towns, communities, and individual homes in the vicinity of the site obtain their water supply from wells. The wells are dug into underlying limestone to the aquifer and then cased to the limestone.

6.5 Vegetation

Vegetation surveys of the Cane Island site were conducted in 1991-1992. Based on these surveys, 16 plant communities were observed at the Cane Island site. These communities are listed below and described in the following subsections. Figure 6-1 is a plant community map of the site.

- Hydric hammock.
- Cypress strand.
- Mixed hardwood swamp.
- Cypress pond.
- Emergent/floating vegetation.
- Mesic hammock.
- Flatwoods.
- Pine flatwoods.
- Pine-mesic oak
- Sand pine scrub.
- Oak scrub.
- Improved grassland.
- Old field--Broomsedge.
- Old field--Saw palmetto.
- Old field--Mixed hardwoods.
- Old field–Slash pine.



Cane Island Vegetation Map
Figure 6-1

Of the communities, five were designated wetland communities (i.e., hydric hammock, cypress strand, cypress pond, mixed hardwood swamp, and emergent/floating vegetation). These five communities account for 70 percent (704 ac) of the total site. The South Florida Water Management District considers the Cane Island property a "regionally significant resource" due to the high diversity of wildlife and plant communities and the upland/wetland systems interactions. Upland communities (i.e., mesic hammock, oak and sand pine scrubs, flatwoods, pine flatwoods, pine-mesic oak, improved grassland, and old fields) account for the remaining 30 percent (299 ac).

Portions of the plant communities onsite are disturbed; others are intact, natural communities. The wetland communities, excluding the emergent/floating vegetation in the canals, are all relatively undisturbed. A number of the upland communities have experienced extensive perturbation. However, the sand pine scrub located at the northern half of Cane Island (39.9 ac) is a relatively undisturbed natural community. The remaining sand pine scrub areas, (2.0 acres at the southern portion of Cane Island, and 4.9 acres at the main entrance of the property) are quite disturbed. Unimproved roads onsite (ca. 6.7 ac.) are located within the hydric hammock, old field, improved grassland, sand pine scrub, flatwoods, and pine-mesic oak communities.

6.5.1 Hydric Hammock

Hydric hammock (189.4 ac) is a wetland community with a flat to slightly sloping topography, which may be inundated for up to six months per year. It is often situated between xeric upland communities and wetlands that are flooded for longer periods. Onsite, hydric hammocks encircle Cane Island and the uplands at Long Island and the farmstead. Tree canopy ranges from relatively open to closed. The understory is sparse to somewhat dense, while the ground cover is usually sparse. Several species are characteristic of this natural community: *Sabal palmetto* (cabbage palm), *Quercus virginiana* (Virginia live oak), *Quercus laurifolia* (laurel oak), *Pinus elliottii* (slash pine), *Quercus nigra* (water oak), *Acer rubrum* (southern red maple), *Cornus foemina* (stiff cornel), *Myrica cerifera* (wax myrtle), *Gordonia lasianthus* (loblolly bay), *Smilax bona-nox* (greenbrier), *Vitis* sp. (a wild grape), *Polypodium aureum* (golden polypody), *Thelypteris palustris* (marsh fern), *Osmunda cinnamomea* (cinnamon fern), *Dryopteris* *ludoviciana* (Florida shield fern), *Chasmanthium sessilfolium* (long leaf chasmanthium), *Dichanthelium dichotomum* (a panic grass), and *Gelsemium sempervirens* (yellow jessamine). Epiphytes such as *Tillandsia usneoides* (Spanish moss), *Tillandsia recurvata* (ball moss), *Tillandsia simulata* (wild pine), and *Polypodium polypodioides* (resurrection fern) are often observed in the trees.

6.5.2 Cypress Strand

Cypress strand (131.1 ac) is a stillwater swamp community situated in a depression channel that is often flooded most of the year. Cypress strands often intergrade with mixed hardwood and cypress pond swamps. Onsite, cypress strands are found throughout the study area, but especially bordering Cane Island to the north and south and at the property boundary to the north and east.

Overstory trees of this natural community, primarily *Taxodium distichum* (bald cypress) and *Acer rubrum* and *Liquidambar styraciflua* (sweet gum), reach a height of 80 feet and form a canopy ranging from moderately open to closed. Understory trees and shrubs, which include *Cornus foemina*, *Persea borbonia* (redbay), *Gordonia lasianthus*, *Ulmus americana* (American elm), tend to be more open than the canopy. In contrast, ground cover is usually sparse and consists of a diverse number of species, including *Carex* sp. (sedge), *Arundinaria gigantea* (switch cane), *Hydrocotyle umbellata* (marsh pennywort), *Dichanthelium dichotomum*, *Cyperus articulatus*, *Sagittaria* sp., *Tovara virginiana* (jumpseed), and *Saururus cernuus* (lizard's-tail). When the soils are flooded, however, floating vegetation (e.g., *Salvinia minima* (water spangles) may thickly cover the water surface.

6.5.3 Mixed Hardwood Swamp

Mixed hardwood swamp (382.0 ac) is a bottomland community that is found on relatively flat land and is flooded from six to nine months annually. Length of inundation depends on precipitation, extent of seasonal overbank water flow, and the distance from the water channel. Mixed hardwood swamps are associated with riverine systems, cypress strands and ponds as well as the more xeric hydric hammock community. At the study area, mixed hardwood swamps occur at the southeast portion of Cane Island.

Dominant overstory trees include *Acer rubrum*, *Quercus laurifolia*, and *Liquidambar styraciflua*, which often form a closed canopy of 80 to 100 feet in height. An occasional *Taxodium distichum* may also be found. Understory ranges from somewhat open to nearly closed and includes *Quercus nigra*, *Sabal palmetto*, *Gordonia lasianthus*, *Cornus foemina*, *Lyonia lucida* (fetterbush), and *Magnolia virginia* (sweet bay). Ground cover ranges from sparse to moderately open and includes a rich variety of herbaceous species and woody vines, such as *Hydrocotyle umbellata*, *Osmunda cinnamomea*, *Osmunda regalis* (royal fern), *Carex* spp., *Vitis* sp., *Rhynchospora* sp., *Dichanthelium dichotomum*, *Arundinaria gigantea*, *Dryopteris ludoviciana*, *Thelypteris palustris*, *Ampelopsis arborea* (peppervine), *Smilax* sp., and *Toxicodendron radicans* (poison ivy).

6.5.4 Emergent/Floating Vegetation

This type of wetland community occurs within the shallow waters and shoreline of the canal (2.4 ac) and Reedy Creek and its tributaries. The actual extent of the community was not determined, but is most likely minimal. Common species include *Eichornia crassipes* (water hyacinth), *Lemna acquinoctialis* (duckweed), and *Salvinia minima* (water spangles).

6.5.5 Cypress Pond

Cypress pond (1.6 ac) is a stillwater community, occurring in depressions which expose the shallow water table. The community is usually inundated with water, but water levels may fluctuate dramatically with climatic conditions. Cypress ponds are often associated with cypress strands, or intermixed with flatwoods and pine flatwoods. Onsite, cypress pond occurs on Long Island, which is in the northeast part of the property.

Canopy in this community approaches complete closure with *Taxodium* sp. (cypress) as the dominant species. Less abundant overstory trees include *Acer rubrum*, *Ulmus americana*, *Liquidambar styraciflua*, and *Pinus elliottii*. Understory cover is sparse and consists of *Gordonia lasianthus* and *Sabal palmetto*. Ground cover is also sparse, but consists of more species than the understory. Species include *Tovara virginiana*, *Osmunda cinnamomea*, *Arundinaria gigantea*, *Cyperus* spp., and *Hypericum* sp.

6.5.6 Mesic Hammock

Mesic hammock (5.6 ac) is an upland community with flat topography and well-drained soils. At the study area, mesic hammock occurs to the south near the entrance to the property. Canopy and understory vegetation are fairly open, while ground cover is fairly dense. Common trees and shrubs are *Carya floridia* (scrub hickory), *Sabal palmetto*, *Quercus nigra*, *Gordonia lasianthus*, and *Persea borbonia*. Characteristic vine and herbaceous species include *Carex* spp., *Serenoa repens* (saw palmetto), *Gelsemium sempervirens*, *Smilax bona-nox*, and *Dichanthelium aciculare*, and *Dichanthelium dichotomum*.

6.5.7 Flatwoods

Flatwoods (51.5 ac) is a natural upland community found on flat topography and well-drained soils. Under the right conditions, this community should mature into pine flatwoods. Characteristically, it is associated with sand pine scrub, sandhills (not at the Cane Island site), oak scrub, pine flatwoods, and hydric hammock. Onsite, flatwoods are found on Long Island and to the south near the site entrance. Flatwoods also encircle the northern half of Cane Island.

At Cane Island, flatwoods canopy cover is sparse to nonexistent with an occasional *Pinus elliottii* encroaching from the pine flatwoods. The understory is dense and includes *Ilex glabra* (gallberry), *Lyonia lucida*, *Lyonia ferruginea* (rusty lyonia), *Quercus geminata* (scrub live oak), and *Serenoa repens*. Ground cover ranges from sparse to somewhat dense and includes seedlings of the understory, as well as *Aristida stricta* (wire-grass), *Opuntia humifusa* (prickly-pear cactus), *Lachnocaulon anceps* (bog buttons), *Cladonia leporina* (British soldier moss), *Cladonia* spp. (lichens), *Vaccinium myrsinites* (shiny blueberry), *Dichanthelium aciculare*, and *Hypericum reductum*.

Although this community occurs naturally, many acres of flatwoods have been disturbed by man through logging, brush clearing, and fire. This is true at the Cane Island site, especially to the northeast on Long Island, where apparently slash or longleaf pine were harvested from pine flatwoods or flatwoods were cleared for roads. Both disturbances left patches of disturbed flatwoods.

6.5.8 Pine Flatwoods

Pine flatwoods (27.6 ac) is an upland community with flat to slightly sloping topography and well to moderately drained soils. The main difference between this community and flatwoods is that pine flatwoods have moister soi s and a denser canopy cover.

Canopy cover consists primarily of *Pinus elliottii*, which may be dense or rather open. *Gordonia lasianthus*, *Myrica cerifera*, *Quercus nigra*, and *Sabal palmetto* may be in the mid-canopy, which often approaches closure. The understory is thick and may reach a height of 8 feet. Typical understory species include *Ilex glabra*, *Serenoa repens*, *Lyonia lucida*, and *Ilex cassine* (dahoon holly). Ground cover tends to be much sparser than the strata above and includes *Vaccinium myrsinites*, *Osmunda cinnamomea*, *Vitis* sp., and *Smilax bona-nox*.

Pine flatwoods vegetation intergrades into flatwoods, such that differentiating the two communities proves difficult. Onsite, pine flatwoods are also associated with hydric hammock and pine-mesic oak and occur on Long Island, Cane Island, and near the property entrance.

6.5.9 Pine-Mesic Oak

Pine-mesic oak (95.8 ac) is an upland community on flat to sloping terrain with well-drained soils. It is associated with most of the plant communities at the study area. The majority of the acreage of pine-mesic oak is located at the northeast portion of the property. Smaller areas also occur on Cane Island and the farmstead.

The community is predominated by *Pinus elliottii*, *Quercus laurifolia*, and *Quercus virginiana*, which form a dense canopy often reaching 60 to 80 feet in height. The midstory is usually open, but may approach closure. It includes *Sabal palmetto*, *Gordonia lasianthus*, *Myrica cerifera*, *Ilex cassine*, *Liquidambar styraciflua*, and *Rhododendron viscosum* (swamp honeysuckle). The understory and ground cover tend to be sparse, but may be somewhat thick in transitional zones with other communities. Typical shrubs and saplings include *Lyonia lucida*, *Ilex glabra*, *Ulmus alata*, *Callicarpa americana* (beautybush), *Persea borbonia*, *Magnolia virginiana*, *Vaccinium myrsinites*, and *Serenoa repens*.

Common woody vines and herbaceous species include *Smilax bona-nox*, *Gelsemium sempervirens*, *Polypodium polypodioides*, *Thelypteris ludoviciana*, *Toxicondendron radicans*, *Osmunda cinnamomea*, *Dichanthelium aciculare*, *Scleria triglomerata* (tall nutrush), and *Rhynchospora* spp. (beak rush). Epiphytic species such as *Tillandsia usneoides*, *T. recurvata*, and *T.* simulata are found in the trees.

6.5.10 Sand Pine Scrub

Sand pine scrub (46.8 ac) is a natural upland community found on flat terrain with well-drained soils. In general, the scrub is a "xeromorphic" (adapted to withstand drought) shrub community composed of evergreen or semi-evergreen oaks. Characteristic oaks of this community at Cane Island are *Quercus geminata*, *Quercus chapmanii* (Chapman's oak), and *Quercus inopina* (bluejack oak), which often form a closed canopy 20 to 30 feet in height. The oak may not always be the dominant tree in the canopy because *Pinus clausa* (sand pine) often reaches 50 feet in height and forms an open to almost closed canopy. Common shrubs in the understory are *Lyonia ferruginea*, *Lyonia lucida*, *Serenoa repens*, and *Ceratiola ericoides* (rosemary). Sand pine scrub can form a dense thicket, but characteristically it is often open with abundant bare sand.

Ground cover is usually sparse with a low number of species, which include: *Aristida stricta*, *Heterotheca graminifolia* (no common name), *Balduina angustifolia* (yellow buttons), several *Cladonia* spp., *Rhynchospora megalocarpa* (beak rush), *Lachnocaulon* sp., *Xyris* spp., and *Andropogon virginicus* (broomsedge). A number of epiphytes (*Tillandsia usneoides*, and *T. simulata*) and epiphytic lichens are found attached to the trees and shrubs.

The sand pine scrub association is rare in Florida. It is also one of the most unique plant communities in Florida, not only because it rarely occurs outside the state, but also contains many rare and endemic plant and animal species. Some of these rare species are federally listed.

Of the acreage (46.8 ac.) designated as sand pine scrub at the Cane Island site, 39.9 ac. are undisturbed and located in the northern portion of Cane Island. The remaining amount (6.9 ac.) is too disturbed to be labeled natural.

6.5.11 Oak Scrub

Oak scrub (3.5 ac) is a natural community with flat topography and well-drained soils. This community is found in the southern portion of the study area. Oak scrub is a xeromorphic community that is very similar in composition to that of the sand pine scrub community except that it lacks *Pinus clausa* and tends to have a denser and shorter oak canopy.

The canopy is thick, reaches a height of only 6 to 8 feet, and is predominated by *Quercus inopina*, *Quercus geminata*, and *Quercus chapmanii*. The understory is fairly open and consists of *Serenoa repens*, *Ilex glabra*, *Lyonia ferruginea*, *Lyonia lucida*, and *Befaria racemosa* (tar flower). Ground cover is also sparse with oak seedlings, *Indigoifera* sp., *Vaccinium myrsinites*, *Smilax laurifolia*, and *Heterotheca graminifolia*. The same epiphytes found in the sand pine scrub are also observed here.

6.5.12 Improved Grassland

Improved grassland (34.0 ac) is an artificial community, in which the original vegetation (probably sand pine scrub) was removed and replanted to exotic grasses. Topography is flat and the soils are well-drained. This grassland community occurs in the southern part of Cane Island.

Ground cover predominates, ranging from 75 percent to 100 percent, and consists mostly of four grasses: *Eustachys glauca* (no common name), *Paspalum notatum* (bahiagrass), *Rhynchyletrum repens* (natalgrass), and *Andropogon virginicus*. Other species observed in the ground cover are *Opuntia humifusa* (prickly-pear cactus), *Cyperus* sp., *Indigoifera hirsuta* (hairy indigo) and *Dracunculoides* sp. Scattered trees and shrubs in the grassland include *Quercus geminata*, *Carya floridana*, *Sabal palmetto*, *Quercus nigra*, *Liquidambar styraciflua*, *Callicarpa americana*, and *Erythrina herbacea* (coralbeans).

In the past, the grassland was grazed by cattle. More recently, it has been burned triennially during the fall to stimulate forage production for wildlife.

6.5.13 Old Field Communities

The old field communities (24.1 ac) described below have been extensively disturbed, such that little or none of the natural vegetation remains. The land apparently had been used for pasture, cropland, and a residence, but now is abandoned. Most of the old field acreage occurs at the farmstead. Each community type is upland in nature, on relatively flat terrain with moderately drained soils. The old field has been separated into four types based on current vegetation.

6.5.13.1 Old Field--Broomsedge. This community (3.9 ac) is a grassland dominated by *Andropogon virginicus*, but accompanied by other herbaceous species including *Rhynchyletrum repens*, *Paspalum notatum*, *Rubus* sp. (a blackberry), *Artemisia* sp. (a ragweed), *Hieracium gronovii* (a hawkweed), *Rhynchospora* sp., *Gutierreza* sp., *Gnaphalium* sp., *Eupatorium capillifolium* (dog fennel), and *Solidago fistula* (a goldenrod). This area is an early-successional community due to the recent disturbance history. Trees are scarce, but those that are present are immature and are encroaching from the adjacent wooded communities. Trees include *Pinus elliottii*, *Quercus nigra*, *Myrica cerifera*, *Liquidambar styraciflua*, and *Sabal palmetto*.

6.5.13.2 Old Field--Saw Palmetto. This community (9.1 ac) is early- to mid-successional in nature, and is dominated by *Serenoa repens* and *Rubus* sp. The ground cover tends to be much sparser than the broomsedge old field, but has approximately the same grass and herbaceous species. The trees, however, are more mature and include *Pinus elliottii*, *Quercus geminata*, *Myrica cerifera*, *Quercus nigra*, and *Liquidambar styraciflua*.

6.5.13.3 Old Field--Mixed Hardwoods. This mid-successional community (9.8 ac) is dominated by a variety of trees, such as *Liquidambar styraciflua*, *Quercus laurifolia*, *Quercus geminata*, and *Sabal palmetto*. These trees reach a height of 40 to 50 feet and form a dense canopy in the more heavily wooded portions. Understory is often dense and includes less mature members of the overstory, as well as *Myrica cerifera*, *Rhododendron viscosum*, and *Lyonia lucida*. Ground cover varies in coverage depending on the sunlight attenuating from above and consists of a high number of species, including *Smilax bona-nox*, *Gelsemium sempervirens*, *Vitis* sp., *Hieracium gronovii*, *Scirpus* sp., *Andropogon virginicus*, *Dichanthelium* sp., *Cyperus* sp., and *Chaptalia tomentosa* (pineland daisy).

Hedge rows of *Quercus nigra* and mature trees of *Quercus virginiana* surrounding the residence were included in this community.

6.5.13.4 Old Field--Slash Pine. This early- to mid-successional community (1.3 ac) is dominated by an open canopy of slash pines reaching 30 to 40 feet in height over a sparse understory and ground cover. Species in the lower strata include *Myrica cerifera*, *Heterotheca graminifolia*, *Xyris* sp., *Andropogon virginicus*, *Paspalum notatum*, *Dichanthelium* sp., *Aristida stricta*, *Rhynchospora megalocarpa*, and *Quercus geminata*.

6.6 Wildlife

The main focus of previous wildlife surveys, conducted in close communication with Florida Game & Fresh Water Fish Commission (FGFWFC) staff, was threatened and endangered species and nesting herons and egrets. Species such as the eastern indigo snake, crested caracara, and other species of special concern were also considered.

Two wildlife surveys of the Cane Island site were conducted. Major wildlife habitats identified onsite and in the Cane Island site include sand pine scrub, grasslands, pine flatwoods, hardwood swamp, cypress swamp, and hammocks. Each of these respective wildlife communities is discussed in the following narrative. The major emphasis of field surveys and discussion, however, was on the upland communities designated for development. The presence of 87 wildlife species was observed, including 60 bird species, 14 mammal species, 9 reptile species, and 4 amphibian species.

6.6.1 Grassland

Ruderal habitats, including improved grasslands and old fields, are characterized by plant communities which are in an early successional stage. Food plants for wildlife mainly consist of various grasses and sedges. Cover for wildlife is sparse in some areas while gopher tortoise burrows provide denning sites in many of these habitats. Many arboreal wildlife, such as squirrels and warblers, are absent or reduced in this community. Common species in the old field include meadowlark, cotton mice, cotton rats, cottontail rabbit, and armadillos. White-tailed deer use these areas as feeding habitat. Many of the grasslands have been maintained by fire. Small mammal use of the grasslands appears to be at a very low level. Common species in the grasslands include loggerhead shrike, cotton mice, cotton rats, and cottontail rabbits. Red-tailed hawks will also use these areas as well as other hunting raptors.

6.6.2 Pine Flatwoods

Pine forests on the Cane Island site include those with a substantial pine canopy and those forests with pine occurring primarily as seedlings in the ground or shrub layer. These factors have a significant influence on the wildlife diversity. Cut-over sections are dominated by open-habitat species, while flatwoods with a substantial canopy have more species representative of a forest system.

Breeding birds in cut-over areas can be expected to be dominated by ground stratum birds such as meadowlark, rufous-sided towhee, and bobwhite. Seasonally abundant winter residents also included robins, palm warblers, savannah sparrows, and tree swallows. Canopy species, such as red-cockaded woodpeckers and other canopy species, were noticeably absent or reduced in this community. In comparison, winter surveys of the less altered flatwoods revealed a more typical flatwoods bird community, including species such as yellow-rumped warbler, Carolina wren, blue-gray gnatcatcher, pine warbler, and cardinal.

The most commonly encountered herptiles were six-lined racerunner, green anole, oak toad, and black racer. In regard to mammals, the hispid cotton rat is characteristic of this community and was collected during the study. Other mammals frequently encountered were nine-banded armadillo, cotton mouse, raccoon, and eastern cottontail. Cotton rats are generally described as being more abundant than cotton mice in pine flatwoods. Another small mammal of this habitat is the house mouse. Larger mammals include white-tailed deer, gray fox, bobcat, and raccoon. Fox squirrels were absent from all areas surveyed.

6.6.3 Sand Pine Scrub

The sand pine scrub occurs as a rather distinct community within the larger expansion of surrounding hydric hammock and cypress swamp. The scrub community is subject to rather dry conditions due to the rapid percolation of water through the overlying sands. Because of these dry conditions, many wildlife species are active only at night or during cooler conditions. Among the bird species occurring here, some of the most common were the rufous-sided towhee, common-yellow throat, blue jays, and brown thrasher. Other important species include a few gopher tortoise, fence lizard, and six-lined racerunner. During the winter months, this habitat is used extensively by a number of migrant bird species such as the palm warbler, yellow-rumped warbler, and the robin. Many of the onsite mammal species were observed in the scrub habitat including white-tailed deer, bobcat and opossum.

6.6.4 Oak Hammocks

The oak hammocks contain three well-developed strata including the ground cover, understory, and canopy. However, in some areas, the dense shading from the canopy has greatly reduced the ground cover. Since this forest association contains many large oaks, important mast (acorns) producers, this habitat is important to species such as deer, squirrel, quail, and red-bellied woodpeckers. Common species here include red-bellied woodpeckers, Carolina wren, tufted titmouse, and blue jays. Winter residents included these same species and the black and white warblers, northern parula warbler, and the woodcock. Some migrants included the American redstart and black-throated blue warbler. Common mammals included the white-tailed deer, gray squirrel, raccoon, and nine-banded armadillo.

6.6.5 Hardwood Swamps and Cypress Swamps

Swamp forests are generally three-layered systems with canopy, understory, and ground cover layers, and include ponded areas and small clearings. There are some areas in which soils are saturated and standing water occurs throughout the year. This condition, plus the dense shading from overstory species, may reduce the ground cover in some areas. Mast production and denning trees are abundant in these systems. Because of the vegetation diversity and alteration of dry and wet habitats, these forested communities offer a greater diversity of microhabitats than most other systems in the study area. The fauna of this habitat is generally a combination of species of aquatic habitats as well as species of the upland habitats.

The avian composition of this habitat is generally characterized by seasonal rises in species richness in the fall and winter with a subsequent decline in the summer. The number of winter residents may be nearly twice that of the summer residents. Common breeding birds of these forests include blue-gray gnatcatcher, tufted titmouse, Carolina wren, yellow-billed cuckoo, and red-bellied woodpecker. The winter residents include blue-gray gnatcatcher, red-bellied woodpecker, barred owl, red-shouldered hawk, and other warblers. Migrants in the fall and spring consist of veery, American redstart, and red-eyed vireo. In comparison to the other habitats, more species of warblers and other perching birds may be observed in these forests. During flooding conditions in the late summer and early fall, a large number of wading birds may use these areas as feeding sites. Ponded and shallow backwater areas are some of the most heavily utilized feeding sites.

The mammalian fauna and herpetofauna of this habitat is diverse. The most conspicuous mammals of this habitat included the raccoon, cotton mouse, gray squirrel, nine-banded armadillo, and opossum. Densities of gray squirrel in these areas commonly range from two to five squirrels per acre. The most common reptiles include the groundskink, southeastern five-lined skink, and black racer. Abundant amphibians were the squirrel tree frog, southern leopard frog, and chorus frog.

6.7 Threatened and Endangered Species

Field surveys were conducted to identify endangered, threatened, and other sensitive species at the Cane Island site. The survey methods included direct sampling, and pedestrian and vehicular surveys. Major habitat types were identified from aerial photographs and surveys for threatened and endangered species were conducted.

No federally endangered plant or animal species were found onsite during the surveys. While appropriate habitat for the Florida scrub jay (state threatened) exists on the northern half of Cane Island, and tape recordings of calling scrub jays were played, no scrub jays were seen or heard during the surveys.

The gopher tortoise *(Gopherus polyphemus)*, a state species of special concern, occurs in high concentration in the southern grassy half of Cane Island. It is also found in much lower concentrations in the scrub community on the northern half of the island and along the site southern boundary.

The following 18 Florida protected plants were found onsite, primarily ferns in the hydric hammocks associated with Reedy Creek.

- *Dryopteris ludoviciana* (Florida shield fern, State Threatened).
- *Polypodium aureum* (golden polypody, State Threatened).
- *Thelypteris palustris* (marsh fern, State Threatened).
- *Tillandsia simulata* (air pine, State Threatened).
- *Woodwardia areolata* (netted chain fern, State Threatened).
- *Botyrchium biternatum* (southern grape fern, State Threatened).
- *Habenaria odontopetala* (unnamed Rein orchid, State Threatened).
- *Lechea cernua* (nodding pinweed, State Endangered).
- *Osmunda cinnamomea* (cinnamon fern, Commercially Exploited).
- *Osmunda regalis* (royal fern, Commercially Exploited).
- *Ponthieva racemosa* (shadow witch, State Threatened).
- *Selaginella arenicola* (sand spikemoss, State Threatened).
- *Tillandsia setacea* (unnamed wild pine, State Threatened).
- *Garberia heterophylla* (garbera, State Threatened).
- *Ilex cassine* (cassine, Commercially Exploited).
- *Epidendrum conopseum* (greenfly orchid, State Threatened).
- *Encyclia tampensis* (butterfly orchid, State Threatened).
- *Psilotum nudum* (whisk fern, State Threatened).

The northern half of the island contains a natural community known as sand scrub. This native community often contains federally protected species (such as the Florida scrub jay), and therefore is of concern to state and federal agencies.

6.8 Jurisdictional Wetlands

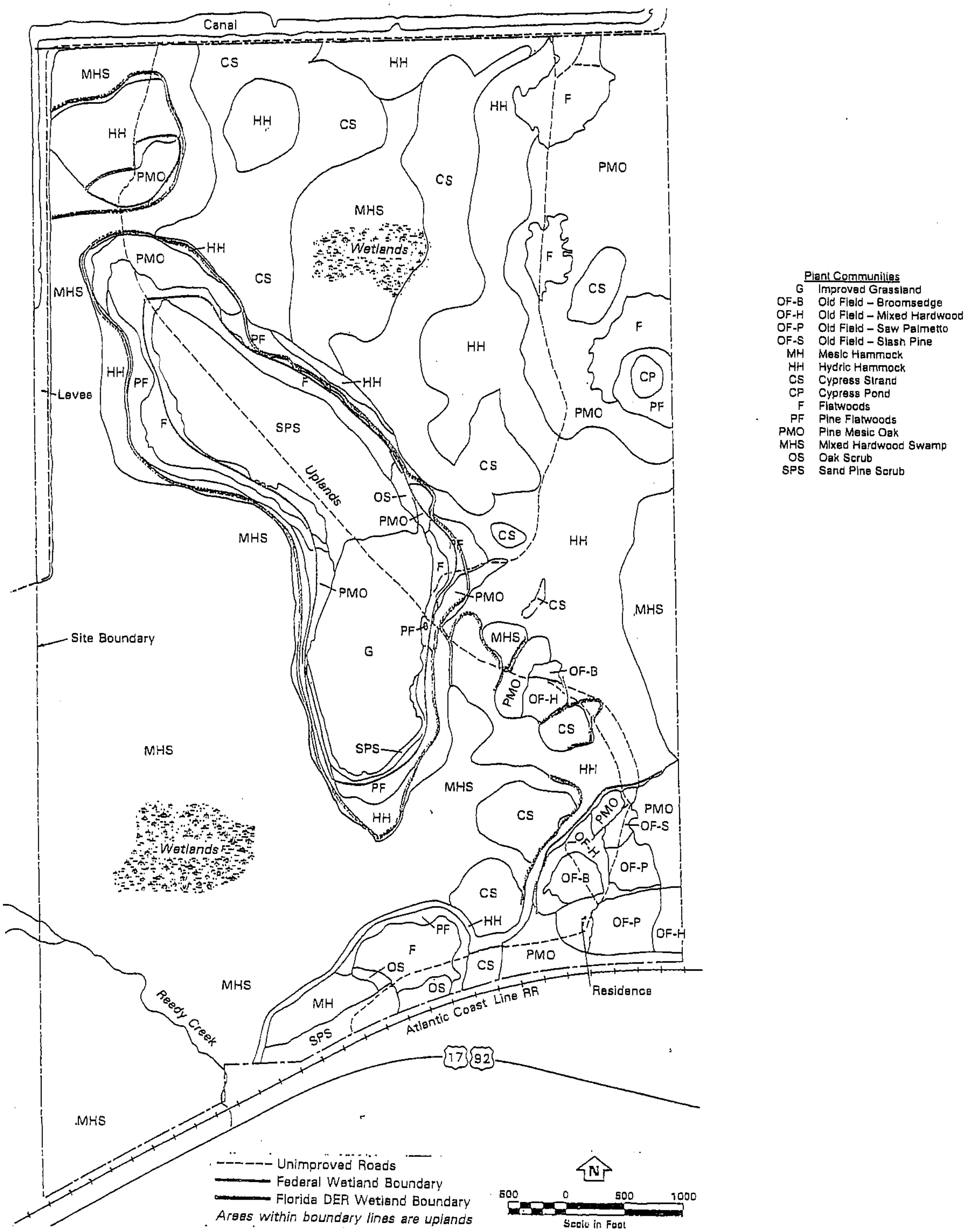
Wetlands in Florida, at the time of the original surveys, were under the jurisdiction of three agencies. Federally jurisdictional wetlands were regulated by the US Army Corps of Engineers (Corps). The Florida Department of Environmental Protection (FDEP) and its subsidiary water management districts (such as the South Florida Water Management District; SFWMD) had separate criteria for defining jurisdictional wetlands. SFWMD generally corresponded to the Corps methods. Dredge and fill activities in "waters of the US," which include wetlands, required Corps and FDEP permits, which are submitted jointly to FDEP. In addition, SFWMD requires permits for activities which affect surface water management and water use.

State and federal wetland boundaries were delineated for the Cane Island site in accordance with the Corps Delineation Manual. Jurisdictional wetland determinations of the site were conducted by the Corps, South Florida Water Management District (SFWMD), and FDEP. Figure 6-2 indicates the jurisdictional wetland boundaries. The following subsections describe the results of the federal and state wetland delineations related to the Cane Island site, access road, and farmstead area in the southeastern portion of the site.

The upland area in the northeastern portion of the property, referred to as Long Island, was not surveyed because no impacts will occur in this area. Hydrology, soils, and vegetation, however, were quickly examined along a transect running in an east-west direction on a portion of the island. It can be predicted from these results that the majority of Long Island has little potential to be federally jurisdictional wetlands.

6.8.1 Cane Island and Access Corridor

Cane Island is one of several natural upland areas in the wetland system known as Reedy Creek Swamp. As a portion of the Lake Wales Ridge, these sandy upland areas are remnants of ancient shoreline dunes. There are no wetlands on Cane Island site.



Jurisdictional Wetland Boundaries
Figure 6-2

6.8.1.1 Federal Wetlands. The federally jurisdictional wetlands on Cane Island frequently follow the treeline at the periphery of the island as indicated on Figure 6-2, particularly on the southern (grassy) end of the island. In the northern half, the pine flatwoods to the east and the disturbed flatwood to the north and west represent the boundary of the federally jurisdictional wetlands. Nonwetland acreage on the northern (scrub) half of the island is approximately 56 acres; nonwetlands on the southern (grassy) portion of the island are approximately 47 acres, for a total of approximately 103 acres on the entire island. The nonwetland acreage is continuous and contains no wetland inclusions. The access road is in federally jurisdictional wetlands for the majority of its length from the island's wetland boundary to the edge of the abandoned farmstead. The access road crosses one small section of nonwetlands contained within old field--mixed hardwood, and broomsedge, and pine-mesic oak plant communities. From the northern edge of the farmstead southward to the property line, no federal wetlands occur.

6.8.1.2 State (FDEP) Wetlands. The FDEP jurisdictional boundary is, in most instances, farther into the Reedy Creek Swamp than is the federal (Figure 6-2). It generally corresponds with the boundary between the pine flatwoods and the hydric hammock plant communities. Based upon state delineation methods, there are approximately 120 nonwetland acres on Cane Island. Contrary to the federal delineation results, the access road crosses nearly all of nonwetlands contained within old field--mixed hardwood and broomsedge, pine-mesic oak, and hydric hammock plant communities. FDEP wetlands include small portions of pine-mesic oak, hydric hammock, and mixed hardwood swamp communities.

6.8.2 Farmstead Area

The access road in the southeastern corner of the property traverses through abandoned farmland. Old field succession is in various stages of growth, depending upon time since most recent disturbance.

6.8.2.1 Federal Wetlands. Using the federal method of wetland identification and delineation, there are no wetlands within the access road corridor.

6.8.2.2 State Wetlands. As with the federal wetland delineation results, there are no state wetlands within the road access corridor.

6.9 Land Use

Cane Island is a 100 acre natural upland area in Reedy Creek Swamp, approximately 10 miles southwest of Kissimmee, the largest city in Osceola County. The County has experienced rapid urbanization in the past 20 years as a result of the construction of Disney World. The County also has a significant rural population.

Kissimmee has no major industrial business, but has a broad base of commercial and retail establishments. Kissimmee also has a municipal airport and two hospitals that serve the City as well as surrounding communities.

Cane Island is roughly 2,200 feet north of Old Tampa Highway. The road runs east/west through Intercession City, a town about 1.5 miles to the southeast. Intercession City is a low density residential community. Sparse commercial and retail establishments are to the west, southwest, and southeast. Disney World is approximately 7 miles north of Cane Island. The land adjacent to Cane Island is undeveloped and used primarily for agriculture.

Cane Island is currently zoned for agriculture and in the past was used to graze livestock. Cane Island Units 1 and 2 are located in the middle of Cane Island and use less than 30 percent of the available upland area. Approximately 3.3 acres of wetlands were filled and 4.5 acres of forested wetlands cleared to accommodate the access/utility corridor onsite.

Intercession City is a small residential community located primarily between US Highway 17/92-State Highway 600 and Old Tampa Highway. Commercial areas are located along US Highway 17/92. The community's residential area is located on both sides of Old Tampa Highway and the CSX railroad track.

Osceola County, through its Planning Department and Development Department, takes an active role in planning for and controlling development in the county. A county-wide zoning ordinance is guided by the Osceola County Comprehensive Plan and the Future Land Use Plan.

6.10 Recreation

Beaches, winter sporting events, and numerous resort facilities make Florida the second largest tourist attraction area in the United States. Disney World, a large resort with numerous entertainment facilities, is the largest tourist attraction in the vicinity.

Before KUA purchased the 1,025 acre plot of land that includes Cane Island, it was privately owned and used for hunting.

6.11 Socioeconomics

The social and economic conditions in Osceola County are described below.

6.11.1 Demographic Trends

Osceola County has experienced rapid population growth in recent decades, much of which can be attributed to the construction of Disney World in the early 1970s. In 1960, the population of the county was 19,029, and by 1970 it had expanded to 25,267, an increase of 32.8 percent. The 1980 US Census reported the county's population almost doubling to 49,287, a 95.1 percent increase. In 1990, the population increased by 65.8 percent to 81,700. Projections indicate that the population will increase by an additional 31 percent to 107,000 by the year 2000.

6.11.2 Economic Trends

The US Census reported that 16,048 people were employed in Osceola County in 1990. The leading employers include the City of Kissimmee, Disney World, the County, and Tupperware. The number of people employed in Osceola County is expected to increase by 154.8 percent to 40,896 by the year 2000. Median household income in the county for 1997 was approximately $30,000.

Disney World continues to expand and create opportunities for employment. Tourism is expected to increase and will boost commercial/retail trade such as hotels, restaurants, and shopping facilities. As cities in the County expand, new jobs for civil employees will become available. This includes positions such as school teachers, police officers, firefighters, post office personnel, sanitation workers, road crews, and administrative staff. Personal service needs such as health care facilities will also expand and create additional jobs.

6.11.3 Housing

Residential development is rapidly expanding in Osceola County. Through 1995, 1,718 residential building permits were issued in Osceola County. In 1980, there were 18,953 single-family dwelling units and 3,947 multi-family units in the county. By 1990, an additional 11,668 single-family (61.6 percent growth) and 4,753 multi-family dwelling units (120.4 percent growth) were built. Residential development is anticipated to expand to 38,963 single-family(27.2 percent growth) and 14,500 multi-family dwelling units (66.7 percent growth) by the year 2000.

6.11.4 Public Services

There are two hospitals, Community Hospital and Kissimmee Memorial Hospital, to serve the City of Kissimmee and surrounding communities. Kissimmee also has a large network of civil services, employing a total of 587 persons providing police and fire protection, solid waste disposal, sewer and road services, administrative, and legal functions.

The Osceola County School District has significantly expanded in the last ten years in response to residential growth. In 1980, 8,417 students (grades 1-12) were enrolled in Osceola County schools. In 1990, the school district grew 51.2 percent to 12,723 students; 17,343 students (36.3 percent increase) are anticipated by the year 2000.

6.12 Aesthetics

Visual and aesthetic resources can be defined as those landscape areas and features which are unique because of their visual quality to an area. Such resources can include natural areas, as well as man-made features. Culturally significant elements of the landscape can also be considered as a visual or aesthetic resource. Aesthetic resources can include any of the following.

- Natural features which create a landscape of high visual/aesthetic quality (i.e., water resources, unique vegetation, topography).
- Man-made features which create a landscape of high visual/aesthetic quality (i.e., outstanding architectural achievements, examples of cultural heritage).

- Areas designated (recognized) for recreational activities (i.e., camping, boating, hiking) which are dependent upon the visual/aesthetic quality of the landscape.
- Landscapes which exemplify historic/archeological significance (i.e., national, state and locally recognized archeological or historic sites) and depend upon the undisturbed integrity of the surrounding visual environment.

Cane Island is located in a sparsely populated rural area of Osceola County. The main plant facilities are constructed in an area surrounded by trees and dense vegetation. This vegetation screens the facilities from view.

As required by the Prevention of Significant Deterioration (PSD) regulations, a visibility impact analysis was conducted. The purpose of the analysis was to determine the project impacts on visibility on Class I air quality areas. The nearest Class I area is the Chassahowitzha Wilderness Area located approximately 70 miles west of the Cane Island site. The EPA-approved VISCREEN model was used to determine the project's maximum visual impacts. The analysis demonstrated that the visual impact of the Cane Island facilities will be below the criteria levels.

6.13 Noise

An ambient noise survey was performed in the vicinity of Cane Island during licensing of Cane Island Units 1 and 2.

The noise measurement data showed that the noise environment generally was controlled by the level of traffic flow. The constant background noise level (L_{90}) was dominated by local traffic in all locations during daytime periods. Only during the early morning hours were noise sources other than traffic the controlling sources.

Since the ambient noise level is dominated by traffic flow during the day and natural sources at night, the existing noise environment varies with the time of day. The L_{90} background measurements ranged from 31.5 dBA to 46.0 dBA during daytime periods, and 27.5 to 30.0 dBA during the nighttime. The L_{eq} average sound levels ranged from 40.8 dBA to 63.1 dBA during daytime, and 33.3 to 49.7 dBA during nighttime.

6.14 Transportation

Roadways, railways, and air transportation serving the Cane Island area are discussed in the following subsections.

6.14.1 Roadways

Transportation facilities near Cane Island include primary, secondary and collector roads, a mainline railroad, and a public airport. The primary highways are US Highway 17/92, which shares the highway designator with State Highway 600, and State Highway 531. Highway 17/92 is primarily an east-west highway which provides a driving option to US Interstate 4 from Orlando to the Tampa area. It offers a four-lane unlimited access highway from Orlando to Kissimmee, two lanes from Kissimmee to Haines City, and four lanes from Haines City through Lakeland to the Tampa area. State Highway 531 is a paved two-lane highway which begins in Kissimmee as Clay Street and extends south as Pleasant Hill Road to the City of Poinciana, where it turns west to Haines City. Secondary roadways include Old Tampa Highway; Hoagland Boulevard, which serves the southwest fringe of the City of Kissimmee and provides access to the Kissimmee Municipal Airport; and South Poinciana Boulevard, a new four-lane boulevard extending from northern Osceola County south to the planned industrial/commercial/office community of Poinciana at Highway 17/92. Before Highway 17/92 and Interstate 4 were constructed, Old Tampa Highway was the primary driving route from Orlando to Tampa. It now serves as a secondary road serving the residential areas of Campbell and Intercession City, merging with US Highway 17/92 south of the Cane Island site.

Highway 17/92 is adjacent to the south boundary of the Cane Island site. The asphalt roadway is in good condition and provides primary access to the site. The highway passes east through Intercession City to Kissimmee where State Highway 192 connects with the Florida Turnpike to the east and with Interstate Highway 4 to the west. State Highway 441 extends north from Kissimmee to Orlando and beyond.

There was a dirt road from Highway 17/92 that ran north into the Cane Island site. This road was used as the base alignment for the plant access road.

6.14.2 Railways

The CSX Transportation Railroad's Jacksonville-Orlando-Tampa mainline passes immediately south of the Cane Island site. This railroad can serve the Cane Island site. CSX owns and maintains one track west of the community of Campbell, with two tracks in their right-of-way to the east. The CSX track is a main freight line between Jacksonville, Orlando, and Tampa. In addition, Amtrak uses this line for daily passenger service between Orlando and Tampa, with intermediate stops in Kissimmee and Lakeland.

6.14.3 Air Transportation

Scheduled airline services are not available in Osceola County, but airline service is readily available at the Orlando International Airport approximately 20 miles north of the Cane Island site.

The Kissimmee Municipal Airport is located approximately 5 miles to the east of Cane Island. The airport is a general aviation facility with no scheduled commercial service. Three hard-surfaced runways are available: NW-SE, 5,300 feet in length; SW-NE, 5,000 feet; and E-W, 3,900 feet. Facilities include hangars, fuel and maintenance, and aircraft sales, leasing and charters.

6.15 Cultural Resources

The Florida Department of State, Division of Historical Resources (Division) was asked on January 31, 1992, to conduct an assessment of cultural resources for the Cane Island site. Their review of the Florida Master Site File indicated that there were no archeological or historic sites recorded within the Cane Island site as of February 20, 1992. However, the State Historic Preservation Officer recommended that such a survey be conducted prior to any land clearing or ground disturbing activities.

In March 1992, KUA solicited bids from qualified professional archaeologists to conduct an assessment survey of the Cane Island site, gas pipeline corridor, and Clay Street Transmission Line and Substation. In April 1992, KUA awarded the survey contract to Janus Research/Piper Archaeology of St. Petersburg. Field work was conducted in May 1992.

The assessment survey resulted in the discovery of 13 previously unrecorded sites. Seven of these were prehistoric, 6 were historic structures. All of the prehistoric sites are within the Cane Island site or corridors. It was the consultant's opinion that none of the archaeological sites were considered eligible for listing on the *National Register of Historic Places*. The historic structures are all located outside the direct impact areas. The assessment report was submitted to the Division in June 1992 for review. The Division ultimately cleared the project areas for construction.

7.0 Environmental Impacts

The following describes the effects that may occur to the natural and cultural characteristics of the Cane Island area as a result of construction and operation of the proposed Cane Island Unit 3. Proposed mitigation measures are described in Section 8.0.

7.1 Geology, Physiography, and Soils

Project construction and operation will alter some physical characteristics of the landscape and convert additional land to an industrial use for the life of the project. Clearing, soil mixing and compaction, and topographic changes will occur. There will be a slight reduction of available permeable surfaces and soil infiltration capacity which will increase surface runoff.

7.2 Climate

Operation of the Cane Island Unit 3 will have no significant impact on the local or regional climate. Oxides of nitrogen (NO_x) will be the principal air pollutants emitted by the plant. NO_x emissions are planned to be regulated to required levels with dry low NO_x combustors.

Changes in the global climate or the "greenhouse effect" may be associated with the atmospheric concentrations of several gaseous pollutants, including carbon monoxide (CO) and NO_x. There will be some increase in the concentration of CO and NO_x as the result of the operation of the generating facility. Federal and Florida air quality standards will be met, and the facility's contribution of NO_x should have no noticeable impact on the local or global temperature.

7.3 Air Quality

There will be short-term air quality impacts during construction, and long-term impacts will occur during the operation of the proposed facility as described below.

7.3.1 Construction Impacts

Air quality may be impacted temporarily by construction activities that generate fugitive dust or by emissions from vehicles. Construction activities involving clearing, excavation, and grading operations have the greatest potential for generating fugitive dust. Dust emissions can vary substantially from day to day depending on the level of activity, the specific operations, and the prevailing weather conditions. There may be a minor increase of fugitive dust as the result of vehicular traffic on Old Tampa Highway.

Workers' cars and vehicles transporting construction materials will affect air quality by emitting CO, NO_x, and hydrocarbons. The overall impact on air quality from such vehicles will not be significant and will be limited to the construction period. Similarly, construction equipment also will emit CO, NO_x, and hydrocarbons. These emissions are minor and will not cause significant air quality deterioration.

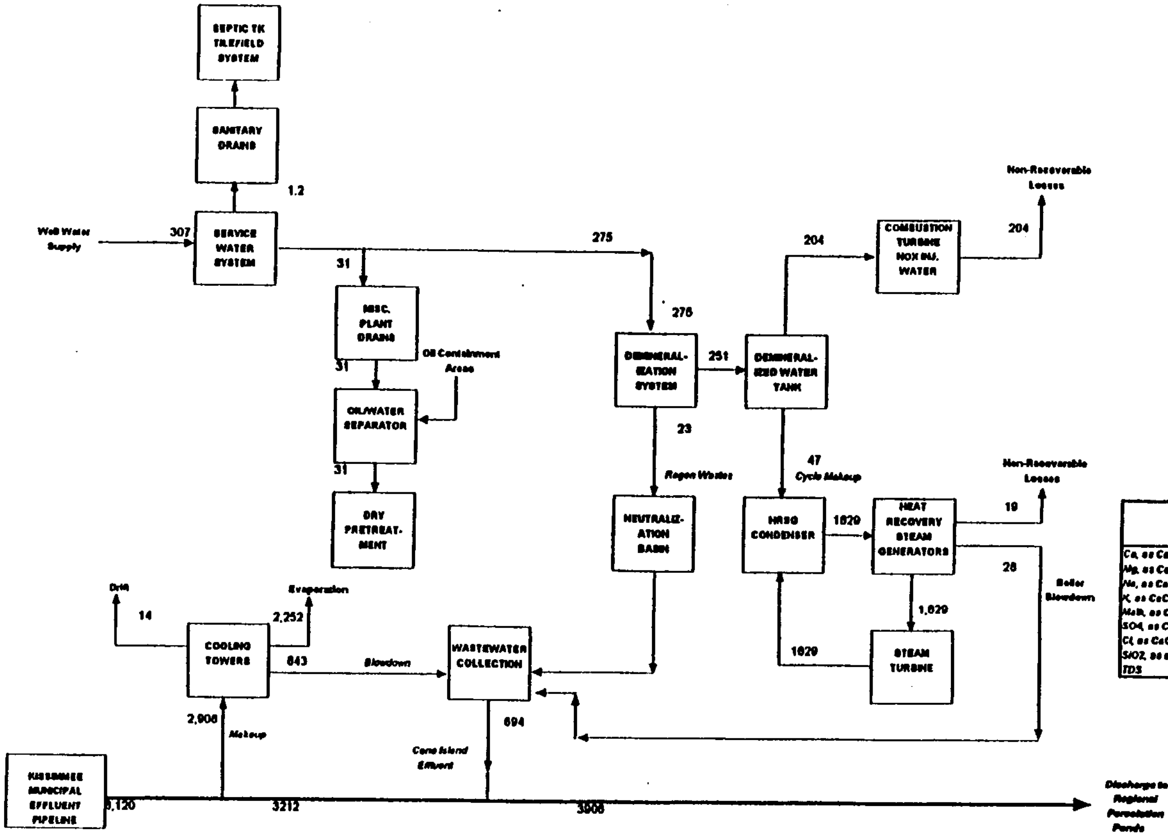
7.3.2 Operation Impacts

Air pollutants will be emitted into the atmosphere during the operation of the Cane Island plant. The facility will comply with all applicable emission limitations and air quality standards, including the New Source Performance Standards, Prevention of Significant Deterioration (PSD) growth increments, and Florida air quality regulations. These standards are designed to protect human health and the environment; therefore, no significant air quality impacts are expected.

7.4 Hydrology

During construction of the Unit 3 facilities, it is possible that surface runoff may carry small amounts of sediment into nearby waterbodies. However, existing vegetation, and mitigation techniques, will filter most of the sediments. Due to the anticipated small magnitude of sedimentation, and the short duration of construction, no significant impacts to surface or ground waters are anticipated.

Service water for project operation will be supplied from wells onsite. The pumping of well water is expected to have no significant impact on the aquifer and withdrawals should not impact other users of the aquifer. Cooling tower makeup water will be treated effluent water from the City of Kissimmee's Water and Sewer Department pipeline adjacent to the site. A water mass balance estimate is shown on Figure 7-1.



WATER ANALYSIS DATA

	Municipal Effluent Analysis	Cane Island Effluent Analysis	Combined Effluent Analysis
Ca, as $CaCO_3$	80	417	140
Mg, as $CaCO_3$	28	139	48
Na, as $CaCO_3$	111	478	176
K, as $CaCO_3$	14	58	22
Malk, as $CaCO_3$	81	190	100
SO_4, as $CaCO_3$	34	410	101
Cl, as $CaCO_3$	91	379	142
SiO_2, as such	16	124	35
TDS	328	1492	534

ALL FLOWS ARE GIVEN IN 1000 GALLONS PER DAY

07-Apr-98

KISSIMMEE UTILITY AUTHORITY
WATER MASS BALANCE

100% LOAD CONDITION

UNITS 1 THRU 3 COMBINED
NATURAL GAS FIRED

Water Mass Balance
Figure 7-1

7.5 Vegetation

The following subsections describe the impacts to upland and wetland vegetation as a result of Unit 3 construction.

7.5.1 Uplands

Construction of Unit 3 on the Cane Island site will impact plant communities. Vegetation will be lost due to the permanent clearing of land. Sand pine scrub will be the major community impacted during development.

7.5.2 Wetlands

No wetlands will be impacted as a result of the construction of Unit 3.

7.6 Wildlife

Construction of the Unit 3 facilities on Cane Island will result in the clearing and subsequent loss of habitat. A buffer area of trees and wetlands will be retained around the island which will continue to provide habitat for birds, small mammals, and other wildlife.

Cane Island wildlife presently are habituated to relatively low levels of human disturbance. Levels of disturbance from human-induced noise and activity will increase beginning with the construction of the site facilities, and will continue throughout the life of the plant. Initially, wildlife will avoid habitat near the construction areas. The area of habitat avoided will vary according to wildlife species, season, and activities. Although most wildlife will become somewhat tolerant of the noise and human activity, generally, most species will shift activities away from the Cane Island area. Such avoidance will further reduce available habitat.

7.7 Threatened and Endangered Species

Low densities (2.9/ac as determined in 1997) of the gopher tortoise (*Gopherus polyphemus*) occur in the sand pine scrub areas on Cane Island. The gopher tortoise is listed as a species of special concern by the State of Florida. Gopher tortoises will inevitably be taken and its habitat destroyed by site preparation within the Unit 3 construction zone.

No other federal or state threatened or endangered animal species were found within the Cane Island site during a survey conducted in 1991.

There are 18 species of plants that occur on Cane Island which are listed as sensitive species by the State of Florida. These species are listed in Subsection 6.7.1. None of these plants will be lost to Unit 3 development.

7.8 Land Use

Impacts to area land use practices can be short-term and temporary, such as construction impacts (noise, fugitive dust, access roads), or long-term and permanent once structures are completed (changes in land use patterns and future land use planning, and land cover). Operational impacts traditionally relate to visual perceptions, the appearance of structures in the environment, and electrical effects.

Further development of the Cane Island site will require several acres of various habitats. However, only land essential for maintaining suitable operation of the power plant will be converted. The plant will not impact adjacent land uses. The power plant, an industrial use, is an allowed use in Agricultural/Conservation zones by Osceola County through issuance of a Conditional Use/Special Development Plan Permit. KUA was issued CU/SDP 92-86 in January 1993 for site development.

7.9 Recreation

The Cane Island property was privately owned prior to purchase by KUA. No public recreation facilities existed onsite or adjacent to the site. Unit 3 construction and operation will not impact local or regional recreational opportunities or facilities, except for private hunting activities on the property, which will be constrained.

7.10 Socioeconomics

No adverse impacts to the socioeconomic structure of Osceola County or the City of Kissimmee are expected from construction or operation of Unit 3. During construction, local workers will be used as much as possible, and revenues from property and sales taxes will create a brief positive economic impact for the County and City. After construction, three full-time additional employees will be required to ensure proper operation of Unit 3.

Once operational, the Cane Island plant will enable KUA and FMPA to continue to provide economical and reliable energy to their customers and service area, thereby enhancing the development potential within these areas.

7.11 Cultural Resources

A cultural resources survey was conducted on all project facility areas by a qualified archaeologist. The archaeological sites located on Cane Island were not considered eligible for listing on the *National Register of Historic Places*. The historic structures are all located outside the direct impact areas, and will not be affected by Unit 3 construction or operation. The Florida Division of Historical Resources concurred that none of the findings were either significant or eligible, and also stated that in their opinion, the Cane Island plant is unlikely to affect any properties currently listed or eligible for the National Register.

7.12 Aesthetics

Trees and other vegetation will screen the plant facilities from view to a great extent. The stack of the combined cycle unit may be partially visible from areas east and south of the site. People traveling on Highway 17/92 in the site vicinity may catch a glimpse of the stack. Other features of the plant facilities should not be visible.

As required by the Prevention of Significant Deterioration (PSD) regulations, a visibility impact analysis was conducted. The purpose of the analysis was to determine visibility impacts on Class I air quality areas. The nearest Class I area is the Chassahowitzha Wilderness Area located approximately 70 miles west of the Cane Island site. The EPA-approved VISCREEN model was used to determine maximum visual impacts. The analysis demonstrated that aesthetic and general visual impacts are well below the criteria levels.

No unique and designated scenic natural areas, man-made features or historic landscapes have been identified for the Cane Island site. Recreation areas include golf courses, an active day-use county park, and playground facilities at an elementary school. None of these recreational areas have been developed because of, or are dependent on, a high visual/aesthetic quality landscape. However, some degree of visual impact will occur to the users of each of these facilities.

7.13 Noise

Cane Island Power Park received Conditional Use Permit CU/SDP92-86. Special Condition 15, requires the sound level to not exceed 55 decibel at the property boundary. Modeling for Cane Island Power Park including Unit 3 indicates that the 55 dBA contour is wholly contained within the KUA property boundaries.

7.14 Transportation

During the construction period, there will be an increase in traffic in the vicinity of the Cane Island site. The existing highways in the area will be capable of handling the additional traffic with few problems.

When Unit 3 becomes operational, the three additional staff members should not impact local traffic conditions.

Operations at the Kissimmee Municipal Airport will not be adversely affected by construction and operation of Unit 3. No facilities will be located in the flight paths of any of the runways, and no air navigation aids are in proximity to the Cane Island site.

8.0 Mitigation Measures

Avoidance is one of the most effective forms of mitigation. With direct agency input, the Cane Island plant has been located and designed to minimize environmental impacts. Temporary and permanent mitigation measures will be installed to further reduce and minimize impacts. The major mitigative measures associated with each resource area are summarized below.

Mitigation measures will be finalized with the appropriate state and federal regulatory agencies prior to commencement of construction activities and will be incorporated into applicable final construction specifications.

8.1 Geology, Physiography, and Soils

After the Unit 3 site has been prepared and construction has been completed, there will be no further impacts on the geologic resources of Cane Island. Disturbed areas not occupied by plant facilities will be treated to control erosion.

Temporary soil erosion and sediment control measures will be developed and implemented by KUA (or its agents). Control measures will include, but not be limited to, sediment filters, traps, and barriers, such as fabric filter fences. Turbidity screens will be placed and maintained as necessary to protect water quality during construction. Upland soils disturbed during clearing and construction will be reseeded using indigenous grasses and/or low growing woody vegetation as soon as possible to minimize and ultimately eliminate the soil erosion potential.

8.2 Air Quality

Mitigation of air quality impacts will be accomplished by the use of best available control technology (BACT) to minimize emissions of pollutants under Prevention of Significant Deterioration (PSD) review. The review process is intended to protect air quality in areas complying with the national ambient air quality standards (NAAQS) while providing a margin for future growth (PSD increments). The BACT assessment will require Unit 3 air pollution controls to be at least as stringent as New Source Performance Standards. The project emissions will be controlled by complete combustion of the fuel, the firing of "clean" fuels (i.e., natural gas, low sulfur fuel oil), and dry low NO_x combustors.

Fugitive dust emissions generated during construction will be controlled by watering, calcium chloride, crushed stone cover, or some other industry-accepted technique.

The construction areas will be treated to control fugitive dust as directed by the Site Engineer. These techniques should significantly reduce fugitive dust emissions. Because of minimal plant operations traffic and natural gas delivery via pipeline, fugitive dust emissions generated during normal plant operations will be minimal.

8.3 Hydrology

The withdrawal of groundwater associated with Unit 3 should have no significant impacts on the hydrology of the area. A Water Use Permit Modification Application has been submitted to the South Florida Water Management District for the required additional amounts. No other mitigation measures are proposed.

8.3.1 Water Conservation

In compliance with Water Use Permit 49-00671-W issued for Cane Island Units 1 and 2, KUA developed and implemented a Water Conservation Plan to demonstrate KUA's commitment to water conservation and justify the requested quantities.

Facility design has and will incorporate cost-effective water recovery, reuse, and recycling procedures to the extent of efficient operations and within regulatory limits. Significant water conservation measures include the following:

- Use of reclaimed sewage treatment effluent water from the City of Kissimmee in lieu of groundwater for cooling tower makeup.
- Use of a recycling closed-loop auxiliary cooling water system for equipment cooling in lieu of once-through cooling with well water.
- Design of the cooling tower and cooling tower water treatment facilities to minimize blowdown requirements, thereby also minimizing makeup water requirements and wastewater production.
- Use of combustion turbine technology on the combined cycle combustion turbine units which results in low nitrogen oxide production without the injection of water into the combustion zone, when firing with natural gas.

- Installation of high efficiency demineralizer systems to provide makeup water to the plant steam cycle. Greater than 90 percent of the well water entering the demineralizer process is produced into high quality demineralized water for the steam cycle.
- Use of mechanical seals for pumps where possible to reduce seal water requirements and process leakage.

All wastewaters, including storm waters, are ultimately made available for ground water recharge either onsite or at the Imperial treatment facility.

8.3.2 Wastewater Discharge

KUA was issued Industrial Wastewater Facility Permit FLA010961 by the FDEP in September 1996 for operation of the Units 1 and 2 wastewater treatment and disposal system. The treatment and disposal system proposed for Unit 3 will be the same as Units 1 and 2, as indicated on the water mass balance (Figure 7-1). A modification of the existing permit will be required to construct new or expand current treatment and disposal systems.

8.3.3 Water Pollution Control

The common fuel delivery area is sloped and curbed to a common drain to contain potential spills. An additional fuel oil storage tank is planned for Unit 3. The switchyard transformers will be curbed to contain potential leaks. The runoff and waters collected in these areas, and wastewaters collected from the equipment and plant floor drains, will be routed to an oil/water separator before ultimate disposal in the expanded percolation pond.

Cooling tower blowdown, neutralization basin effluent, and boiler blowdown will be collected and held in a common sump pit prior to return to the Imperial effluent line. There will be no discharge from the industrial wastewater treatment system to surface waters of the State.

8.4 Vegetation

The following subsections summarize the mitigation measures proposed for upland and wetland areas impacted by the construction of Unit 3.

8.4.1 Uplands

An Upland Habitat Management Plan has been developed for selected upland areas of the Cane Island site. The plan focuses on management of the remaining gopher tortoise population and habitat, and also management of the sand pine and oak scrub habitats as potential scrub jay habitat. The plan is fully described in the Cane Island Project Mitigation Plan. The upland management plan has been approved by the appropriate agencies.

8.4.2 Wetlands

Several mitigation measures for wetlands impacts have been implemented. These include wetlands creation, enhancement, and preservation. The Mitigation Plan provides additional details on the wetlands mitigation plan.

8.5 Wildlife

Of the total acres comprising the Cane Island site, only a small portion will be developed for Unit 3. The undeveloped portions of the site, including forested and extensive wetland areas, will continue to serve as wildlife habitat, as well as a buffer zone for the plant facilities.

8.6 Threatened and Endangered Species

Gopher tortoises may be taken and portions of its habitat destroyed as a result of Unit 3 construction on Cane Island. A management plan as described in the Mitigation Plan has been developed to maintain a stable, reproducing population of tortoises in several different locations on the Cane Island site. Strategies to accomplish mitigation include enhancing foraging habitat by conducting prescribed growing season burns to promote better forage, and limiting use of the proposed management areas. A permit to "take" gopher tortoises has been issued for the site.

8.7 Land Use

A Conditional Use/Site Development Plan Permit has been issued for the Cane Island site from Osceola County for use of the site in an industrial capacity.

8.8 Recreation

The construction of Unit 3 will not impact any federal, state, or county recreational facilities. No mitigation measures are proposed.

8.9 Socioeconomics

No adverse socioeconomic impacts are anticipated. No mitigation measures are proposed.

8.10 Cultural Resources

Clearance to develop the Cane Island site was issued by the State Historic Preservation Officer (SHPO). If unknown resources are discovered during construction of Unit 3, activities will be suspended. Consultations with the consultant and the SHPO will be initiated to determine the resources eligibility for listing on the National Register and possible mitigation measures.

8.11 Aesthetics

The color and design of Unit 3 will be similar to that of Units 1 and 2 and will blend with the surrounding area as much as possible. Landscaping of selected areas will help mitigate visual impacts. Existing vegetation will provide a buffer zone and screen around the plant site.

8.12 Noise

To control noise, Unit 3 will be equipped with noise attenuation equipment including exhaust silencers, inlet silencers, and acoustic housing around the combustion turbine package.

8.13 Transportation

Existing roads, streets, and bridges will be used to access the Cane Island site. No mitigation measures are proposed.

Appendix A
Schedules

Schedule 1
Existing Generating Facilities
As of December 31, 1998

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
				Fuel		Fuel Transport						Net Capability	
Plant Name	Unit No.	Location	Unit Type	Pri	Alt	Pri	Alt	Alt. Fuel Days Use	Commercial In-Service month/Year	Expected Retirement Month/Year	Gen Max. Nameplate KW	Summer MW	Winter MW
Hansel Plant		Osceola County Sec 27/T25S/ R29E											
	8		IC	NG	FO2	PL	TK		02/59	01/02	3,000	3	3
	14		IC	NG	FO2	PL	TK		02/72	01/02	2,070	2	2
	15		IC	NG	FO2	PL	TK		02/72	01/02	2,070	2	2
	16		IC	NG	FO2	PL	TK		02/72	01/02	2,070	2	2
	17		IC	NG	FO2	PL	TK		02/72	01/02	2,070	2	2
	18		IC	NG	FO2	PL	TK		02/72	01/02	2,070	2	2
	19		IC	FO2	--	TK	--		02/83	01/13	2,500	3	3
	20		IC	FO2	--	TK	--		02/83	01/13	2,500	3	3
	21		CT	NG	FO2	PL	TK		02/83	01/13	35,000	28	32
	22		ST	WH	--	--	--		02/83	01/13	10,000	10	10
	23		ST	WH	--	--	--		02/83	01/13	10,000	10	10
Plant Total											73,350	67	71

Schedule 1
Existing Generating Facilities
As of December 31, 1998

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
				Fuel		Fuel Transport		Alt. Fuel Days Use	Commercial In-Service	Expected Retirement	Gen Max. Nameplat e KW	Net Capability	
Plant Name	Unit No.	Location	Unit Type	Pri	Alt	Pri	Alt		month/Year	Month/Year		Summer MW	Winter MW
Crystal River		Citrus County Sec 33/T17S/ R16E											
	8		N	UR	--	TK	--		03/77	Unknown	890,460	6(1)	6(1)
Plant Total											890,460	6	6

(1) KUA's 0.6754 percent portion of joint ownership.

Schedule 1
Existing Generating Facilities
As of December 31, 1998

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
				Fuel		Fuel Transport		Alt. Fuel				Net Capability	
Plant Name	Unit No.	Location	Unit Type	Pri	Alt	Pri	Alt	Days Use	Commercial In-Service month/Year	Expected Retirement Month/Year	Gen Max. Nameplat e KW	Summer MW	Winter MW
Stanton Energy Center		Orange County Sec 13, 14, 23, 24/R31E/T23S and Sec 18, 19/ T23S/R32E											
	1		ST	BIT	--	RR	--		07/87	Unknown	464,580	21(2)	21(2)
Plant Total											464,580	21	21

(2) KUA's 4.8193 percent ownership portion.

Schedule 1
Existing Generating Facilities
As of December 31, 1998

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
				Fuel		Fuel Transport		Alt. Fuel Days	Commercial In-Service	Expected Retirement	Gen Max. Nameplat	Net Capability	
Plant Name	Unit No.	Location	Unit Type	Pri	Alt	Pri	Alt	Use	month/Year	Month/Year	e KW	Summer MW	Winter MW
Indian River		Brevard County Sec. 12/T23S/ R35E											
	A		CT	NG	FO2	PL	TK		07/89	Unknown	41,400	4.5(3)	5.5(3)
	B		CT	NG	FO 2-	PL	TK		07/89	Unknown	41,400	4.5(3)	5.5(3)
Plant Total											890,460	9	10

(3) KUA's 12.2 percent portion of joint ownership.

Schedule 1
Existing Generating Facilities
As of December 31, 1998

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
				Fuel		Fuel Transport		Alt. Fuel Days Use	Commercial In-Service month/Year	Expected Retirement Month/Year	Gen Max. Nameplate KW	Net Capability	
Plant Name	Unit No.	Location	Unit Type	Pri	Alt	Pri	Alt					Summer MW	Winter MW
Cane Island		Osceola County Sec. 29, 32/ R28E/T25S											
	1		CT	NG	FO2	PL	TK		11/94	Unknown	42,000	15(1)	20(4)
	2		CT	NG	FO2	PL	TK		06/95	Unknown	80,000	34(1)	40(4)
	2		ST	WH	--	--	--		06/95	Unknown	40,000	20(1)	20(4)
Plant Total											162,000	69	80

(4) KUA's 50 percent ownership portion.

Schedule 2.1
History and Forecast of Energy Consumption and Number of Customers by Customer Class

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Rural and Residential				Commercial		
Year	Population	Members per Household	GWh	Average No. of Customers	Average kWh Consumption Per Customer/Yr	GWh	Average No. of Customers	Average kWh Consumption Per Customer/Yr
1989	63,031	2.746	200	25,225	7,930	304	4,471	67,897
1990	67,453	2.083	201	28,002	7,165	333	4,954	67,262
1991	71,889	2.88	200	29,014	6,893	351	6,056	57,993
1992	75,515	2.916	200	30,128	6,647	362	6,656	54,454
1993	73,342	2.954	205	31,553	6,484	386	7,000	55,187
1994	83,615	3.002	207	32,699	6,316	411	7,719	53,280
1995			211	34,053	6,209	426	7,997	53,244
1996			215	35,015	6,127	438	8,150	53,759
1997			215	35,603	6,048	465	8,607	54,039
1998			213	36,622	5,815	489	8,747	55,900
1999			215	37,970	5,652	519	9,056	57,287
2000			215	39,347	5,464	537	9,354	57,422
2001			217	40,568	5,360	575	9,659	59,522
2002			220	41,797	5,259	608	9,977	60,976
2003			222	43,062	5,157	643	10,307	62,412

Schedule 2.1
History and Forecast of Energy Consumption and Number of Customers by Customer Class

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Rural and Residential				Commercial		
Year	Population	Members per Household	GWh	Average No. of Customers	Average kWh Consumption Per Customer/Yr	GWh	Average No. of Customers	Average kWh Consumption Per Customer/Yr
2004			228	44,364	5,144	683	10,650	64,145
2005			232	45,672	5,074	701	11,005	63,656
2006			235	46,850	5,025	715	11,363	62,912
2007			236	48,035	4,906	729	11,722	62,223
2008			231	49,248	4,687	744	12,083	61,599
2009			233	50,492	4,608	760	12,445	61,036
2010			236	51,754	4,563	775	12,809	60,520
2011			240	52,979	4,521	791	13,178	59,994
2012			243	54,224	4,482	806	13,558	59,474
2013			245	55,497	4,408	823	13,950	58,964
2014			245	56,800	4,321	839	14,353	58,463
2015			246	58,121	4,236	856	14,765	57,978
2016			244	59,415	4,115	873	15,171	57,537
2017			243	60,729	4,004	890	15,586	57,108
2018			245	62,072	3,947	908	16,012	56,686

Schedule 2.2
History and Forecast of Energy Consumption and Number of Customers by Customer Class

(1) Year	(2) GWh	(3) Industrial Average No. of Customers	(4) Average kWh Consumption Per Customer	(5) Railroads and Railways GWh	(6) Street & Highway Lighting GWh	(7) Other Sales to Public Authorities GWh	(8) Total Sales to Ultimate Consumers GWh
1989	--	--	--	--	2	0	595
1990	--	--	--	--	2	0	658
1991	--	--	--	--	5	0	681
1992	--	--	--	--	5	0	709
1993	--	--	--	--	5	0	760
1994	--	--	--	--	6	0	804
1995	--	--	--	--	6	0	858
1996	--	--	--	--	7	0	892
1997	--	--	--	--	7	0	921
1998	--	--	--	--	8	0	999
1999	--	--	--	--	9	0	1,022
2000	--	--	--	--	9	0	1,062
2001	--	--	--	--	10	0	1,125
2002	--	--	--	--	10	0	1,184

Schedule 2.2
History and Forecast of Energy Consumption and Number of Customers by Customer Class

(1) Year	(2) GWh	(3) Industrial Average No. of Customers	(4) Average kWh Consumption Per Customer	(5) Railroads and Railways GWh	(6) Street & Highway Lighting GWh	(7) Other Sales to Public Authorities GWh	(8) Total Sales to Ultimate Consumers GWh
2003	--	--	--	--	11	0	1,246
2004	--	--	--	--	12	0	1,314
2005	--	--	--	--	12	0	1,359
2006	--	--	--	--	13	0	1,400
2007	--	--	--	--	13	0	1,441
2008	--	--	--	--	14	0	1,483
2009	--	--	--	--	15	0	1,526
2010	--	--	--	--	15	0	1,570
2011	--	--	--	--	16	0	1,614
2012	--	--	--	--	17	0	1,658
2013	--	--	--	--	17	0	1,704
2014	--	--	--	--	18	0	1,751
2015	--	--	--	--	18	0	1,800
2016	--	--	--	--	19	0	1,847
2017	--	--	--	--	20	0	1,896

Schedule 2.2
History and Forecast of Energy Consumption and Number of Customers by Customer Class

(1) Year	(2) GWh	(3) Industrial Average No. of Customers	(4) Average kWh Consumption Per Customer	(5) Railroads and Railways GWh	(6) Street & Highway Lighting GWh	(7) Other Sales to Public Authorities GWh	(8) Total Sales to Ultimate Consumers GWh
2018	--	--	--	--	20	0	1,946

Schedule 2.3
History and Forecast of Energy Consumption and Number of Customers by Customer Class

(1) Year	(2) Sales for Resale GWh	(3) Utility Use & Losses GWh	(4) Net Energy for Load GWh	(5) Other Customers (Average No.)	(6) Total No. of Customers
1989	0	57	652	0	29,696
1990	0	40	698	0	32,956
1991	0	40	721	0	35,071
1992	8	36	745	0	36,784
1993	0	41	801	0	38,553
1994	0	37	841	0	40,418
1995		58	915	0	42,051
1996		51	943	0	43,164
1997		50	970	0	44,210
1998		48	1,047	0	45,370
1999		54	1,075	0	47,026
2000		56	1,118	0	48,701
2001		59	1,184	0	50,227
2002		62	1,246	0	51,774
2003		66	1,311	0	53,369
2004		69	1,383	0	55,014

Schedule 2.3
History and Forecast of Energy Consumption and Number of Customers by Customer Class

(1) Year	(2) Sales for Resale GWh	(3) Utility Use & Losses GWh	(4) Net Energy for Load GWh	(5) Other Customers (Average No.)	(6) Total No. of Customers
2005		72	1,431	0	56,678
2006		74	1,473	0	58,213
2007		76	1,516	0	59,757
2008		78	1,561	0	61,331
2009		80	1,606	0	62,937
2010		83	1,653	0	64,562
2011		85	1,699	0	66,157
2012		87	1,746	0	67,782
2013		90	1,794	0	69,447
2014		92	1,844	0	71,153
2015		95	1,894	0	72,886
2016		97	1,945	0	74,586
2017		100	1,996	0	76,315
2018		102	2,049	0	78,085

Schedule 3.1
History and Forecast of Summer Peak Demand
Base Case

(1) Year	(2) Total	(3) Wholesale	(4) Retail	(5) Interruptible	(6) Residential Load Management	(7) Residential Conservation	(8) Comm./Ind. Load Management	(9) Comm./Ind. Conservation	(10) Net Firm Demand
1989	141	0	141	0	0	0	0	0	141
1990	151	0	151	0	0	0	0	0	151
1991	157	0	157	0	0	0	0	0	157
1992	169	0	169	0	0	0	0	0	169
1993	183	0	183	0	3	0	0	0	180
1994	180	0	180	0	8	0	0	0	172
1995	195	0	195	0	12	0	0	0	183
1996	206	0	206	0	13	0	0	0	193
1997	216	0	216	0	12	0	0	0	204
1998	233	0	233	0	13	0	0	0	220
1999	244	0	244	0	13	0	0	0	231
2000	252	0	252	0	14	0	0	0	238
2001	274	0	274	0	14	0	0	0	260
2002	296	0	296	0	14	0	0	0	282
2003	315	0	315	0	15	0	0	0	300

Schedule 3.1
History and Forecast of Summer Peak Demand
Base Case

(1) Year	(2) Total	(3) Wholesale	(4) Retail	(5) Interruptible	(6) Residential Load Management	(7) Residential Conservation	(8) Comm./Ind. Load Management	(9) Comm./Ind. Conservation	(10) Net Firm Demand
2004	329	0	329	0	15	0	0	0	314
2005	345	0	345	0	16	0	0	0	329
2006	355	0	355	0	16	0	0	0	339
2007	365	0	365	0	17	0	0	0	348
2008	375	0	375	0	17	0	0	0	358
2009	385	0	385	0	18	0	0	0	367
2010	396	0	396	0	18	0	0	0	378
2011	406	0	406	0	19	0	0	0	387
2012	417	0	417	0	19	0	0	0	398
2013	428	0	428	0	20	0	0	0	408
2014	439	0	439	0	20	0	0	0	419
2015	451	0	451	0	21	0	0	0	430
2016	462	0	462	0	21	0	0	0	441
2017	474	0	474	0	22	0	0	0	452
2018	486	0	486	0	22	0	0	0	464

Schedule 3.2
History and Forecast of Winter Peak Demand
Base Case

(1) Year	(2) Total	(3) Wholesale	(4) Retail	(5) Interruptible	(6) Residential Load Management	(7) Residential Conservation	(8) Comm./Ind. Load Management	(9) Comm./Ind. Conservation	(10) Net Firm Demand
1989	148	0	148	0	0	0	0	0	148
1990	200	0	200	0	0	0	0	0	200
1991	147	0	147	0	0	0	0	0	147
1992	158	0	158	0	0	0	0	0	158
1993	158	0	158	0	3	0	0	0	155
1994	173	0	173	0	8	0	0	0	165
1995	196	0	196	0	12	0	0	0	184
1996	218	0	218	0	12	0	0	0	206
1997	198	0	198	0	12	0	0	0	186
1998	180	0	180	0	13	0	0	0	167
1999	235	0	235	0	13	0	0	0	222
2000	242	0	242	0	14	0	0	0	228
2001	264	0	264	0	14	0	0	0	250
2002	286	0	286	0	14	0	0	0	272
2003	304	0	304	0	15	0	0	0	289

Schedule 3.2
History and Forecast of Winter Peak Demand
Base Case

(1) Year	(2) Total	(3) Wholesale	(4) Retail	(5) Interruptible	(6) Residential Load Management	(7) Residential Conservation	(8) Comm./Ind. Load Management	(9) Comm./Ind. Conservation	(10) Net Firm Demand
2004	318	0	318	0	15	0	0	0	303
2005	334	0	334	0	16	0	0	0	318
2006	343	0	343	0	16	0	0	0	327
2007	353	0	353	0	17	0	0	0	336
2008	362	0	362	0	17	0	0	0	345
2009	372	0	372	0	18	0	0	0	354
2010	382	0	382	0	18	0	0	0	364
2011	392	0	392	0	19	0	0	0	373
2012	403	0	403	0	19	0	0	0	384
2013	413	0	413	0	20	0	0	0	393
2014	424	0	424	0	20	0	0	0	404
2015	435	0	435	0	21	0	0	0	414
2016	446	0	446	0	21	0	0	0	425
2017	457	0	457	0	22	0	0	0	435
2018	469	0	469	0	22	0	0	0	447

Schedule 3.3
History and Forecast of Annual Net Energy for Load - GWh
Base Case

(1) Year	(2) Total	(3) Residential Conservation	(4) Comm./Ind. Conservation	(5) Retail	(6) Wholesale	(7) Utility Use & Losses	(8) Net Energy for Load	(9) Load Factor %
1988	528	0	0	528	0	29	557	48.5
1989	595	0	0	595	0	57	652	50.3
1990	658	0	0	658	0	40	698	39.8
1991	681	0	0	681	0	40	721	52.4
1992	709	0	0	709	0	36	745	50.3
1993	760	0	0	760	0	41	801	50.0
1994	804	0	0	804	0	37	841	53.3
1995	858	0	0	858	0	57	915	53.3
1996	892	0	0	892	0	51	943	49.4
1997	921	0	0	921	0	49	970	51.3
1998	999	0	0	999	0	48	1047	51.3
1999	1022	0	0	1022	0	53	1075	50.3
2000	1062	0	0	1062	0	56	1118	50.7
2001	1125	0	0	1125	0	59	1184	49.4
2002	1184	0	0	1184	0	62	1246	48.1
2003	1246	0	0	1246	0	65	1311	47.5

Schedule 3.3
History and Forecast of Annual Net Energy for Load - GWh
Base Case

(1) Year	(2) Total	(3) Residential Conservation	(4) Comm./Ind. Conservation	(5) Retail	(6) Wholesale	(7) Utility Use & Losses	(8) Net Energy for Load	(9) Load Factor %
2004	1314	0	0	1314	0	69	1383	47.9
2005	1359	0	0	1359	0	72	1431	47.3
2006	1400	0	0	1400	0	73	1473	47.4
2007	1441	0	0	1441	0	75	1516	47.4
2008	1483	0	0	1483	0	78	1561	47.5
2009	1526	0	0	1526	0	80	1606	47.6
2010	1570	0	0	1570	0	83	1653	47.7
2011	1614	0	0	1614	0	85	1699	47.7
2012	1658	0	0	1658	0	88	1746	47.8
2013	1704	0	0	1704	0	90	1794	47.9
2014	1751	0	0	1751	0	93	1844	47.9
2015	1800	0	0	1800	0	94	1894	48.0
2016	1847	0	0	1847	0	98	1945	48.0
2017	1896	0	0	1896	0	100	1996	48.1
2018	1946	0	0	1946	0	103	2049	48.1

Schedule 4
Previous Year and 2-Year Forecast of Retail Peak Demand and Net Energy for Load by Month

(1)	(2)	(3)	(4)	(5)	(6)	(7)
	1998 Actual		1999 Forecast		2000 Forecast	
Month	Peak Demand (MW)	NEL (GWh)	Peak Demand (MW)	NEL (GWh)	Peak Demand (MW)	NEL (GWh)
January	152	72	235	81	242	84
February	166	65	NA	79	NA	82
March	164	73	NA	74	NA	77
April	164	74	NA	76	NA	79
May	194	88	NA	82	NA	85
June	231	110	NA	97	NA	100
July	233	102	NA	108	NA	112
August	231	113	244	110	252	114
September	216	97	NA	108	NA	111
October	205	93	NA	99	NA	102
November	164	80	NA	82	NA	85
December	149	75	NA	79	NA	82

Schedule 5
Fuel Requirements

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
				Actua l	Actua l										
Ln	Fuel Requirements		Units	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
(1)	Nuclear		GBtu	0	459	427	363	419	421	433	423	420	419	430	426
(2)	Coal		1000 Ton	58	51	60	55	64	59	59	70	68	72	72	74
(3)	Residual	Total	1000 BBL												
(4)		Steam	1000 BBL												
(5)		CC	1000 BBL												
(6)		CT	1000 BBL												
(7)		Diesel	1000 BBL												
(8)	Distillate	Total	1000 BBL	1	5	30	37	9	3	1	0	0	0	0	0
(9)		Steam	1000 BBL												
(10)		CC	1000 BBL												
(11)		CT	1000 BBL												
(12)		Diesel	1000 BBL	1	5	30	37	9	3	1					
(13)	Natural Gas	Total	1000 MCF	4881	3764	2781	2593	4528	5968	5563	4898	4982	5073	5326	5470
(14)		Steam	1000 MCF												
(15)		CC	1000 MCF												
(16)		CT	1000 MCF												
(17)	Other (Specify)		GBtu												

Schedule 6.1
Energy Sources

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
				Actual	Actual										
Ln	Energy Sources		Units	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
(1)	Annual Firm Interchange		GWh	499	438	576	674	398	257	387	518	557	575	579	596
(2)	Nuclear		GWh	0	43	40	34	39	39	40	39	39	39	40	40
(3)	Coal		Gwh	145	143	160	145	169	156	158	185	181	190	190	195
(4)	Residual	Total	GWh												
(5)		Steam	GWh												
(6)		CC	GWh												
(7)		CT	GWh												
(8)		Diesel	GWh												
(9)	Distillate	Total	GWh	0	2	13	16	4	1	0	0	0	0	0	0
(10)		Steam	GWh												
(11)		CC	GWh												
(12)		CT	GWh												
(13)		Diesel	GWh		2	13	16	4	1						
(14)	Natural Gas	Total	GWh	337	421	286	250	575	793	726	640	655	669	707	731
(15)		Steam	GWh												
(16)		CC	GWh	295	404	256	220	566	790	720	639	654	667	705	729
(17)		CT	GWh	42	17	30	30	9	3	6	1	1	2	2	2
(18)	Other (Specify)		GWh												
(19)	Net Energy for Load		GWh	981	1047	1075	1118	1184	1246	1311	1382	1431	1473	1516	1561

Schedule 6.2
Energy Sources

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
				Actual	Actual										
Ln	Energy Sources		Units	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
(1)	Annual Firm Interchange		%	51	42	54	60	34	21	30	37	39	39	38	38
(2)	Nuclear		%	0	4	4	3	3	3	3	3	3	3	3	3
(3)	Coal		%	15	14	15	13	14	12	12	13	13	13	13	12
(4)	Residual	Total	%												
(5)		Steam	%												
(6)		CC	%												
(7)		CT	%												
(8)		Diesel	%												
(9)	Distillate	Total	%	0	0	1	1	0	0	0	0	0	0	0	0
(10)		Steam	%												
(11)		CC	%												
(12)		CT	%												
(13)		Diesel	%			1	1								
(14)	Natural Gas	Total	%	34	40	27	22	49	64	55	46	46	45	47	47
(15)		Steam	%												
(16)		CC	%	30	39	24	20	48	63	55	46	45	45	47	47
(17)		CT	%	4	1	3	2	1	1	0	0	0	0	0	0
(18)	Other (Specify)		%												
(19)	Net Energy for Load		%	100	100	100	100	100	100	100	100	100	100	100	100

Schedule 7.1
Forecast of Capacity, Demand, and Scheduled Maintenance at Time of Summer Peak

(1) Year	(2) Total Installed Capacity MW	(3) Firm Capacity Import MW	(4) Firm Capacity Export MW	(5) QF MW	(6) Total Capacity Available MW	(7) Summer System Firm Net Peak Demand MW	(8) Reserve Margin before Maintenance MW	(9) Reserve Margin before Maintenance % of Peak	(10) Scheduled Maintenance MW	(11) Reserve Margin after Maintenance MW	(12) Reserve Margin after Maintenance % of Peak
1999	176	98	0	0	274	232	42	18%	—	—	—
2000	176	108	0	0	284	240	44	18%	—	—	—
2001	297	68	0	0	365	261	104	40%	—	—	—
2002	297	68	0	0	365	283	82	29%	—	—	—
2003	297	68	0	0	365	302	63	21%	—	—	—
2004	425	48	0	0	473	316	157	50%	—	—	—
2005	425	48	0	0	473	332	141	42%	—	—	—

Schedule 7.1
Forecast of Capacity, Demand, and Scheduled Maintenance at Time of Winter Peak

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
							Reserve Margin before Maintenance			Reserve Margin after Maintenance	
Year	Total Installed Capacity MW	Firm Capacity Import MW	Firm Capacity Export MW	QF MW	Total Capacity Available MW	Winter System Firm Net Peak Demand MW	MW	% of Peak	Scheduled Maintenance MW	MW	% of Peak
1999	191	98	0	0	289	223	66	30%	—	—	—
2000	191	108	0	0	299	230	69	30%	—	—	—
2001	191	98	0	0	289	251	38	15%	—	—	—
2002	322	68	0	0	390	273	117	43%	—	—	—
2003	322	68	0	0	390	291	99	34%	—	—	—
2004	322	48	0	0	370	305	65	21%	—	—	—
2005	453	48	0	0	501	321	180	56%	—	—	—

Schedule 8
Planned and Prospective Generating Facility Additions and Changes

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
				Fuel		Fuel Transport						Net Capability		
Plant Name	Unit No.	Location	Unit Type	Pri	Alt	Pri	Alt	Const. Start Mo/Yr	Commercial In-Service Mo/Yr	Expected Retirement Mo/Yr	Gen. Max. Nameplate KW	Summer MW	Winter MW	Status
Cane Island		Osceola County Sec 29, 32/R28E/ T25S												
	3		CT	NG	FO2	PL	TK	08/99	06/01	Unknown				
	3		ST	WH	—	—	—	08/99	06/01	Unknown				

Schedule 9
Status Report and Specifications of Proposed Generating Facilities

(1)	Plant Name and Unit Number	Cane Island 3
(2)	Capacity	
	a. Summer:	243.7 MW
	b. Winter:	267 MW
(3)	Technology Type:	1 x 1 F-Class Combined-Cycle
(4)	Anticipated Construction Timing	
	a. Field construction start-date:	10/99
	b. Commercial in-service date:	06/01
(5)	Fuel	
	a. Primary fuel:	Natural Gas
	b. Alternate fuel:	No. 2 Oil
(6)	Air Pollution Control Strategy:	Dry Low NOx Combustors
(7)	Cooling Method:	Mechanical Cooling Towers
(8)	Total Site Area:	1,023 Acres
(9)	Construction Status:	Not Started
(10)	Certification Status:	Site certification in progress. Application filed 8/5/98
(11)	Status with Federal Agencies:	Notice of intent to file PSD Air Construction Permit filed 1/8/99

Schedule 9
Status Report and Specifications of Proposed Generating Facilities

(12)	**Projected Unit Performance Data**	
	Planned Outage Factor (POF):	**4.3%**
	Forced Outage Factor (FOF)	**4.1%**
	Equivalent Availability Factor (EAF):	**91.8%**
	Resulting Capacity Factor (%):	**91.8%**
	Average Net Operating Heat Rate (ANOHR):	**6,815 Btu/kWh**
(13)	**Projected Unit Financial Data**	
	Book Life (Years):	**30**
	Total installed Cost (In-Service year $/kW):	**430**
	Direct Construction Cost ($/kW):	**—**
	AFUDC Amount ($/kW):	**—**
	Escalation ($/kW):	**—**
	Fixed O&M ($/kW-yr):	**2.27**
	Variable O&M ($/MWh):	**2.82**
	K Factor:	**NA**