

3.0 SITE AND VICINITY CHARACTERIZATION

Chapter 3.0 presents detailed information describing the current environmental characteristics of the GREC Site and its immediate surroundings. This chapter contains sections describing the physical, environmental, socioeconomic, cultural, and aesthetic features and conditions of the Site and surrounding areas. Chapter 3.0 begins by describing the GREC Site and its City of Gainesville and Alachua County environs. Following the site description are detailed characterizations of the sociopolitical and biophysical environment. This chapter contains the following sections, per the FDEP draft Application Instruction Guide (Revised September 1, 2009):

- 3.1—Site and Associated Facilities Delineation.
- 3.2—Social and Political Environment.
- 3.3—Physical and Biological Environment.

The information provided in this chapter was developed from field surveys and information and data collected from literature and other publicly available sources, including environmental documents associated with the existing DGS. In particular, the original DGS Unit 2 SCA provided useful information on the Site and its environmental characteristics. As discussed in Subsection 1.2.1, the previously certified DGS site currently consists of 1,146 acres.

3.1 SITE AND ASSOCIATED FACILITIES DELINEATION

This section provides an overview of the Site—its location, description of adjacent properties, existing land uses, and land uses following construction of GREC.

3.1.1 SITE LOCATION

GREC will be built on leased property at the existing GRU DGS, which is located approximately 8 miles northwest of downtown Gainesville and approximately 7 miles southeast of the City of Alachua downtown area. The location of GREC within the state of Florida and within Alachua County is shown on Figure 3.1.1-1. Figure 3.1.1-2

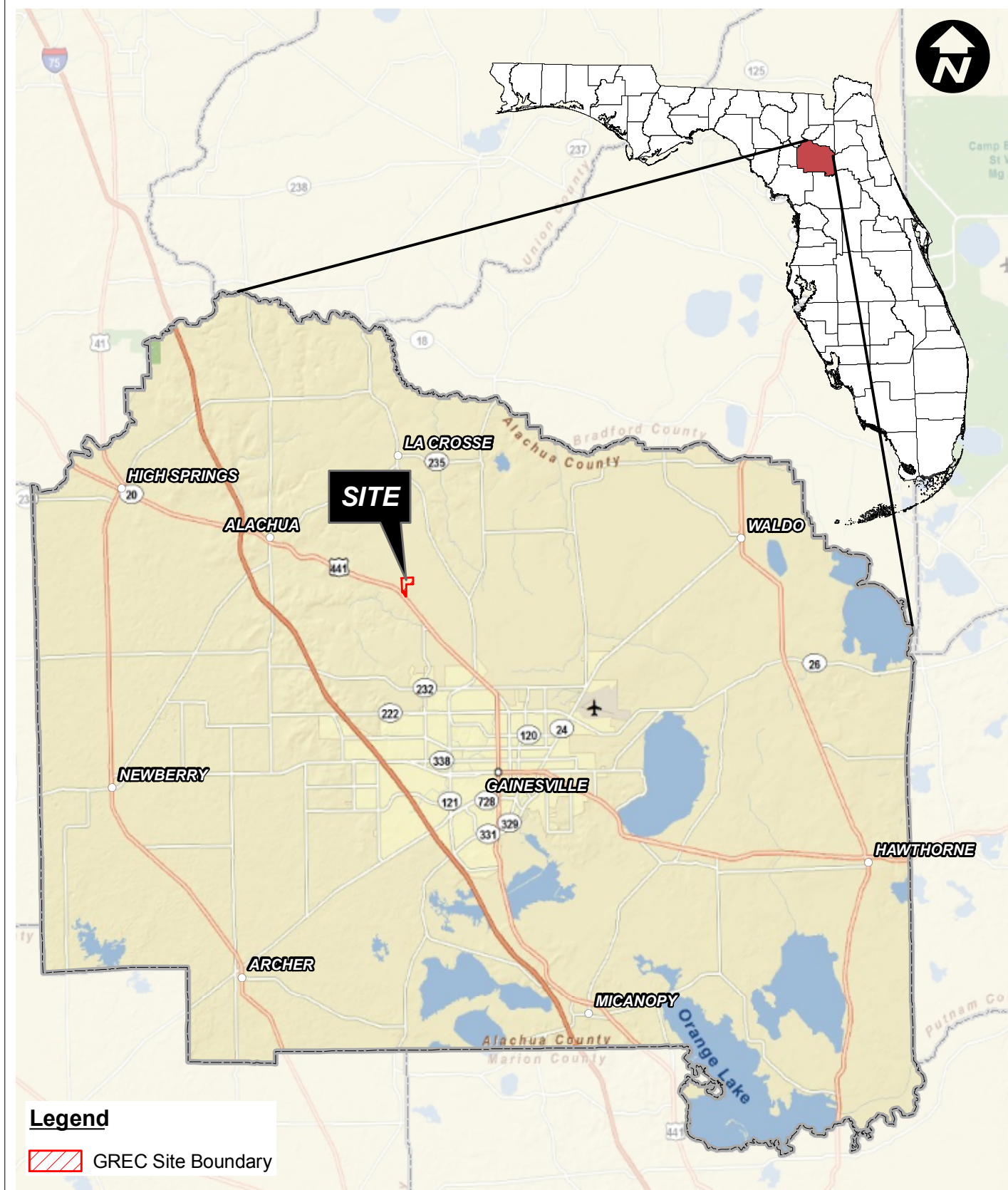


FIGURE 3.1.1-1.

GREC SITE LOCATION WITHIN FLORIDA AND ALACHUA COUNTY

Sources: ERSI, 2009; US Census, 2000; ECT, 2009.

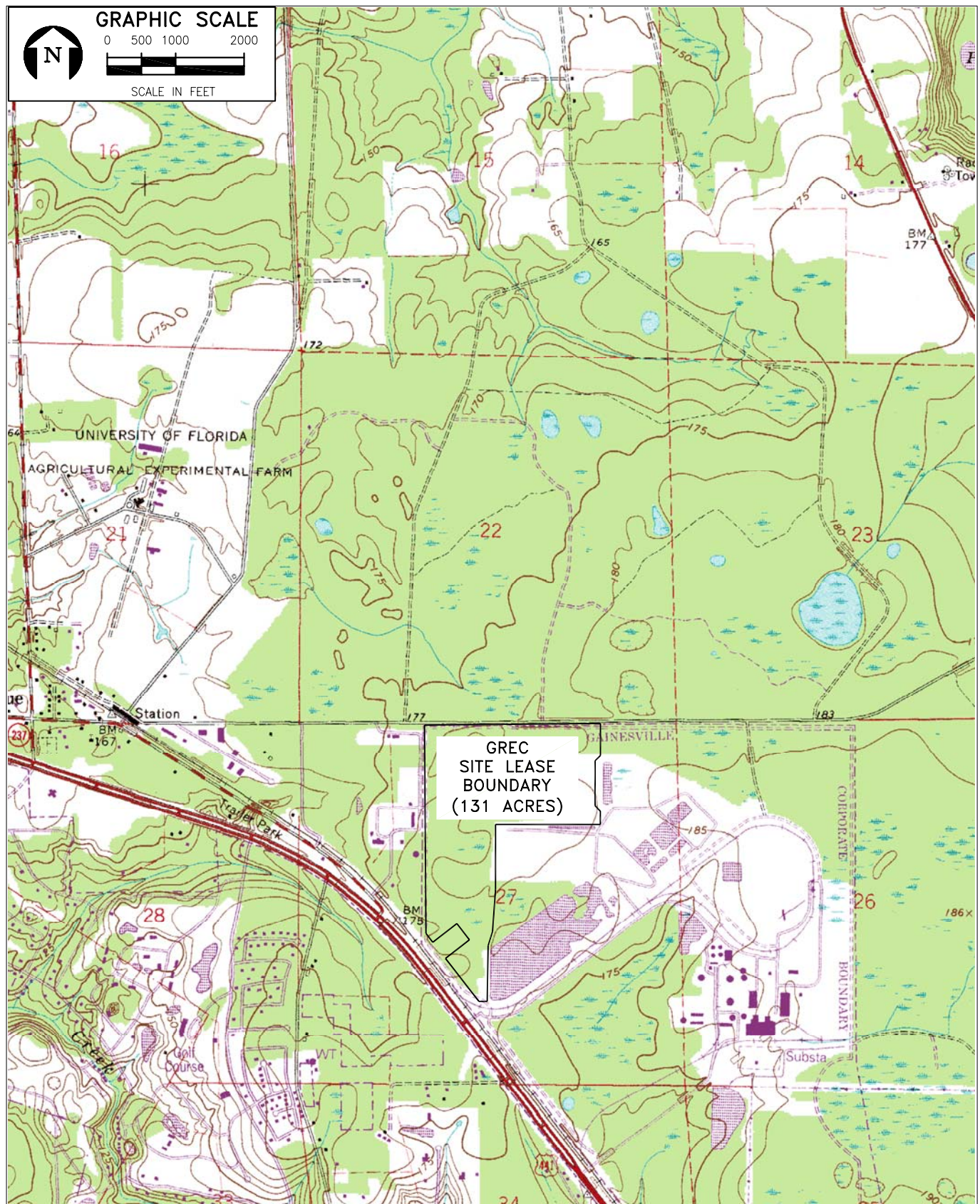


FIGURE 3.1.1-2.

GREC SITE LOCATION AND VICINITY

Sources: USGS Quad, Alachau, FL, 1993; ECT, 2009.

illustrates the leased property boundaries of the 131-acre site on a U.S. Geological Survey (USGS) 1:24,000-scale topographic quadrangle map. Figure 3.1.1-3 shows the site leased property and the GRU DGS certified site boundaries on a recent (January 2008) aerial photograph.

The Site is located within Gainesville and is bordered by Northwest 128th Lane on the north, the existing GRU DGS on the east, U.S. 441 on the south, and the Alachua County Public Works Department Complex on the west.

3.1.2 EXISTING SITE AND ADJACENT PROPERTY USES

The Site is presently undeveloped and has historically been used for agriculture and pine silviculture. Current land use and vegetation types at the Site consist of primarily forested communities including pine plantations, mixed pine and hardwoods, and several wetland types. Nonforested communities include manmade swales, trails/roads, open land, and herbaceous dry prairie. Most of the Site is actively managed for timber production and has been altered by land preparation (furrowing) and periodic harvesting of timber. The Site is transected by numerous unpaved roads/trails and is surrounded by manmade swales/ditches.

The adjacent property east of the Site is part of the GRU DGS, a nominal 440-MW coal-, oil-, and natural gas-fired electrical power generating facility. Facilities associated with the DGS located immediately adjacent to the GREC Site include a stormwater treatment basin, a brine disposal area, and an ash disposal/storage area. Facilities of the Alachua County Public Works Department, a radio tower, and undeveloped land are situated west of the Site. Undeveloped, wooded land is located north of the Site. U.S. 441 and commercial uses, including plumbing and construction supply stores, a carwash, retail shed sales, and boat sales and storage, are located south of the GREC Site.

3.1.3 PROPOSED SITE USES

Figure 3.1.3-1 provides the general arrangement of the facilities on the Site after construction of GREC overlaid on the January 2008 aerial photograph. The main access road to the Site will run north from U.S. 441 to the fuel storage and power block areas. The

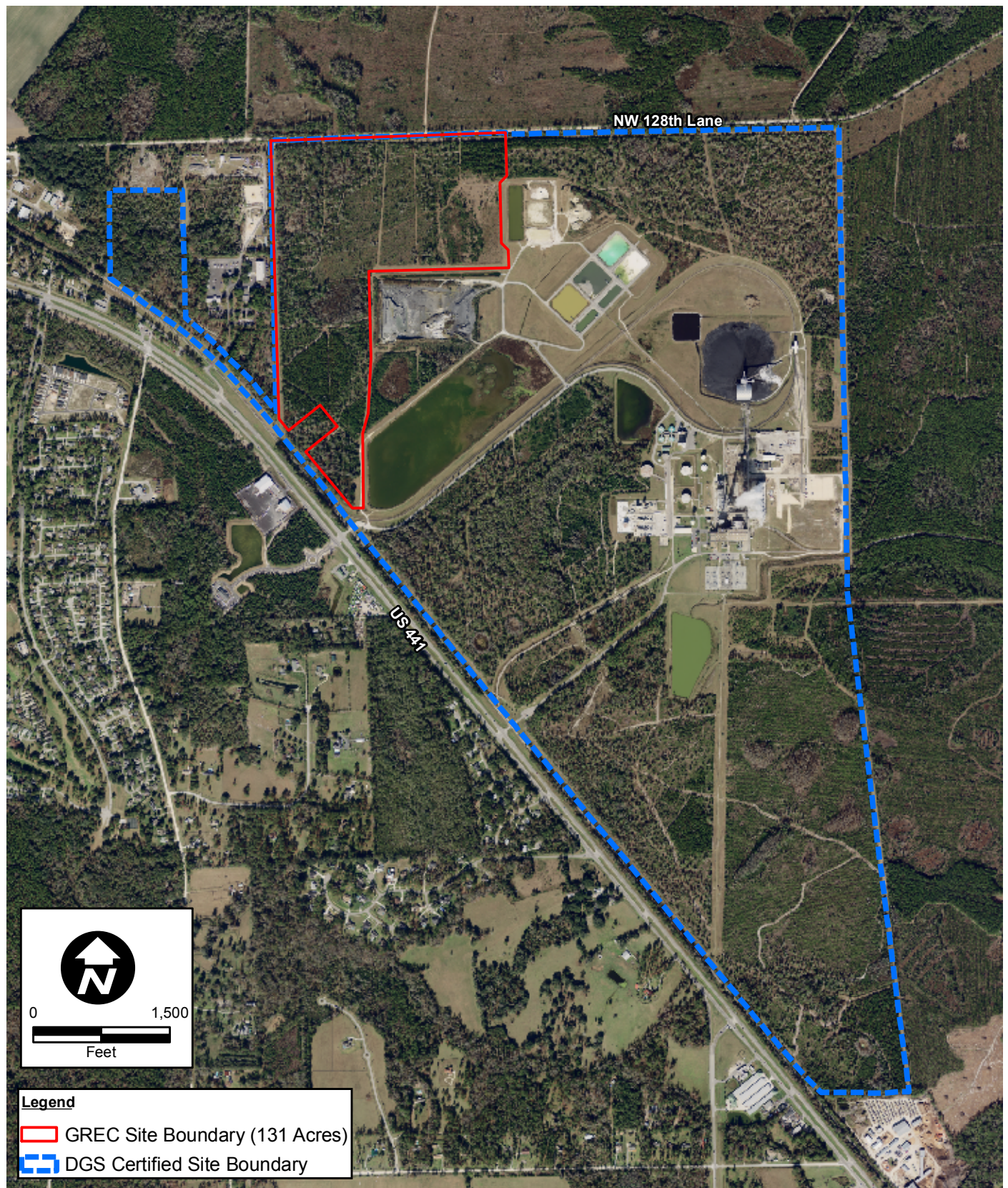


FIGURE 3.1.1-3.

GREC SITE

Sources: GRU, 2009; FDOT, 2008; GENESIS, 2009; ECT, 2009.

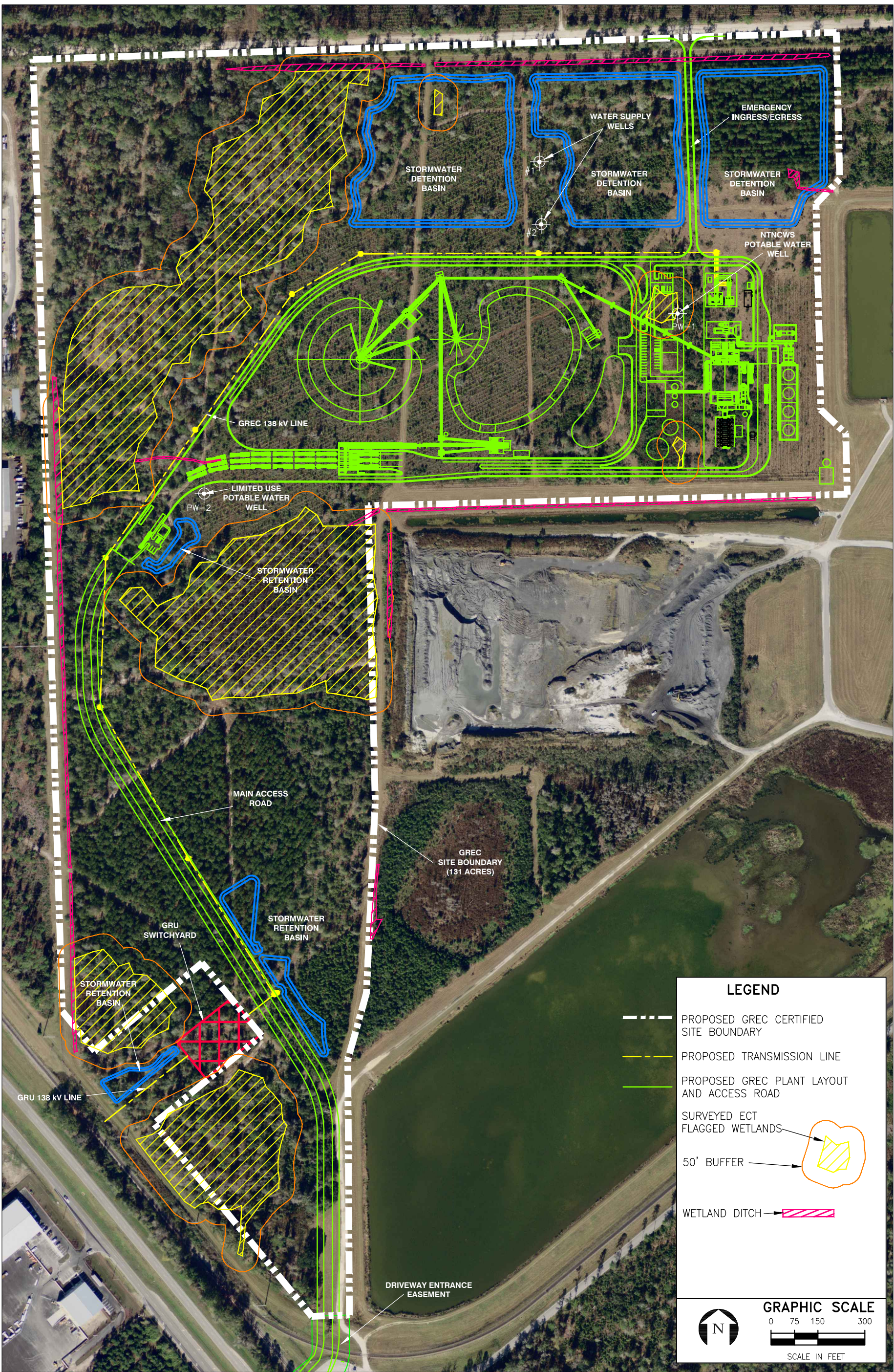


FIGURE 3.1.3-1.
GENERAL ARRANGEMENT OF FACILITIES
ON GREC SITE

Source: FDOT, 2008; EDA, 2009; Zachary, 2009; Genesis, 2009; ECT, 2009.

Site's main access road intersection with U.S. 441 will be approximately 0.5 mile north of the entrance to the GRU DGS. An emergency access road will run north from the fuel storage/power block area to Northwest 128th Lane.

Biomass fuel will be transported to the GREC Site by truck. The biomass fuel trucks will enter the Site from U.S. 441 on the southern side of the Site and travel north on the paved main access road to the truck weigh scale and biomass fuel receiving areas.

The main power block facilities (i.e., BFB biomass boiler, steam turbine, emission control equipment, boiler stack, cooling tower, etc.) will be located in the northern portion of the Site approximately 3,200 feet (ft) (0.6 mile) northeast of U.S. 441, 2,200 ft (0.4 mile) west of the Alachua County Public Works Department Complex, and 1,100 ft (0.2 mile) south of Northwest 128th Lane. The biomass fuel storage areas will be situated immediately west of the power block area. Facilities of the existing GRU DGS are located to the east and southeast of the GREC power block area. The planned locations of the GREC power block area and biomass fuel storage areas will provide a significant buffer between plant operations and adjoining land uses.

Electricity will be transmitted from the steam turbine generator to a switchyard located at the GREC Site, which will be used to increase the voltage. From the power block area switchyard, aerial 138-kV transmission lines will generally follow the main access road and connect to a new GRU-owned switchyard located on GRU DGS property just outside the GREC leased site boundary. New GRU 138-kV transmission lines will run southwest from the switchyard and interconnect with existing GRU 138-kV transmission lines along U.S. 441.

Other GREC facilities will include an administration building, warehouse, four water wells, water and wastewater treatment facilities, BFB boiler sand and fly ash handling and storage, two emergency diesel engines, and several stormwater runoff basins. Construction laydown and parking areas will be located to the north and east of the power block area on the Site. GREC construction activities will impact approximately 65 acres of the 131-acre Site. Also, the GREC construction activities will temporarily use approx-

imately 8 acres of land located east of the GREC Site on the GRU DGS property for additional laydown area and vendor/contractor use.

3.1.4 FLOOD ZONES

Figure 3.1.4-1 shows the 100-year flood zones on the GREC Site overlaid on an aerial photograph based on available Federal Emergency Management Agency (FEMA) flood insurance rate maps (FIRM). As shown in Figure 3.1.4-1, small areas of the Site near the northern and southern boundaries are situated within the 100-year flood zone. Topography of the Site is generally flat with land surface elevations ranging from approximately 175 to 185 feet above mean sea level (ft-msl).

3.2 SOCIAL AND POLITICAL ENVIRONMENT

The FDEP rules for certification of a new site or new generating facilities meeting certain criteria require an analysis of various land use and socioeconomic baseline conditions and projected impacts in accordance with local government comprehensive plans, zoning ordinances, and development regulations. The various planning issues relevant to the GREC Site fall within the following generalized categories: existing land use, comprehensive plans and zoning ordinances, infrastructure and growth management, cultural resources, aesthetics, and socioeconomics.

Based on Environmental Consulting & Technology, Inc.'s (ECT's) evaluation of existing conditions, land development plans and ordinances, and capacity of public facilities, the development of the GREC Site is a compatible development and should result in no significant negative impacts to the sociopolitical environment in the surrounding area. The GREC Site and all associated facilities are consistent and in compliance with the existing land use plans and zoning ordinances in effect at this time.

3.2.1 GOVERNMENTAL JURISDICTIONS

As shown on Figure 3.2.1-1, the GREC Site lies within the incorporated city limits of Gainesville in Alachua County. Unincorporated portions of Alachua County are located immediately north of the Site and further to the east and south. The next nearest incorporated municipality to the GREC Site is the City of Alachua, located across U.S. 441 to the

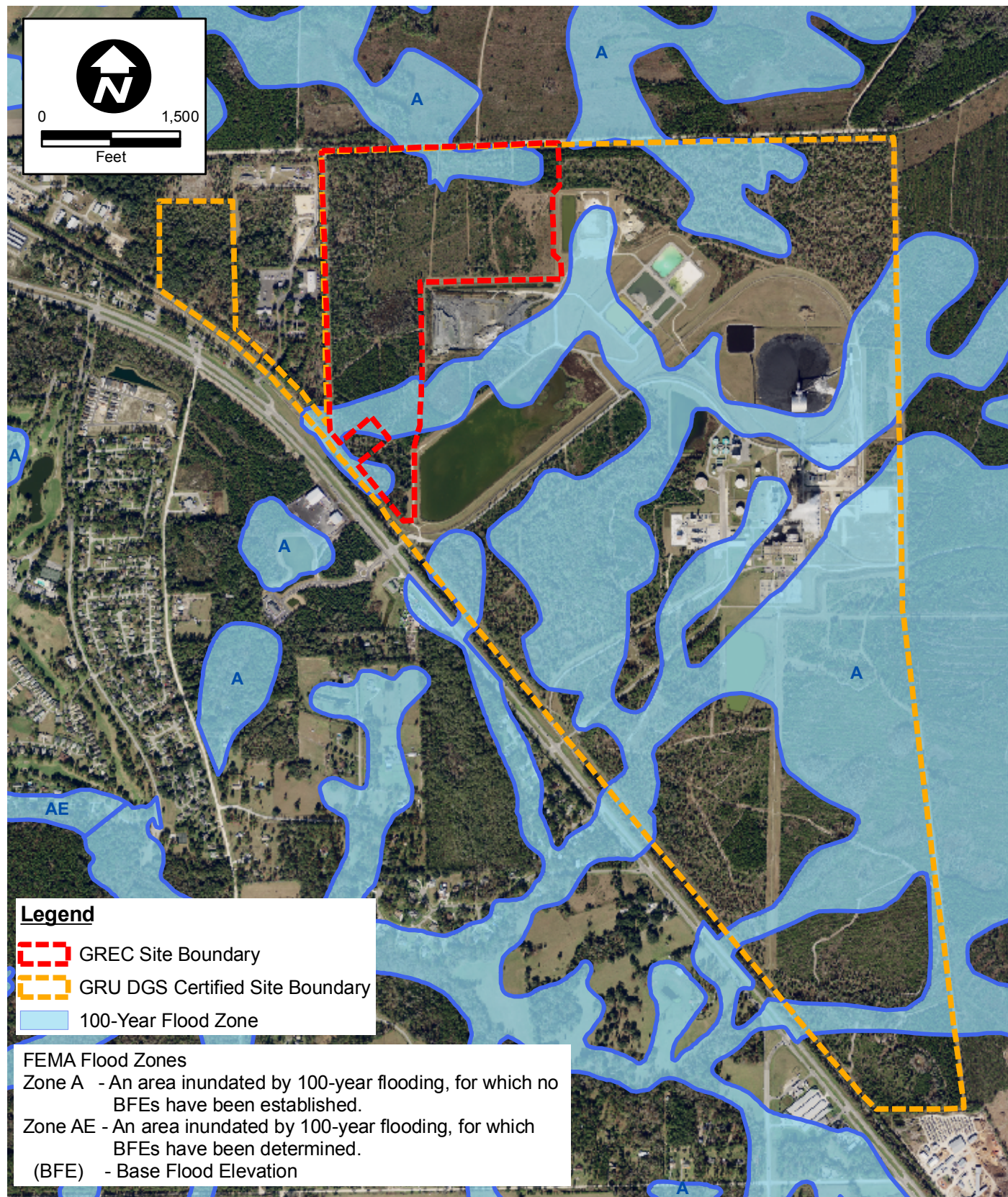


FIGURE 3.1.4-1.

100-YEAR FLOOD ZONES

Sources: FEMA,2006; FDOT, 2008; GREC, 2009; ECT,2009.

west. The southern boundary of the town of Lacrosse is located approximately 4.3 miles to the north.

The GREC Site is also within the jurisdiction of the North Central Florida Regional Planning Council (NCFRPC) and the Suwannee River Florida Water Management District (SRWMD). Public lands located within a 5-mile radius of the Site include the San Felasco Hammock State Preserve and Devil's Millhopper State Geological Site.

3.2.2 ZONING AND LAND USE PLANS

The current zoning and land use plan designation for the Site are described in the following subsections based on the applicable sections of Gainesville's Comprehensive Plan and Land Development Code (LDC).

3.2.2.1 Zoning District

The GREC Site is designated as a Public Services and Operations (PS) District. This was the assigned zoning district after annexation by Gainesville of the DGS property in 1981. Since the zoning district was approved in 1982, the LDC has been updated to require permitted uses to be specified in the PS zoning districts. The City initiated an amendment to the existing PS District encompassing the DGS property in May 2009 to add permitted uses. An ordinance amending the zoning map atlas by specifying permitting uses in the PS zoning category on the DGS property was adopted by the Gainesville City Commission on August 6, 2009. The permitted uses include all those uses currently existing on the DGS site and two new uses: (1) communication towers and facilities, and (2) green industries that assist in reducing reliance on fossil fuels. The proposed activities for GREC are consistent with the amended zoning ordinance for green industries. Appendix 10.3 provides applicable portions of Gainesville's zoning ordinance.

3.2.2.2 Comprehensive Plan Future Land Use Map

Figure 3.2.2-1 depicts the onsite and surrounding future land use designations. The Site has been designated Public Facilities (PF) since the annexation of the DGS property. This land use category identifies administrative and operational governmental functions such as government offices, utility facilities, and storage facilities. The PS zoning district is a

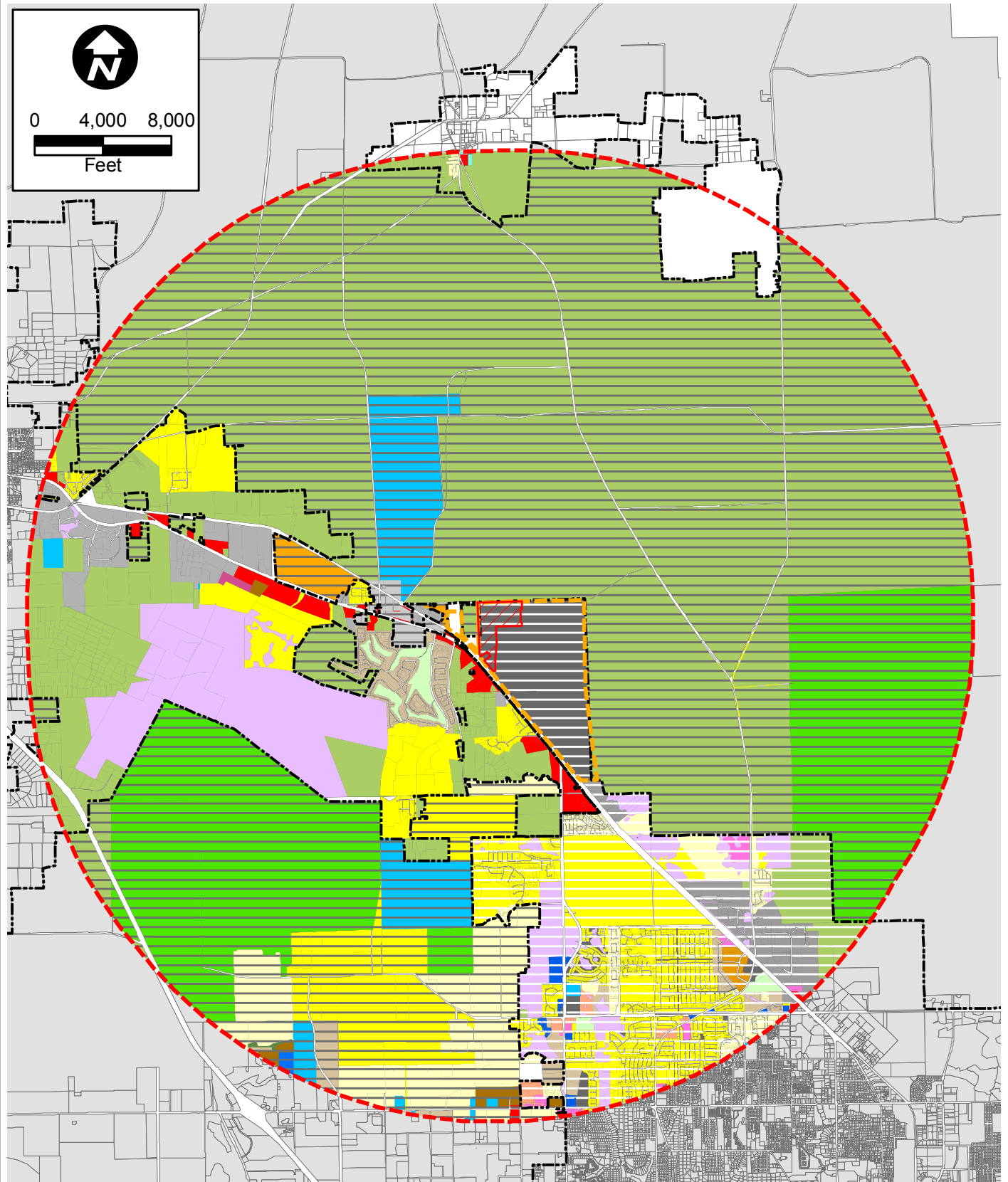


FIGURE 3.2.2-1

FUTURE LAND USE WITHIN 5 MILES
SHEET (1 OF 2)

Source: Alachua County, 2009; City of Gainesville, 2009; City of Alachua, 2009; City of Lacrosse, 2009; ECT, 2009.

Legend

-  GREC SiteBoundary
-  GRU Deerhaven Site Boundary
-  5 Mile Area Around GREC Site

Alachua County Future Land Use

-  Commercial
-  Conservation
-  Institutional
-  Office
-  Open Space
-  Preservation
-  Recreation
-  Residential Estate (0.5 du/acre)
-  Residential Low Density (1-4du/acre)
-  Residential Medium Density (4-8du/acre)
-  Residential Medium High Density (8-14du/acre)
-  Rural Cluster
-  Rural Commercial Agriculture
-  Rural Employment Center
-  Rural/Agriculture

City of La Cross Future Land Use

-  Agriculture
-  Commercial
-  Industrial
-  Public
-  Recreation
-  Residential Low Density

City of Gainesville Future Land Use

-  Single Family
-  Agricultural
-  Commercial
-  Conservation
-  Education
-  Industrial
-  Mixed Use Low
-  Mixed Use Medium
-  Office
-  Public Facilities
-  Planned Use Development
-  Recreation
-  Residential Low
-  Residential Medium

City of Alachua Future Land Use

-  Agriculture
-  Community Commercial
-  Commercial
-  Conservation
-  High Density Residential
-  Industrial
-  Medium Density Residential
-  Moderate Density Residential
-  Public
-  R/AG(COUNTY)
-  RC(COUNTY)
-  Recreation

FIGURE 3.2.2-1

FUTURE LAND USE WITHIN 5 MILES
SHEET (2 OF 2)

Source: Alachua County, 2009; City of Gainesville, 2009; City of Alachua, 2009; City of Lacrosse, 2009; ECT, 2009.

compatible district within the PF land use category. Appendix 10.5 provides applicable portions of the City of Gainesville Comprehensive Plan.

3.2.3 DEMOGRAPHY AND ONGOING LAND USE

3.2.3.1 Demography and Existing Population

The U.S. Census estimates the 2007 population of Gainesville as 122,671. Table 3.2.3-1 provides population trends for the cities of Gainesville and Alachua, Alachua County, and the state of Florida.

The population growth of Gainesville had been lagging that of the state until recently. The population growth in Alachua County has been similar to that of the state as a whole. Since 2000, the population growth experienced in the incorporated cities has exceeded that of the county and the state. Alachua County was the 23rd most populous of the 67 counties in Florida based on the 2007 census data, and it ranked 23rd in density.

Table 3.2.3-2 provides the medium projections of population prepared by the Bureau of Economic and Business Research (BEBR) at the University of Florida for Gainesville, Alachua County, and Florida.

It is anticipated that Gainesville and Alachua County will experience a slightly lower growth rate than that of the state as a whole through 2020.

3.2.3.2 Existing Land Use

Existing land use and land cover characteristics, using the Level II categories of the Florida Land Use, Cover, and Forms Classification System (FLUCFCS), within the GREC Site and the surrounding area within a 5-mile radius, are shown at a scale of 1 inch equals 4,000 ft (1:63,360 proportion scale) on Figure 3.2.3-1.

Almost the entirety of the GREC Site has been used for silvicultural use or as a vegetated buffer for the existing DGS facilities. There is no current onsite development.

Table 3.2.3-1. Cities of Gainesville and Alachua, Alachua County, and Florida Population Trends

Area	Population 1980	Percent Change 1970 to 1980	Population 1990	Percent Change 1980 to 1990	Population 2000	Percent Change 1990 to 2000	Population 2007	Percent Change 2000 to 2007
Gainesville*	81,371	26.1	84,770	4.2	95,447	12.6	122,671	28.5
Alachua	3,561	NA	4,529	27.2	6,098	34.6	7,854	28.8
Alachua County	151,369	44.5	181,596	20	217,955	20.0	247,561	13.6
Florida	9,746,961	43.5	12,938,071	32.7	15,982,400	23.5	18,680,367	16.9

*The Gainesville population was affected by annexations.

Sources: BEBR Statistical Abstract, 2008.
U.S. Census data.

Table 3.2.3-2. Medium Projections of Population

Area	Population 2007	Population 2010	Population Change 2007 to 2010	Population 2015	Population 2020	Population Change 2010 to 2020	Population 2025
Gainesville	122,671	127,209	3.7	NA	NA	NA	NA
Alachua County	247,561	253,400	2.4	269,900	283,200	11.8	296,000
Florida	18,089,888	19,308,100	6.7	20,955,900	22,477,900	16.4	23,955,100

Note: NA = not available.

Sources: BEBR Statistical Abstract, 2008.

FLUCCS L2	Description
1100	RESIDENTIAL, LOW DENSITY
1200	RESIDENTIAL, MEDIUM DENSITY
1300	RESIDENTIAL, HIGH DENSITY
1400	COMMERCIAL AND SERVICES
1500	INDUSTRIAL
1600	EXTRACTIVE
1700	INSTITUTIONAL
1800	RECREATIONAL
1900	OPEN LAND
2100	CROPLAND AND PASTURELAND
2200	TREE CROPS
2300	FEEDING OPERATIONS
2400	NURSERIES AND VINEYARDS
2500	SPECIALTY FARMS
3100	HERBACEOUS (DRY PRAIRIE)
3200	SHRUB AND BRUSHLAND
3300	MIXED RANGELAND
4100	UPLAND CONIFEROUS FORESTS
4200	UPLAND HARDWOOD FORESTS
4300	UPLAND HARDWOOD FORESTS
4400	TREE PLANTATIONS
5200	LAKES
5300	RESERVOIRS
6100	WETLAND HARDWOOD FORESTS
6200	WETLAND CONIFEROUS FORESTS
6300	WETLAND FORESTED MIXED
6400	VEGETATED NON-FORESTED WETLANDS
7400	DISTURBED LAND
8100	TRANSPORTATION
8200	COMMUNICATIONS
8300	UTILITIES

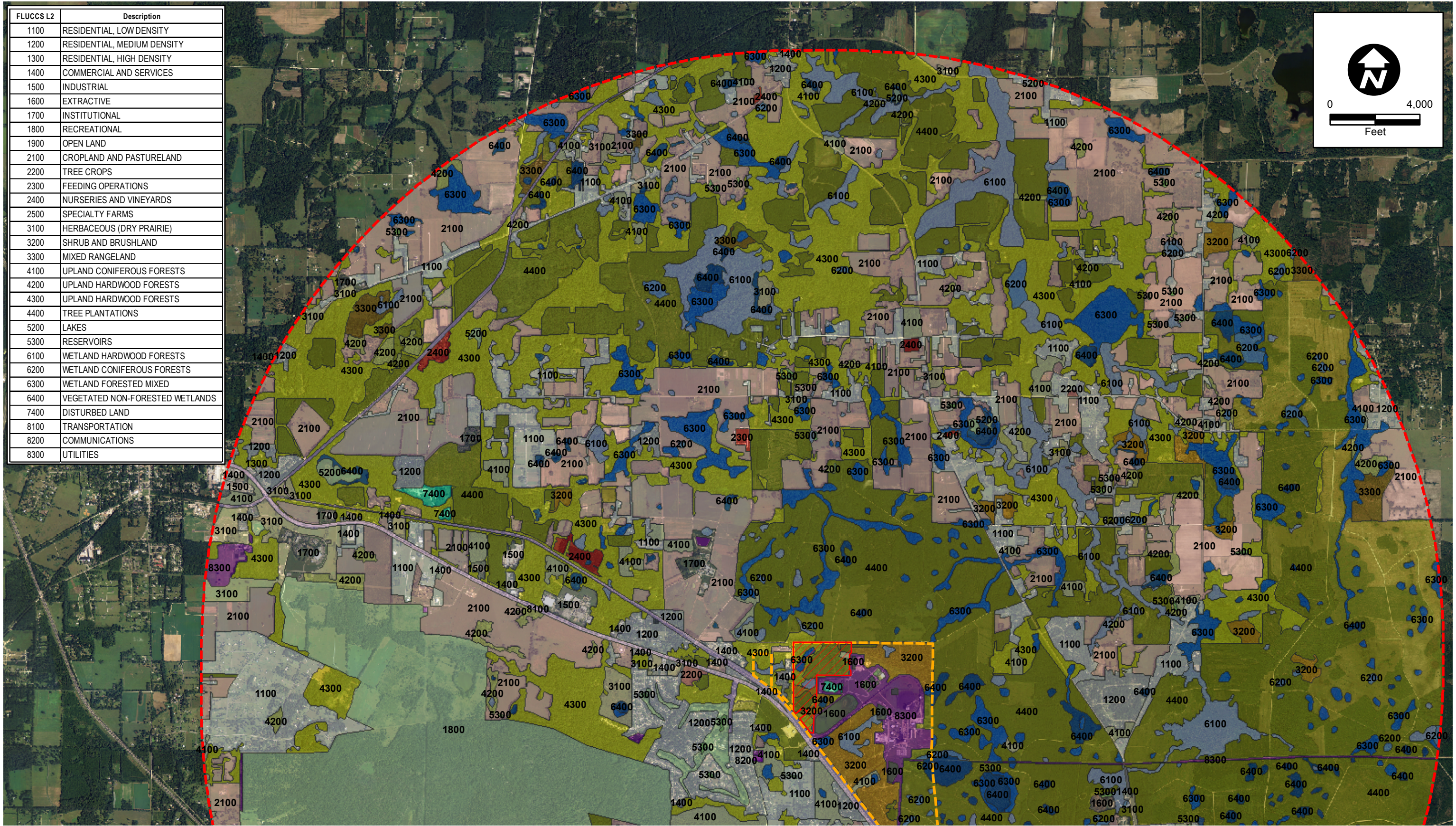
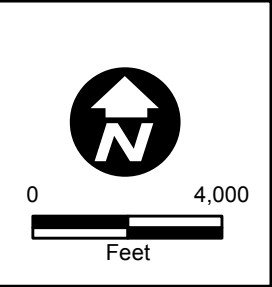


FIGURE 3.2.3-1

GENERALIZED LAND USE WITHIN 5 MILES OF GREC
SHEET 1 OF 2

Sources: FDOT, 2008; SJRWMD, 2004; SRWMD, 2004; Genesis, 2009; GRU, 2009; ECT, 2009.

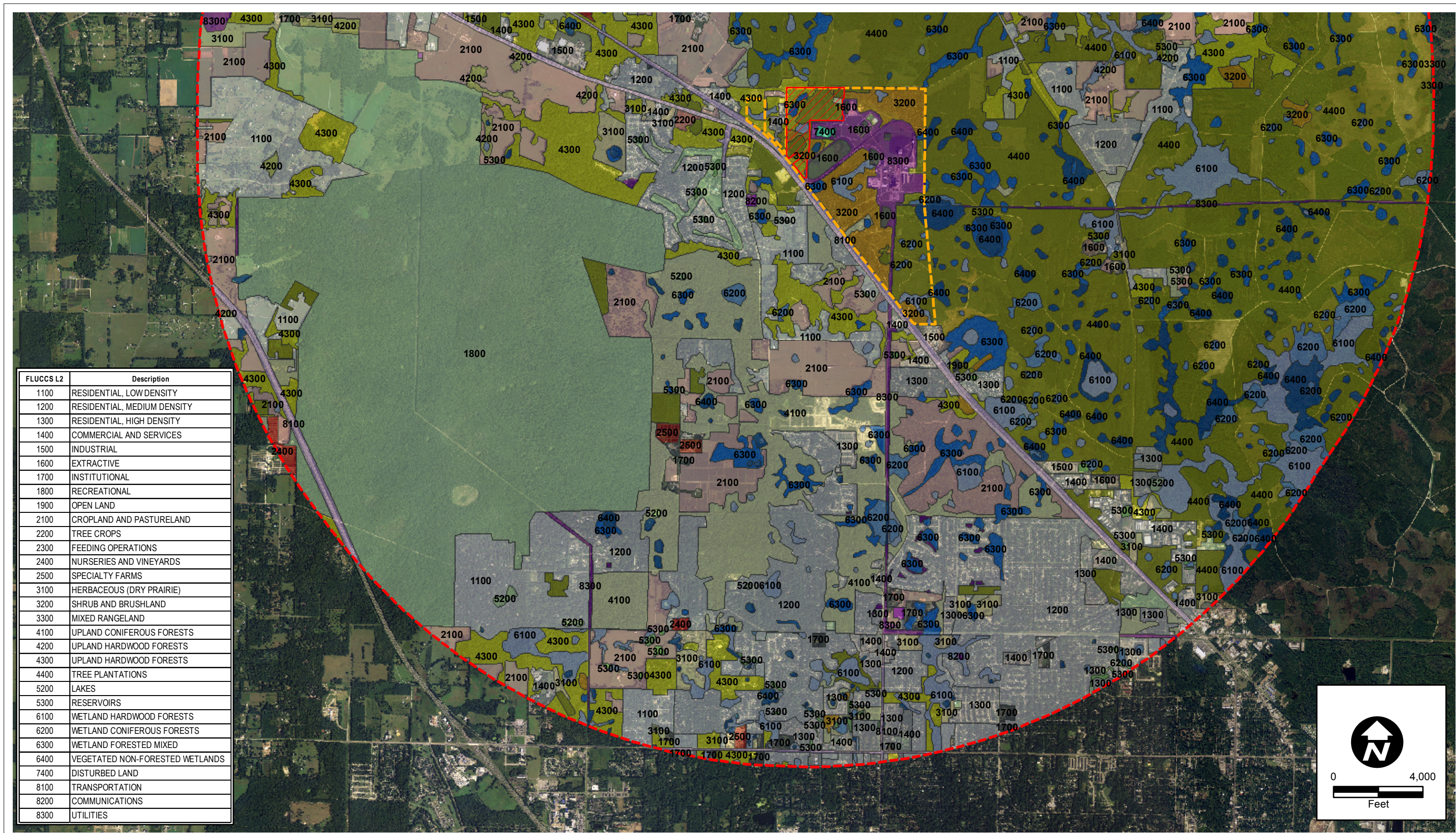


FIGURE 3.2.3-1
GENERALIZED LAND USE WITHIN 5 MILES OF GREC
SHEET 2 OF 2

Sources: FDOT, 2008; SJRWMD, 2004; SRWMD, 2004; Genesis, 2009; GRU, 2009; ECT, 2009.

Existing land uses found adjacent to the GREC Site boundaries are DGS to the east; U.S. 441 and a CSX rail line to the south with commercial uses located across the highway; facilities associated with the Alachua County Public Works Department, a radio tower, and undeveloped land to the west; and undeveloped land to the north. The closest facilities associated with DGS located to the east are two stormwater treatment basins, a brine disposal area, and an ash landfill/storage area. The closest residential development is located to the southwest of the Site, and it is associated with the Turkey Forest subdivision. Other areas of residential development are located more than 1 mile from the GREC Site boundaries.

3.2.3.3 Proposed Development

GREC is compatible with the electrical power generation facilities located to the east and the Alachua County Public Works Department facilities to the west. Currently, there are 440 MW of electrical generation at the DGS power plant. DGS Unit 2 was brought online in 1981.

3.2.4 LEASES, EASEMENTS, TITLE, AGENCY WORKS

The Site is leased by GREC LLC from the City of Gainesville pursuant to the lease agreement between the City and GREC LLC dated September 28, 2009 (Site lease). The Site Lease is for the purpose of the construction, operation and maintenance of GREC. The City of Gainesville has conveyed an ingress/egress easement at the CSX railroad crossing to GREC LLC across DGS property outside the leased premises. Pursuant to the Site lease, the City will convey to GREC LLC additional easements and/or land rights as may be necessary for proposed additional access roads and proposed potable water, sanitary sewer, and natural gas pipelines over and across DGS property outside the leased premises to serve the GREC. Chapter 9.0 describes these linear utility facilities and access road.

In addition, the current license between the City of Gainesville/GRU and CSX where the main access road for GREC crosses the railroad will be expanded to allow for the wider roadway.

3.2.5 REGIONAL SCENIC, CULTURAL, AND NATURAL LANDMARKS

There are no onsite regionally significant scenic, cultural, or natural landmarks. There are no such landmarks located immediately adjacent to the GREC Site. The closest regionally significant resource identified in the NCFRPC Strategic Regional Policy Plan (SRPP) is the San Felasco Hammock State Preserve located approximately 3 miles to the southwest. Devil's Millhopper State Geological Site, located approximately 3.2 miles to the south, is a National Natural Landmark.

The following areas are not found within a 5-mile radius of the Site:

- National parks.
- National forests.
- National seashores.
- Military lands.
- Roadless area review and evaluation (RARE) areas.
- National wild and scenic rivers.
- Scenic and wild rivers.
- State forests.
- National memorials or monuments.
- Areas of critical state concern.
- National marine and estuarine sanctuaries.
- Indian reservations.

3.2.6 ARCHAEOLOGICAL AND HISTORIC SITES

Correspondence from the Florida Division of Historical Resources (FDHR) (May 21, 2009) states that no archaeological sites or historic structures had previously been recorded in the Project area. Appendix 10.7.3 provides a copy of this correspondence. One resource group associated with the adjacent active CSX rail line was identified. A resource group can include a linear resource that is a special type of rural historic landscape such as canals, railways, and roads. This site is not eligible for listing on the National Register of Historic Places (NRHP), nor is considered significant at a regional or local level. Therefore, no adverse impacts to significant cultural resources are expected.

3.2.7 SOCIAL AND ECONOMIC CHARACTERISTICS AND PUBLIC SERVICES

3.2.7.1 Social and Economic Characteristics

Employment and Income

The Florida Statistical Abstract (BEBR, 2008) provides employment and economic information at the county level. According to the Florida Statistical Abstract, Alachua County had an estimated labor force of 126,432 in 2007, the most recent year for which there is BEBR data. Unemployed persons in 2007 totaled 3,746 for an unemployment rate of 2.96 percent. The unemployment rate in 2006 was 2.98 percent. The statewide unemployment rate in 2007 was 4 percent and 3.4 percent in 2006. More recent reports indicate that the unemployment rates are now higher. The total number of Alachua County jobs was 137,232 in 2006, indicating the county imports workers from surrounding counties. Major industries in terms of employment in Alachua County in 2005 were as follows:

<u>Industry</u>	<u>Number of Persons Employed</u>	<u>Percent of Total Persons Employed</u>
Accommodation and food services	11,824	9.7
Government	34,511	28.4
Retail trade	14,734	12.1
Professional scientific and technical services	5,883	4.8
Finance and Insurance	4,351	3.6
Health care and social assistance	19,286	15.9
Transportation and warehousing	11,122	9.2
Manufacturing	4,532	3.7
Construction	6,098	5.0

The industry with the highest number of employed persons is Government, which reflects the presence of the University of Florida and Santa Fe College in Alachua County. Health care and social assistance has the second highest number of employed persons due to several large hospitals in the county, including Shands Hospital, Veterans' Administration Medical Center, and North Florida Regional Medical Center.

Total per capita personal income in Alachua County in 2006 was \$31,391 compared to the Florida and national per capita figures of \$36,720 and \$36,714, respectively. Per capita transfer payments (income maintenance, unemployment insurance, retirement, and div-

idends) in 2006 were lower in Alachua County than in Florida or the nation: \$4,588 versus \$5,783 and \$5,399, respectively.

The relationship between revenue and expenditure per capita is an indicator of the cost of providing services and the economic stability of a local government. For 2005 to 2006, Alachua County reported \$1,507 per capita for expenditures, compared to \$1,627 per capita income from revenues, equating to a net surplus of \$120 per capita. The comparable amounts for Florida for 2005 to 2006 are \$2,243 (expenditures), \$2,266 (revenue), and \$23 (surplus).

Alachua County has a different distribution of land uses based on assessed value than does the state of Florida as follows: residential (57.9 to 72.9 percent), commercial (12.5 to 12.8 percent), industrial (2.2 to 3.2 percent), agricultural (2.1 to 0.8 percent), institutional (3.4 to 2.2 percent), and government (21.9 to 8.1 percent). The percentage of residential land is considerably less, and the percentage of government land is much higher in Alachua County than the state as a whole.

Housing

The 2000 U.S. Census indicates that there were 37,279 occupied housing units in Gainesville. Of these, 17,791 were owner-occupied (47.7 percent) and 19,488 were renter-occupied. In 2000, there were 2,826 vacant housing units. In 2000, the persons-per-household multiplier was 2.25.

As of July 2008, there were 468 licensed lodgings with 32,610 units in Alachua County. These units included 27,855 apartment units in 393 apartment buildings, 71 units in 3 rooming houses, and 134 units in 6 transient apartment buildings. For the year 2006 to 2007, there were 3,279 mobile home, 1,436 park trailers, and 1,429 recreational vehicle tags sold in Alachua County.

The average house cost in Alachua County in 2007 was \$198,690 compared to the statewide average cost of \$247,100.

3.2.7.2 Area Public Service and Utilities

Transportation Facilities

Transportation facilities servicing the Site include roadways and rail. No public or private airports are located within a 5-mile radius. Figure 3.2.1-1 shows the regional transportation facilities.

Major roadways within a 5-mile radius of the Site include Interstate 75 (I-75), U.S. 441 (also identified as State Roads [SR] 20 and 25), County Road (CR) 237, CR 121, and CR 232. An existing CSX rail line runs northwest-southeast adjacent to U.S. 441 just south of the GREC Site. A spur of the rail line enters the DGS property.

As previously stated, no public airport is located within a 5-mile radius of the Site. The closest public airport to the Site is the Gainesville Regional Airport (GRA) located approximately 10 miles to the southeast. Other nearby private airports include the Santa Fe Airport (approximately 10.4 miles to the north) and the Link Airport (approximately 7 miles to the southwest).

Traffic Volumes

The southern portion of the GREC Site is just north of U.S. 441, a four-laned divided roadway. This highway is classified as an arterial and will serve as the main access road for GREC. Based on the latest available Metropolitan Transportation Planning Organization's (MTPO's) Highway Level of Service Data from NCFRPC, U.S. 441 between Northwest 23rd Street and the Gainesville Metropolitan Area (GMA) has an adopted level of service (LOS) standard of D. Based on 2007 traffic counts, MTPO data indicate that the segment is operating at LOS B with a daily available capacity of 17,100. Based on 2008 average daily traffic (ADT) counts of 19,400 trips (2008 Florida Department of Transportation [FDOT] Traffic Information CD), the segment maintains LOS B, with an available capacity of 16,300. According to the City of Gainesville and City of Alachua, there are no reserved trips along the subject segment of U.S. 441 at this time. The existing level of service summary for the study area segment of U.S. 441 in the vicinity of GREC is as follows:

Roadway	To	From	Adopted LOS Standard	Maximum Service Volume	2008 FDOT ADT	Percent of Capacity	Available Service Volume	LOS
U.S. 441	Northwest 23 rd Street	GMA boundary	D	35,700	19,400	54	16,300	B

FDOT does not currently list any projects in the 5-year work program that would increase capacity on U.S. 441 within the study area. Also, at the current time, neither the City of Gainesville nor the City of Alachua has any planned roadway project that would increase capacity. The current LOS standards and capacities are expected to remain constant during construction of GREC as well as when fulltime plant operations begin.

Educational Facilities

According to the Alachua County School Board Web site, there are 23 prekindergarten and elementary schools, 9 middle schools, and 7 high schools serving an estimated student population of 25,503 (fall 2009). The estimated total capacity of the school district is 29,581 (ACSB, 2009). The following information provides school projections through the construction period of the proposed plant:

Fiscal Year						
<u>2006-07</u>	<u>2007-08</u>	<u>2008-09</u>	<u>2009-10</u>	<u>2010-11</u>	<u>2011-12</u>	<u>2012-13</u>
26,254	25,603	25,325	24,890	24,952	24,801	25,012

Source: Florida Department of Education, 2009.

As the projections and past enrollment numbers indicate, the future number of students will be below that of the actual school population in fiscal year 2006-2007.

Medical Facilities

The nearest hospitals to the GREC Site are North Florida Regional Medical Center and Shands Hospital located approximately 6.3 miles to the south and 8.3 miles to the south-southeast, respectively. The two hospitals are equipped with emergency rooms. North Florida Regional Medical Center has 323 beds and Shands Hospital has 367 beds.

The emergency medical services (EMS) facility that would respond to GREC is located at the Alachua County Fire Rescue Station #9 at the intersection of U.S. 441 and Northwest 43rd Street, approximately 1 mile to the south. This facility includes advanced life support.

Fire Protection

The nearest fire station to the GREC Site is located within Gainesville at 5601 Northwest 43rd Street, approximately 3.4 miles to the south. The city has a total of 132 firefighters and 15 emergency vehicles. There are a total of 193 firefighters in Alachua County.

Police Protection

The GREC Site lies in incorporated Gainesville and would receive police services from the City of Gainesville Police Department, which has 295 sworn officers. The Alachua County Sheriff's Office, which has 205 sworn deputies (May 31, 2009) would also be able to respond to emergencies. The Sheriff's office had an average response time of 4 minutes in 2008. In general, responses are prioritized according to urgency, with an average estimated response time of 15 to 20 minutes for a routine response, with a considerably shorter time expected for high-priority emergencies.

Potable Water, Sanitary Sewer, and Solid Waste

GRU's potable water supply is provided by the Murphee Water Treatment Plant with an existing capacity of 54 MGD. The current maximum daily flow is approximately 41.9 MGD. The potable water is supplied to the DGS site area by a single 12-inch diameter line along U.S. 441.

Sanitary wastewater will be treated by the Kanapaha Water Reclamation Facility with a permitted capacity of 14.9 MGD. The current flow is 11.48 MGD, which is based on the projected calendar year 2009 annual average flow. The DGS has a lift station that connects to the GRU wastewater system by a 3-inch diameter force main.

Solid waste will be hauled offsite and transported to the Alachua County Transfer Station. From there, the waste is trucked to the New River regional landfill located in Rai-

ford in Union County. According to personnel at the landfill, the estimated life is greater than 50 years at current landfilling rates.

Recreation and Open Space

No recreational areas, open space, or public lands are currently located adjacent to, or in the immediate vicinity of the GREC Site. There is no unauthorized access to the DGS property. The perimeter of DGS is fenced with security posted at the points of access. The nearest recreational facility to the Site is the San Felasco Hammock State Preserve, located approximately 3 miles to the southwest. The Preserve offers hiking, cycling, and equestrian trails. The Devil's Millhopper State Geological Site, located approximately 3.2 miles to the south, has guided tours, nature trails, a visitors' center, and picnicking facilities. Hogtown Creek Headwaters Nature Park is located at 1500 Northwest 45th Avenue, approximately 5 miles to the south-southeast.

3.3 PHYSICAL AND BIOLOGICAL ENVIRONMENT

3.3.1 GEOLOGY AND HYDROLOGY

This subsection describes the major geological aspects of the Site and surrounding areas, including physiography, structure, stratigraphy, lithology, and soil characteristics.

3.3.1.1 Geologic Description of the Site and Area

Regional Lithostratigraphy

Table 3.3.1-1 provides a summary of the geologic and hydrogeological framework for the sediments from recent times to the Paleocene series in the area of the GREC Site. The Site is covered by a thin veneer of recently deposited undifferentiated sands and clays that cap a thick sequence of mostly Tertiary and Cretaceous sediments that in turn cap a crystalline Triassic basement. The stratigraphy of the underlying area around the Site in descending order is as follows:

- Undifferentiated surficial sediments.
- Hawthorn Group.
- Ocala Group.
- Avon Park formation (Avon Park limestone and Lake City limestone).
- Oldsmar formation.

Table 3.3.1-1. Hydrogeological Framework for GREC Site

System	Series	Stratigraphic Unit		General Lithology	Major Lithologic Unit	Hydrogeological Unit
Quaternary	Holocene and Pliestocene	Undifferentiated surficial sediments		Iron-stained, clayey, organic-rich quartz sands.	Sand	Surficial aquifer system
Tertiary	Miocene	Hawthorn Group		Interbedded phosphatic dolosilts, sandy clays, and clayey sands.	Clays	Confining unit
	Eocene	Ocala Group		Limestone, soft to hard, porous, fossiliferous; dolomitic limestone near lower section.	Carbonates	Upper Floridan aquifer system
		Avon Park Formation	Avon Park Limestone	Dolomite, granular, hard, porous; interbedded with limestone.	Carbonates	
			Lake City Limestone	Limestone, dolomite, and dolomitic limestone; foraminiferal. Thin seams of peat.		Middle confining unit of Floridan
		Oldsmar Formation		Fragmental limestone, partially dolomitized with lenses of chert, pore-filled gypsum, and thin shale beds.	Carbonate with evaporites	Lower Floridan aquifer system
	Paleocene	Cedar Keys Formation	Dolomite and limestone with beds of anhydrite		Carbonate with evaporites	Lower confining unit of Floridan aquifer system

Sources: Green, 1989.
 Clark *et al.*, 1964.
 Miller, 1997.

- Cedar Keys formation.
- Lawson limestone.
- Taylor beds.
- Austin beds.
- Eagle Ford shale.
- Woodbine sandstone.
- Unnamed Lower Cretaceous unit.
- Unnamed Lower Mesozoic units.

The following paragraphs provide limited details on each of the units previously listed.

The sediments from recent times to the Miocene have been studied and described in detail; however, their general similarities make it easier to discuss them together. The upper (undifferentiated surficial) sediments generally consist of iron-stained, clayey, organic-rich quartz sands from the Pleistocene to Holocene series. The thickness of this youngest series is shown in two cores (W-16200 and W-16206) drilled and logged by the Florida Geological Survey (FGS) that amounted to an average of 25 ft (Green *et al.*, 1989). The underlying sediments also reported by Green *et al.* were composed of undifferentiated Hawthorn Group from the Miocene series. This group's general lithology is comprised of interbedded, phosphatic dolosilts, sandy clays, and clayey sands ranging from 65 to 90 ft in thickness. A map of those core locations in Alachua County and copies of those two columnar core sections are provided in Appendix 10.7.2.1. These upper sand-to-clay sediments are approximately up to 115 ft thick.

The next set of sediments underlying the Hawthorn Group was formed in Eocene times, and they are generally considered to be limestones. Clark *et al.* (1964), while researching the water resources of several Florida counties including Alachua County, provided a generalized geologic map of the area (see Clark Figure 4 in Appendix 10.7.2.2). One particular core (946-226-2), shown on the C-C' line of the geologic section (see Clark Figure 7 in Appendix 10.7.2.2), appears to tie into Green's data and provides additional deeper confirmation of lithostratigraphy for the area. That core penetrates the upper Eocene series Ocala Group, which attains an approximate thickness of 200 ft in this area. Clark

does not differentiate the Ocala Group in this reference preferring to indicate it is mostly a soft, white-to-cream-colored, chalky, coquina limestone grading downward into alternating layers of hard and soft, tan-to-brown, crystalline and dolomitic limestone.

An unconformity exists between the Ocala Group and the underlying Avon Park limestone with that particular middle Eocene stratigraphic series attaining a similar thickness of approximately 200 ft in the area. Clark *et al.* (1964) states this formation is chiefly a dark brown to tan, granular, hard, dense-to-porous dolomite that in places contains a few beds of cream-colored limestone and is generally fossiliferous and carries a distinctive assemblage of cone-type Foraminifera.

The next lower, middle Eocene series belongs to the Lake City limestone, which Clark *et al.* indicated was the oldest formation from which supplies of fresh groundwater are obtained in the area. The general lithology of this particular series consists of mostly tan, gray, and brown, hard, finely crystalline dolomite and dolomitic limestone. Included with these beds, however, are many softer layers of tan and gray, porous, fossiliferous limestone and seams of peat or lignite readily identified in drill samples with the first appearance of the Foraminifera, *Dictyoconus americanus*. Since there appears to be no clear distinction between the Avon Park limestone and the underlying Lake City limestone, Miller (1986) recommended combining the two beds in one formation that is now called the Avon Park formation.

Circa late 1977, the Gainesville/Alachua County Regional Electric and Sewer Utilities Board (G/ACRESUB) (now known as GRU) completed a deep injection test well for cooling tower blowdown water disposal as part of the SCA for DGS. Appendix 10.7.2.3 contains copies from that 1977 SCA of a map of deep well locations in Alachua County (including the DGS deep injection well), associated geological cross-sections of the deep wells in Alachua County, and a table describing the geologic units encountered in those deep wells in Alachua County. A review of the strata identified from that deep injection well show general agreement with published literature in terms of expected thicknesses for the previously described geologic strata: Hawthorn Group, Ocala Group, and Avon Park formation. In which case, one can expect the identifications of the lower units from

the deep injection well with their depth and thicknesses are plausible. Keeping in mind the earlier comment about the Lake City limestone being the deepest exploited source of fresh groundwater, the table in Appendix 10.7.2.3 indicates that the bottom of the Lake City limestone is approximately 1,020 feet below land surface (ft bls). Even so, the lowest formation of the Eocene series, the Oldsmar formation, with approximately 530 ft of moderately indurated cryptocrystalline dolostone interbedded with porous, poorly indurated limestone, is still described by Clark *et al.* (1964) as likely to be fresh water-bearing at least in part. From the Ocala to the Oldsmar, the Eocene formations span approximately 1,440 ft, with the bottom of the Oldsmar formation at approximately 1,550 ft bls.

The deepest Cenozoic sediment encountered in this area consists of the Paleocene series formation known as the Cedar Keys formation, which attains a thickness of 445 ft. While somewhat similar to the overlying Oldsmar, the Cedar Keys formation's cavities are often filled with gypsum and traces of anhydrite. Thus, the base of the Cedar Keys formation that marks the beginning of the Cenozoic is buried almost 2,000 ft bls (see geologic table of descriptions in Appendix 10.7.2.3).

Cretaceous-age sediments range from limestones to shales to sandstones. Beginning with the upper Cretaceous, the Lawson limestone is dolomitic, poorly indurated with gypsum throughout. In this area, the Lawson is only approximately 200 ft thick, and it tops the Taylor beds that are composed of chalky limestone separated by thin seams of dolomite and marl. Even though the underlying Austin beds are only 400 ft thick as compared to the 500-ft thickness of the Taylor beds, the change in lithology appears to be evidence of a change from marine to marginal marine. The Austin beds consist of shales, sandstones, and clays separated by limestones. The middle Cretaceous formation, Eagle Ford shale, is approximately 100 ft of shaly limestone interbedded with sandstone and lignite, calcareous sandstone, and micaceous shale. The last 100 ft of Cretaceous-age sediments is split evenly between the Woodbine sandstone with its calcareous sands and quartz sandstones to an unnamed formation composed of shales and sandstones. This array of formations amounts to just over 1,200 ft of sediments, and that places the top of the crystalline basement, a quartz diabase, at approximately 3,300 ft bls. This assemblage of marine,

near shore, and igneous formations completes the known geology underlying the Site (see geologic table of descriptions in Appendix 10.7.2.3).

Lithology

Generalized descriptions (Green *et al.*, 1989; Clark *et al.*, 1964; Vernon, 1951; and G/ACRESUB, 1977, where not indicated otherwise) of the formations in the area of the GREC Site are summarized here in descending order:

- Undifferentiated Surficial Sediments—Pinkish-gray to dark yellowish-orange clayey, organic quartz sand to light greenish-yellow sandy and phosphatic clay (Green *et al.*, 1989).
- Hawthorn Group—Grayish brown to yellowish-gray clayey quartz sand, yellowish-gray to light-olive clayey, phosphatic quartz sand with clay and limestone fragments and yellowish-gray sandy, phosphatic calcilutite (Green *et al.*, 1989).
- Ocala Group—Limestone; white, cream, and tan; soft, granular, porous, fossiliferous, coquinoid in part. Some hard layers of limestone and dolomitic limestone mostly in lower part (Clark *et al.*, 1964).
- Avon Park Limestone—Dolomite, dark brown and tan, granular, hard, dense to porous; interbedded tan and cream limestone and dolomitic limestone (Clark *et al.*, 1964).
- Lake City Limestone—Limestone, dolomite, and dolomitic limestone, tan, grey, and brown (Clark *et al.*, 1964).
- Oldsmar Formation—Fragmental marine limestones, partially to completely dolomitized and containing irregular and rare lenses of chert, impregnation of gypsum, and thin shale beds (Vernon, 1951).
- Cedar Keys Formation—Dolostone, microcrystalline, cream to gray, euhe-dral, subhedral, porosity; intercrystalline, vugs filled by gypsum, trace anhydrite; interbedded anhydrite oolitic limestone, poor to moderate induration.
- Lawson Limestone—Limestone, dolomitic, very fine to medium, euhe-dral, subhedral, white to tan, chalky, pasty, porosity intergranular, poor to moderate induration, gypsum impregnations throughout. Upper zone coquinoid.

- Taylor Beds—White to cream chalky limestone separated by thin beds and seams of tan, crystalline dolomite, gray marl.
- Austin Beds—Marly shales; fine-grained, argillaceous sandstones; sandy, micaceous clay; and some limestone.
- Eagle Ford Shale—Sandy, dense hard, shaly limestone interbedded with thin seams of sandstone and flecks of lignite; poorly sorted, slightly calcareous sandstone; blocky, micaceous shale.
- Woodbine Sandstone—Micaceous, calcareous sand overlying calcareous shale and shaly limestone with lignite and gypsum; irregularly interbedded in the shale are a quartz sandstone with thin shale partings and a coarse sand and gravel conglomerate.
- Unnamed Lower Cretaceous Unit—Red, green, and brown clastics, largely shales and sandstones. The base is a coarse sand containing pebbles of Paleozoic sediments.
- Unnamed Lower Mesozoic Units—Quartz diabase and igneous intrusives.

Site Area Stratigraphy

The stratigraphy for the Site can be summarized from two sets of boring log data: shallow borings that were reportedly completed by Breedlove and Associates, Inc. circa 1976, and the deep injection well boring that was in progress at the time of the writing of the 1977 SCA (G/ACRESUB).

The 1977 SCA (*ibid.*) contains shallow boring data and a map of the locations of those borings that characterize the undifferentiated surficial sediments of the area as well as tagging a thick clay unit that appears to cap the upper portion of the Hawthorn Group. Appendix 10.7.2.4 contains the map and cross-sections A, B, and C, each of which crosses near or within the GREC Site boundaries. The undifferentiated sediments of Pleistocene-Holocene age were shown to consist of the following soil types in descending order: top soil, tan-to-brown sands, and tan-to-black sand with a trace of clay. The underlying sediments (probably Pliocene) include blue-gray sandy clay or gray sandy clay. Of particular note is the fact that the blue-gray clay was shown to be continuous and always greater than 6 ft in thickness.

Appendix 10.7.2.3 contains the boring log and cross-sectional map of the deep injection well data and other deep well boring data from around Alachua County. The deep boring stratigraphic sequence at the GRU DGS site is summarized as follows:

<u>Formation</u>	<u>Depth (ft bls)</u>	<u>Thickness (ft)</u>
Undifferentiated (surficial sediments)	0 to 17	17
Hawthorn Group	17 to 110	93
Ocala Group	110 to 330	220
Avon Park limestone	330 to 515	185
Lake City limestone	515 to 1,020	505
Oldsmar formation	1,020 to 1,550	530
Cedar Keys formation	1,550 to 1,995	445
Cretaceous	1,995 to 3,325	1,330

The deep boring log (see Table 2.4-1 of Appendix 10.7.2.3) indicates that the recent sediments above the Hawthorn Group consist of sands and clays with varicolored clays indicated at the base. Since blue-gray clays were encountered in the shallow borings previously discussed, it appears plausible that the shallow borings were ended at or near the top of the Hawthorn Group yet still in clay. Thus, within a matter of a few feet, it appears that the basal, blue-gray clay of the undifferentiated surficial sediments would then tie into the even thicker sequence of clays that comprise the Hawthorn Group. The blue-gray clay is probably a Pliocene sediment and may be a weathering residuum of Miocene Hawthorn Group carbonate sediments.

Site Area Structure

Two main features influenced the depositional environments and geologic setting of this part of north central Florida: the Peninsular Arch and the Ocala Uplift or Platform. A copy of the structural maps showing those features is provided in Appendix 10.7.2.5 from the publication, A Geological Overview of Florida (Scott, 1992).

The GREC Site is likely very near the crest of the main axis of the Peninsular Arch, which trends generally north-northwestward, and is estimated to be 275 miles long. The arch extends from south-central Georgia to slightly northeast of Lake Okeechobee (Ap-

plin and Applin, 1944). The arch is thought to be an anticlinal fold of pre-Cenozoic times, which caused differential subsidence of the overlying strata (Faulkner, 1973).

The Ocala Platform, or Ocala Uplift, is a mid-Cenozoic structural feature that parallels the Peninsular Arch. The Ocala Platform trends approximately northwest and covers an elliptical area approximately 230 miles long and 70 miles wide (Vernon, 1951). This feature affected the Eocene and younger stratigraphic units. The Site is located east of the Ocala Platform. It is likely that the Ocala Uplift was the most important structure in the area of the GREC Site that caused exposure and erosion of the sediments overlying the Ocala Group like the Hawthorn and recent surficial sediments. Thus, the expression of the Ocala Group is present along the axis of the Ocala Uplift in southwest Alachua County, and further northeastward, on the flanks of the Ocala Uplift the Hawthorn Group and Pleistocene-Holocene sediments overlap each other. The generalized geologic map in Appendix 10.7.2.2 from Clark *et al.* (1964) indicates that the Pleistocene sediments that cover the Site are considered terrace deposits.

While no faulting has been identified in the area of the GREC Site (G/ACRESUB, 1977), which has been occupied by DGS continuously since 1972 without evidence of subsidence due to faulting, it is likely that fracture sets exist in the limestones of the underlying Ocala Group. Vernon (1951) identified regional fracture sets trending northeast-southwest and northwest-southeast that were attributed to tensional stresses associated with the formation of the Ocala Uplift. Actual identification of such fractures is made all the more difficult since the Ocala Group is overlain by approximately 110 ft of sediments composed of sands and clays.

Site Area Physiography

The physiographic province identified by White (1970) as the Northern or Proximal Zone has an upper bound synonymous with the Florida-Georgia border, while the lower bound is a line running through the cities of St. Augustine, Palatka, Hawthorn, and Gainesville; thus, the Site is within the aforesaid territory. White also states the zone is distinguished by continuous high ground forming a broad upland that extends eastward to the Eastern Valley (along the Atlantic side of the peninsula) and westward continuously into the

western highlands of Florida. A subdivision of the aforementioned zone is called the Northern Highlands that extend from the northern border of the state of Florida, south to the Cody Scarp, east as far as the Trail Ridge, and west to the Suwannee River. The GREC Site is situated within the Northern Highlands (Schneider *et al.*, 2008).

Appendix 10.7.2.2 includes a map of physiographic regions as published in Figure 3 by Schneider *et al.*, (2008). According to LaFrenz *et al.* (2003), the Northern Highlands comprise a broad upland area with moderate relief, steep to gentle slopes, and incised streams that extend as much as 15 miles upstream from the toe of the Cody Scarp. White (1970) states that the difference in drainage habit east and west of Gainesville seems to result from a capping by clays of the Hawthorn formation in the eastern part of the area and exposure of soluble limestone in the western part. Thus, in the area of the Site where soil borings describe approximately 90 to 100 ft of Hawthorn clays, it is likely a piezometric surface or perched water table exists that is higher than stream valleys running through the area thus assuring surface drainage through local streams like Turkey Creek.

The site vicinity map (Figure 3.1.1-2), which shows topography of the area around the GREC Site, displays elevations ranging from approximately 185 feet National Geodetic Vertical Datum of 1929 (ft-NGVD) on the eastern side of the Site that gently slope westward to approximately 175 ft-NGVD on the west. This 10-ft drop across the Site translates into a gentle, westward facing slope of less than 1 percent.

3.3.1.2 Detailed Site Lithologic Description

The SCA for DGS (G/ACRESUB, 1977) stated in Subsection 2.4.2 that 21 soil borings were completed in 1976 on DGS by Breedlove and Associates and reported by them in 1977. Appendix 10.7.2.4 contains a map of those boring locations as well as three of the cross-sections (A, B, and C) that cross through or near the GREC Site. The 1977 SCA stated that the soil tends to become less permeable with depth, forming an aquiclude on which the surficial groundwater is perched. In January and August 1974, the SCA (1977) reported that 19 split-spoon borings were also completed to various depths (approximately 13 to 100 ft bls). The borings indicated that brown topsoil, gray to dark brown sands with traces of clay, and gray clayey sands were encountered from land surface to as deep

as 18 ft bls followed at that depth by clays and various clay strata down to 100 ft bls. The underlying clays reportedly were extremely stiff, requiring 100 blows of the driving hammer to achieve less than 1 foot of split-spoon penetration (*ibid.*). Also, of particular note, the borings did not encounter significant limestone or sand deposits within the clay.

Well completion reports with driller's logs are available for monitoring wells R4T5B, R6T4B, and R7T2B. Lithologic logs are available for shallow wells R1T4, R6T1, R8T10, R9T5, R10T8, and R11T4. A log for deep well R11T5 is also available, and it extends to a depth of 164 ft bls. The reports or logs for all 10 of these wells are included in Appendix 10.7.2.6, along with a map showing their locations at the GRU DGS site.

In addition, Appendix 10.7.2.6 also includes well construction details and lithologic descriptions for the GRU facility Floridan aquifer water supply well No. 4, which is the northernmost of four supply wells. The lithology is described to a depth of 495 ft bls.

A geotechnical study was conducted at the GREC Site in 2009 by GSE Engineering & Consulting, Inc. (GSE) (2009). It included 50 soil borings to depths of 5 to 15 ft bls, with detailed lithologic logging. These results are also included in Appendix 10.4.2, Attachment A.

Appendix 10.7.2.3 includes the deeper lithologic descriptions, associated with the test injection well at the GRU DGS site; it extends to depths greater than 3,300 ft bls. The lithology of these deeper formations was previously described in Subsection 3.3.1.1, Regional Lithostratigraphy.

3.3.1.3 Geologic Maps

The geology for Alachua County has been mapped by Clark *et al.* (1964). The generalized map in Appendix 10.7.2.2 shows the surface geology along with elevation contours of the top of the Ocala Group. The GREC Site is located within the extreme western part of the region mapped as Older Pleistocene Terrace Deposits. The Hawthorn Group is mapped within 1 mile west of the facility, and the Ocala Group is mapped within a few miles west of the facility.

Appendix 10.7.2.7 contains the general soil map for Alachua County from the U. S. Department of Agriculture (USDA) (1985) and a table of the soil groups with information on hydraulic category, stratum depths, and permeabilities from the SCA (1977). The SCA (1977) stated that nearly all soils are classified as poorly drained sands with varying silt and clay content. The Site was marked on USDA's general soil map, and it lies on soils characteristic of Pomona-Wauchula-Newnan soil types. Those are described by USDA as being nearly level, poorly drained, and somewhat poorly drained soils that have a sandy, organic coated subsoil at a depth of 30 inches or less and a loamy subsoil between a depth of approximately 28 to 80 inches. Closer details of the soil types specific to the GREC Site are located on Map Sheets 28 and 37 from USDA (1985) (see Appendix 10.7.2.7). From those maps, the Site is estimated to be situated primarily on Pomona sand, Surrency sand, and Wauchula sand soil types. Nine other soil types occur across the Site as shown by the table in Appendix 10.7.2.7.

The following information covering specific soil types for the GREC Site was summarized and/or copied from USDA (1985):

- Pomona soils are nearly level, poorly drained soils in flatwoods. The surface layer is very dark gray sand followed by gray to light gray sand to a depth of approximately 21 inches. The subsoil from 21 to 48 inches and consists of the following in descending order: very dark gray sand coated with organics, dark reddish brown sand, pale brown sand with mottles, and very pale brown sand. Then, a generally pale brown fine sandy loam to fine sandy clay loam extends to a depth of 69 inches. The last 15 inches is composed of a light gray, mottled fine sandy loam to a depth of 84 inches. The water table is generally high (within 10 inches of land surface) in this soil type for at least 3 months of the year, except during dry seasons when it recedes to depths below 40 inches. Surface runoff is slow, and the water capacity is low to medium in the surface to moderate in the subsurface. Permeability is rapid in the surface and subsurface, and generally moderate in the subsoils. This soil is severely limited for urban uses, including absorption fields for septic tanks, dwellings, small commercial buildings, sewage lagoons, trench

landfills, and roads and streets. Wetness is the major problem, and it requires a good drainage system to remove excess rainwater and control the water table. If used for sewage lagoons, this soil has a potential hazard of contamination of groundwater by seepage of liquid waste material through the sandy sidewalls of the pits. The pits need to be well lined and sealed.

- Surrency soils, like Pomona soils, are nearly level, poorly drained soils in depressed areas of broad flatwoods. The surface layer is black sand approximately 15 inches thick followed by light gray sand to approximately 28 inches followed by gray to light gray sandy clay loam to a depth of 80 inches. The water table in this soil type is within 10 inches of land surface for approximately 6 months of the year and can be on the surface for 4 months of the year. The water capacity of the soil is low to high in the surface and subsurface and low to medium in the subsoil. Permeability is fairly rapid in the sandy surface and subsurface, but becomes slow in the loamy subsoils. This soil is severely limited for urban uses because of the low drainage properties. A major, expensive water control system would be required to lower and maintain the water table at a depth needed to use this soil for sewage lagoons and trench landfills.
- The Wauchula soils are basically similar to Pomona soils that consist of black to dark gray sands from land surface to 8 inches; light brownish gray sand to 14 inches; pale, brown mottled fine sand to 19 inches; a fine sandy loam (gray to light brownish gray to light gray) to 62 inches; and, light gray, mottled sandy clay loam to 80 inches. Like the Pomona, these soils are within 10 inches of land surface from 1 to 4 months of the year and within 10 to 40 inches for approximately 6 months of the year. During dry seasons, it too recedes to below 40 inches in depth. The available water capacity is low to medium in the surface layer, low to very low in the subsurface, and low to high in the subsoils. Permeability is moderate to rapid in the surface to subsurface to subsoils and slow in the lower parts. Its limitations for urban use are the same as those previously cited for the Pomona soils.

3.3.1.4 Bearing Strength

Onsite geotechnical investigations are planned for the GREC Site to support final engineering and design of the facilities and foundations. Therefore, currently, detailed information regarding bearing strength is not available. Since the DGS was built and has operated for more than 30 years without incident and without the use of extraordinary measures, it appears likely that bearing strengths will not be a significant issue for development of GREC.

3.3.2 SUBSURFACE HYDROLOGY

The hydrostratigraphy in the immediate area of the GREC Site includes three groundwater aquifer systems; in descending order, these include the surficial aquifer system (SAS), intermediate aquifer system and intermediate confining unit (IAS), and Floridan aquifer system (FAS).

Table 3.3.1-1, provided previously, shows the relations between these aquifer systems and their corresponding geologic units. The SAS is comprised of the Holocene and Pleistocene series undifferentiated surficial sediments. The IAS is comprised primarily of the Miocene series Hawthorn Group but also includes a Pliocene clay bed that overlies the Hawthorn Group at the GREC Site. The FAS is comprised of the Eocene series Ocala Group, Avon Park formation, and Oldsmar formation. The lithologic composition of these stratigraphic units was described in detail in Subsections 3.3.1.1 and 3.3.1.2 and is also summarized in Table 3.3.1-1.

An evaluation of the local water wells and the well depths (see Subsection 3.3.3.2) suggests that less than 10 percent of these nearby water wells use the IAS, and none use the SAS, while the FAS is used by more than 90 percent of these wells. As such, locally, the IAS functions much more as the intermediate confining unit than as an aquifer.

3.3.2.1 Subsurface Hydrology Data for the Site

Relevant physical characteristics of these aquifer systems are described herein. Those descriptions are followed by an evaluation of groundwater quality data for the SAS and the FAS at the end of this subsection.

Surficial Aquifer System (SAS)

The SAS is composed primarily of quartz sands and slightly clayey sands. At the Site, the sands of the SAS range in thickness from approximately 5 to 18 ft, with an average thickness of approximately 10 ft. Permeability tests performed on various sands in the upper 5 ft indicated an average hydraulic conductivity of 0.43 feet per day (ft/day) as reported by G/ACRESUB (1977) and an average hydraulic conductivity of 13 ft/day as reported by GSE (2009). Overall, a representative average hydraulic conductivity for the entire SAS is estimated at 2 ft/day.

The SAS sands are underlain by a blue-gray sandy clay that marks the base of the SAS. These relations are illustrated in the geologic cross-sections included in Appendix 10.7.2.4. Figure 3.3.2-1 is a map showing the elevation of the base of the SAS, which also is the top of the IAS. As shown, the slope of the underlying clay bed is toward the west at the GREC Site.

Water table depth and elevation data are available from quarterly monitoring events that are conducted at the GRU DGS site. The saturated thickness of the SAS is typically less than 10 ft locally and averages 7 to 8 ft in saturated thickness. The water table in the SAS generally occurs within 6 ft of land surface and is commonly found 2 to 4 ft bls at the GREC Site. The water table tends to fluctuate approximately 5 ft through the annual seasons.

Figure 3.3.2-2 is a water table elevation contour map for the April 2009 monitoring event (the most recent available at the time of this writing). At the Site, the apparent direction of groundwater flow is primarily westward in the SAS. Similarly, Figure 3.3.2-3 is a water table elevation contour map that shows the average elevations for each well based on the latest ten quarterly monitoring events. Again, the apparent direction of groundwater flow is primarily westward in the SAS, with a northwesterly flow direction indicated for the extreme northeastern portion of the GREC Site. The SAS groundwater elevation data also suggest the presence of a local groundwater divide, as shown in Figure 3.3.2-3. As

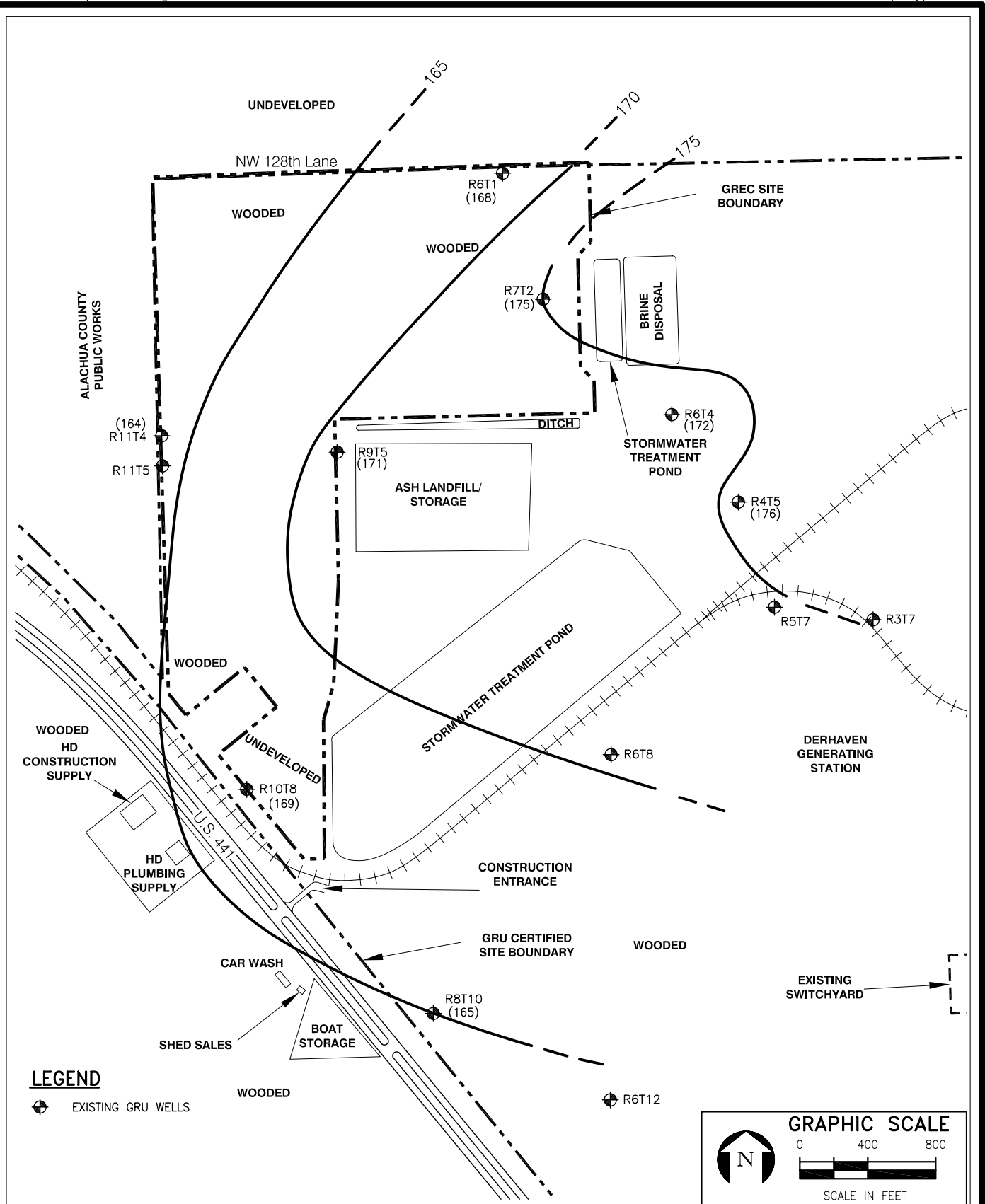


FIGURE 3.3.2-1.

ELEVATION (FT. NGVD) OF BASE OF SURFICIAL AQUIFER
AND TOP OF CONFINING UNIT

Sources: GRU, 2009; ECT, 2009.

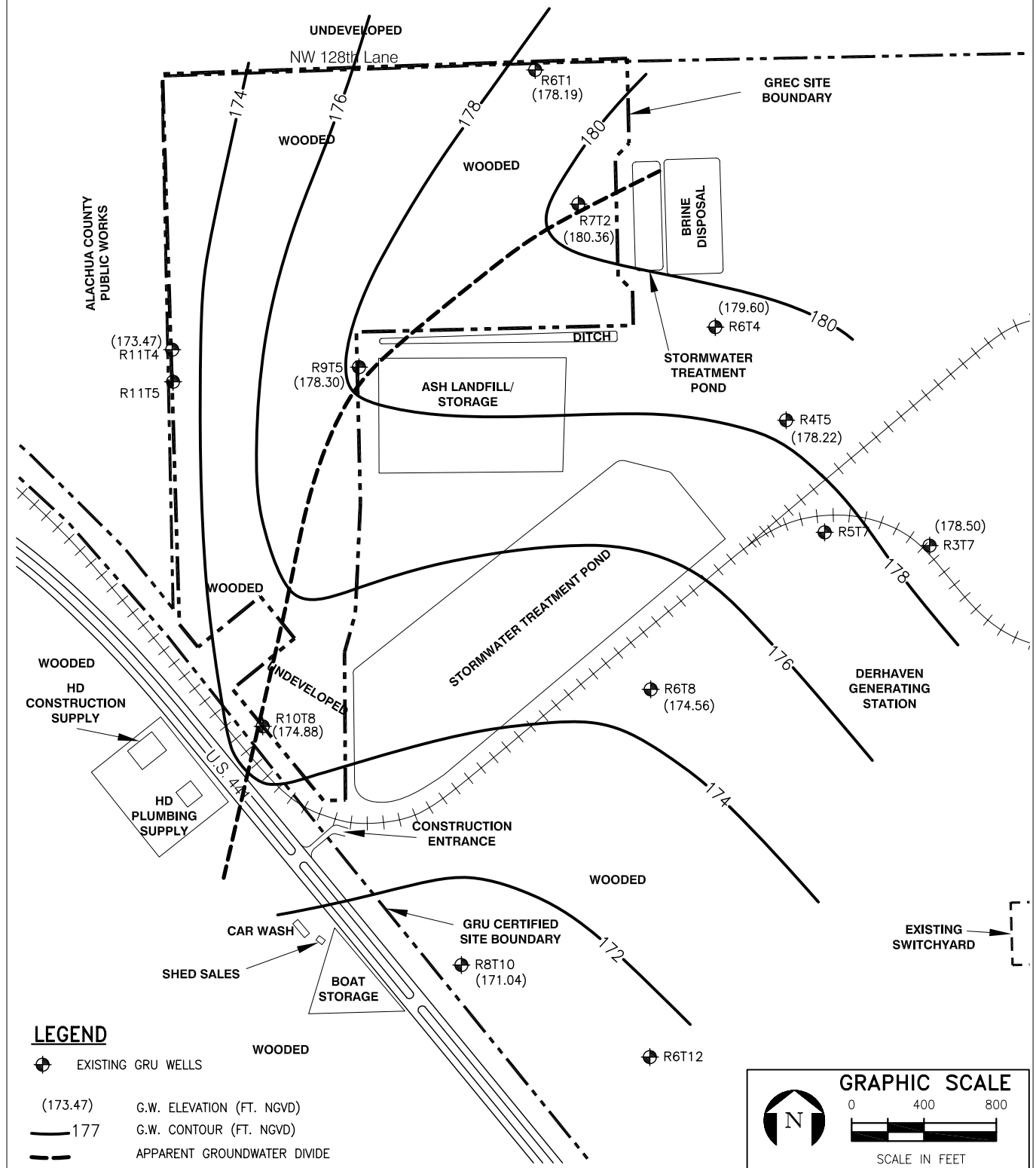


FIGURE 3.3.2-3.
GROUNDWATER ELEVATION MAP - WATER TABLE
AVERAGE OF 10 MOST RECENT QUARTERLY DATA
THROUGH APRIL 2009

Sources: GRU, 2009; ECT, 2009.

such, the direction of groundwater flow in western portions of the adjacent GRU property appears to be primarily toward the south and southwest in the SAS.

The average linear groundwater flow velocity (v) is estimated for the SAS at the GREC Site using the standard equation (Freeze and Cherry, 1979):

$$v = K i / n$$

where: K = hydraulic conductivity (2 ft/day) (G/ACRESUB, 1977).

i = hydraulic gradient (0.004 foot per foot [ft/ft], Figure 3.3.2-3).

n = effective porosity (0.2 [fraction], typical for SAS).

These parameter values suggest an average linear groundwater flow velocity of 0.04 ft/day, or 15 feet per year (ft/yr), toward the west in the SAS at the Site.

The SAS is not known to be used as a water supply source in the immediate area of the facility, although it would be possible to obtain very small quantities of water from shallow dug wells in the SAS.

Intermediate Aquifer System and Intermediate Confining Unit (IAS)

The IAS is approximately 90 ft thick at the Floridan monitoring well R11T5 location on the GREC Site (well locations are included in Figure 3.3.2-3). Similarly, the IAS is approximately 100 ft thick at the GRU deep injection test well site (Appendix 10.7.2.3). At these locations, the IAS is composed almost entirely of low permeability clayey sediments; thin layers or lenses of sand or limestone are also present but are less than 10 ft in thickness.

A vertical hydraulic conductivity (K_v) value of 0.003 ft/day is suggested by SRWMD's calibrated regional groundwater model for the IAS in immediate area of the Site (Schneider *et al.*, 2008). That K_v value is consistent with an expected average value based on the lithologic conditions observed onsite. The vertical leakance value, calculated as the ratio of the K_v value (0.003 ft/day) to the confining unit thickness (90 ft), is

estimated at 0.00003 ft/day/ft for the GREC Site. This low value indicates a high resistance to vertical flow.

The rate of vertical movement (e) of groundwater is calculated by (Fetter, 1980):

$$e = K_v h / b'$$

where: K_v = vertical hydraulic conductivity (0.003 ft/day, Schneider *et al.*, 2008).

h = the head difference across the confining unit (52 ft, measured on July 8, 2009, at nested wells R11T4 and R11T5).

b' = confining unit thickness (90 ft at R11T5).

These parameter values suggest a rate of downward vertical movement of 0.0017 ft/day, or 0.6 ft/yr at the Site. The rate is consistent with the FAS recharge rate of 0.7 ft/yr estimated by SRWMD's regional groundwater flow model for the area of the Site (Schneider *et al.*, 2008).

As shown in Figure 3.3.2-3, the water table of the SAS at the GREC Site typically exists at elevations ranging from approximately 173 to 180 ft-NGVD. In contrast, as described in the following discussions, the potentiometric surface of the FAS typically exists at elevations ranging from approximately 38 to 48 ft-NGVD beneath the GREC Site. As such, the hydraulic head difference between the SAS and the FAS is typically approximately 130 ft; this is due to the presence of the IAS, which separates the overlying SAS from the underlying FAS. This indicates that the IAS serves as an effective confining unit locally.

As further described later in this subsection, comparisons of the Site groundwater quality data for the SAS and the FAS suggest that the intermediate confining unit is very effective at preventing downward migration from the SAS to the FAS.

Floridan Aquifer System (FAS)

The FAS is the main source of water supply is the general area of the Site. The FAS has a total thickness of approximately 1,450 ft locally, which includes all of the Eocene series geologic formations (see Table 3.3.1-1 and Appendix 10.7.2.3). The base of the FAS oc-

curs at a depth of 1,550 ft bls locally (G/ACRESUB, 1977), which corresponds with the top of the Cedar Keys formation that is part of the sub-Floridan confining unit (SFCU) (Schneider *et al.*, 2008).

Various aquifer tests have been performed in this region to estimate values for the FAS aquifer characteristics of transmissivity and storage coefficient. Table 3.3.2-1 provides a summary of aquifer test results for this area (G/ACRESUB, 1977), along with the well locations and construction depths. Those data suggest transmissivity values ranging from approximately 17,000 to 88,000 square feet per day (ft²/day) for the given depth intervals tested. The deeper wells typically showed higher transmissivities than the shallower wells. The reported storage coefficients ranged from 0.0001 to 0.0009. Aquifer testing of the FAS onsite at the GRU DGS facility resulted in estimated values of 40,000 ft²/day for transmissivity and 0.00005 for storage coefficient (*ibid.*). That testing involved wells with open hole depth intervals from approximately 185 to 450 ft bls.

As is commonly the case, no tests have been performed in this region to estimate the aquifer characteristics for the full 1,450-ft thickness of the FAS. Calibrated groundwater models are useful for that purpose, and such models typically render values that are much higher than those obtained from aquifer testing of discrete depth intervals. In this regard, aquifer characteristic values are further discussed in Subsection 6.3.2.

Figure 3.3.2-4 is a map of the FAS potentiometric surface elevation for May 2005 throughout the SRWMD (SRWMD, 2005, online map). As shown, the potentiometric surface elevation was approximately 46 ft-NGVD near the GREC Site. The apparent direction of groundwater flow was toward the west, and the hydraulic gradient was approximately 0.0004 ft/ft. Figure 3.3.2-5 is a map showing the total fluctuation of groundwater levels in the FAS (SRWMD, 2003, online map); the total fluctuation is approximately 10 ft in the area of the GREC Site. Specifically, the potentiometric surface seems to fluctuate from approximately 38 to 48 ft-NGVD locally. The FAS groundwater levels have trended downward in this region over the past several decades.

Table 3.3.2-1. Summary of Aquifer Coefficients for the Florida Aquifer in Alachua County

Well Name	Location	Depth of Well (ft)	Depth of Casing (ft)	Transmissivity (gpd/ft)	Storage Coefficient	Permeability (gpd/ft ²)	Specific Storage* (ft ⁻¹)
Murphree N-1	T9S, R20E, Sec 15	530	173	166,000	0.00022	465	6.16×10^{-7}
Murphree N-2	T9S, R20E, Sec 15	475	185	165,000	0.0002	569	6.90×10^{-7}
Murphree N-3	T9S, R20E, Sec 15	540	217	326,000	0.00066	1,009	2.04×10^{-6}
Murphree N-4	T9S, R20E, Sec 15	545	190	262,000	0.00091	738	2.56×10^{-6}
Murphree N-5	T9S, R20E, Sec 15	500	190	129,000	0.00037	416	1.19×10^{-6}
Murphree N-6	T9S, R20E, Sec 15	521	189	203,000	0.0006	611	1.81×10^{-6}
Murphree N-7	T9S, R20E, Sec 15	534	181	NA	NA	NA	NA
Murphree N-8	T9S, R20E, Sec 15	538	180	NA	NA	NA	NA
Kanapaha -1	T10S, R19E, Sec 16	1,047	450	500,000	NA	826	NA
Kanapaha -2	T10S, R19E, Sec 16	1,050	450	725,000	NA	1,208	NA
Kanapaha -3	T10S, R19E, Sec 16	1,028	450	525,000	NA	908	NA
Kanapaha -4	T10S, R19E, Sec 16	1,0331	450	660,000	NA	1,136	NA
Sperry Band†	T9S, R20E, Sec 13	350	160	165,000	0.0001‡	868	5.26×10^{-7}

*Calculated by dividing storage coefficient by length of open hole.

†USGS Well No. 942-216-2 as reported by Clark *et al.*, 1964.

‡Estimated by Clark *et al.*, 1964.

Source: GRUB, 1978.

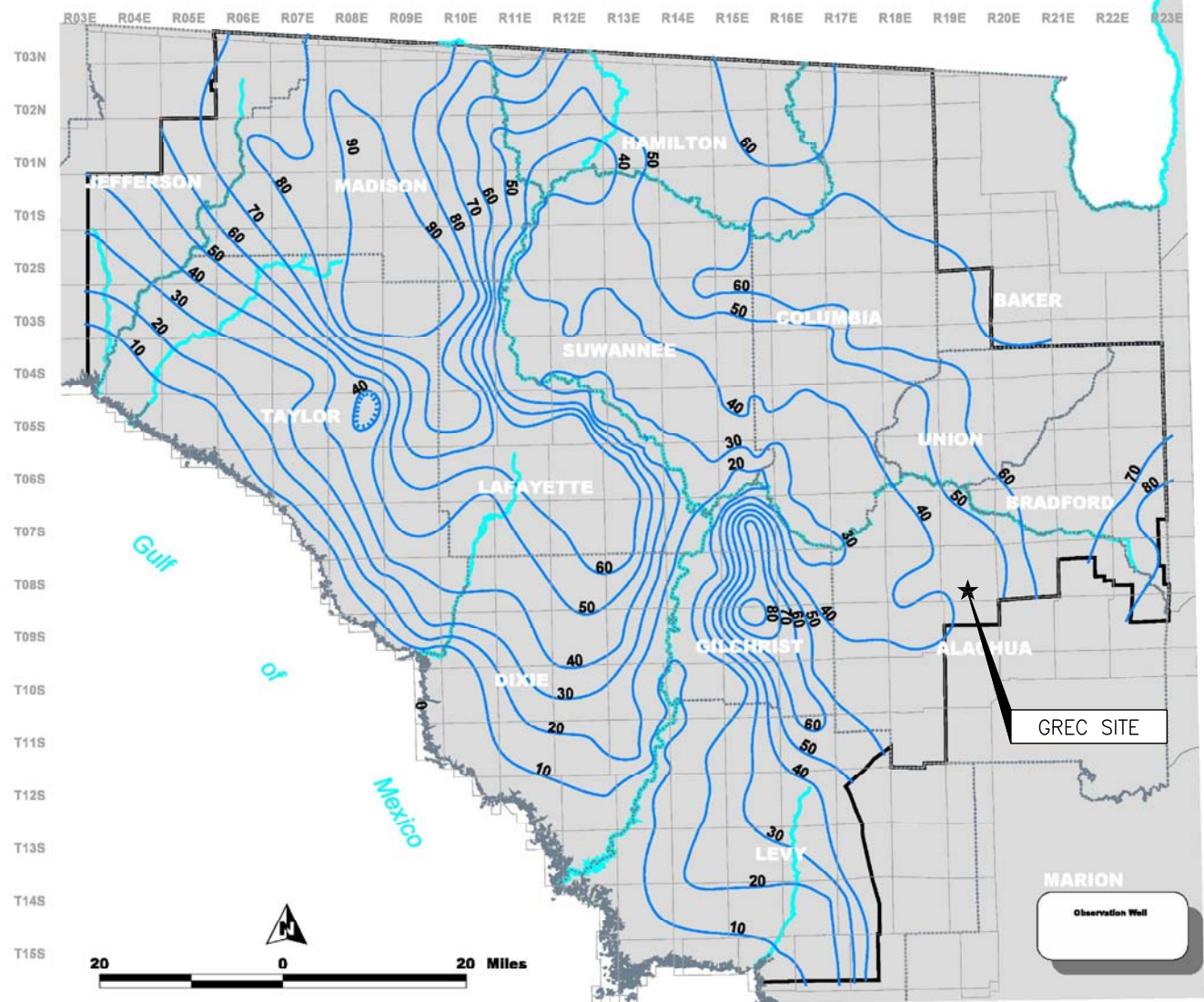


FIGURE 3.3.2-4.

POTENTIOMETRIC SURFACE OF THE
UPPER FLORIDAN AQUIFER (MAY 2005, FT NGVD)

Source: SRWMD, 2005; ECT, 2009.

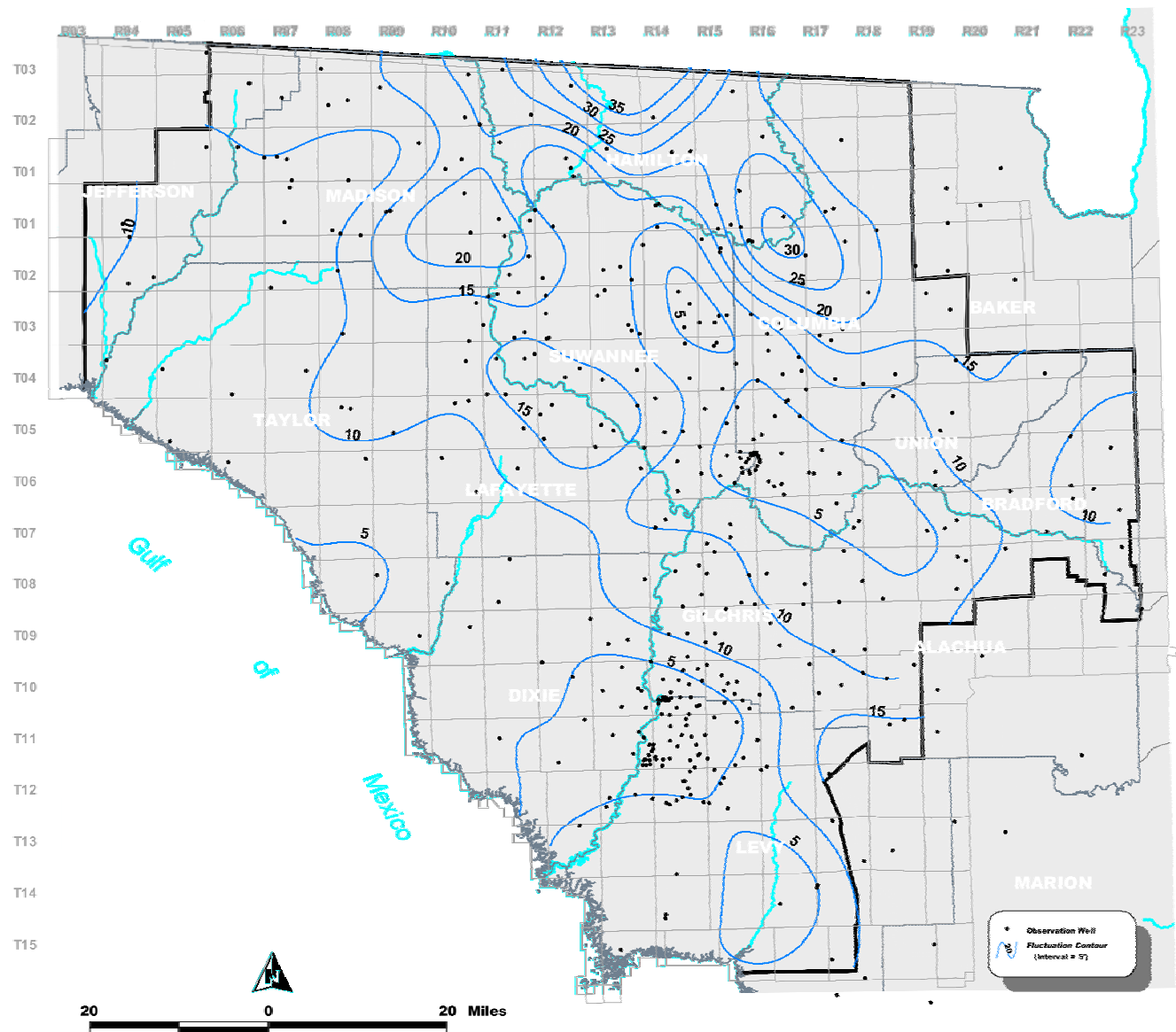


FIGURE 3.3.2-5.

TOTAL FLUCTUATION OF GROUND WATER LEVELS
IN THE FLORIDAN AQUIFER SYSTEM (IN FEET)

Source: SRWMD, 2003; ECT, 2009.

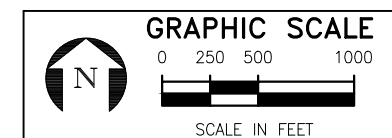
The top of the FAS (i.e., the top of the Ocala Group) occurs at an elevation of approximately 70 ft-NGVD at the GREC Site, which corresponds with depths of approximately 100 to 110 ft bls. Monitoring well R11T5 is constructed with an open hole interval from 140 to 164 ft bls. The water level measured on July 8, 2009, at well R11T5 was 53 ft bls, which equals an elevation of approximately 124 ft-NGVD. That groundwater surface elevation is approximately 80 ft higher than the potentiometric surface elevations representative of the FAS at the Site (i.e., 38 to 48 ft-NGVD; Figure 3.3.2-4). This seems to indicate that the uppermost 75 to 85 ft of the FAS (the top third of the Ocala Group) may have low permeability zones and may function more as a confining unit rather than an aquifer. This observation is consistent with the fact that each of the four GRU water supply wells is constructed with surface casing extending to a depth of approximately 185 ft bls, which is typically approximately 80 ft below the top of the Ocala Group.

The local FAS recharge rate may be approximately 0.7 ft/yr as suggested by SRWMD's regional groundwater flow model for the area of the Site (Schneider *et al.*, 2008). That rate is consistent with the rate of downward vertical movement of 0.6 ft/yr from the SAS, through the IAS, into the FAS as calculated for the GREC Site.

Groundwater Quality

At the time of certification of the GRU DGS, a shallow groundwater monitoring well network was established along the property perimeters and throughout the plant property to monitor SAS water quality. GRU samples the wells quarterly, and the samples are analyzed for numerous constituents including 13 priority pollutant metals, total dissolved solids (TDS), total suspended solids (TSS), and gross alpha. Figure 3.3.2-6 shows the locations of the groundwater monitoring wells on the DGS site.

Tables 3.3.2-2 through 3.3.2-10 display 2008 and 2009 groundwater quality data for nine of the shallow SAS wells on the DGS property compared to the primary (i.e., maximum contaminant levels) drinking water standards. None of the analytes exceed primary drinking water standards at the existing DGS property boundaries. The secondary groundwater standards do not apply to the existing DGS site pursuant to FDEP Rule 62-520.310(14),



LEGEND

-  SHALLOW MONITORING WELL
-  DEEP MONITORING WELL

FIGURE 3.3.2-6.

LOCATION OF GROUNDWATER MONITORING WELLS ON DGS SITE

Sources: FDOT, 2008; GRU, 2009; Genesis, 2009; ECT, 2009.

Table 3.3.2-2. Available Groundwater Data Compared to the Drinking Water Standards—Well DER11T4

Analyte	Unit	Sample Date				Primary Drinking Water Standards
		07/15/08	10/03/08	01/14/09	04/06/09	
AG	µg/L	0.5	0.4	0.4	0.4	
AL	µg/L	83	318	87.7	120	
AS	µg/L	4	4	4	4	10
BA	µg/L	6.2	7.5	6.3	11.4	2,000
BE	µg/L	0.06	0.06	0.06	0.06	4
CA	mg/L	8.5	7.06	7.26	8.22	
CD	µg/L	0.3	0.3	0.3	0.3	5
CL-	mg/L	50	44	45	45	
CO	µg/L	1	1	1	1	
Color	pcu	10	17	13	14	
Conductivity	µS/cm	417.4	407	383.6	388	
CR	µg/L	2.2	2.1	1.8	2.4	100
CU	µg/L	1	1	1	1	
DO	mg/L	0.2	0.5	0.3	0.3	
FE	µg/L	806	571	430	1,150	
Gross alpha	pCi/L	4.9	8	5	12.2	15
HG	µg/L	0.1	0.1	0.1	0.1	2
K	mg/L	0.27	0.3	0.3	0.28	
MG	mg/L	3.23	2.82	2.82	3.07	
MN	µg/L	13	10	9.6	10.1	
MO	µg/L	2	1	1	1	
NA	mg/L	56	60.9	64.4	62.3	160
NI	µg/L	2.4	1	1	1	100
NPDOC	mg/L	16	19	14	16	
PB	µg/L	4	4	4	4	15
PH	s.u.	5.46	5.37	5.39	5.47	
REDOX	mv	42.1	15.4	29.1	-151.7	
SE	µg/L	4	4	4	4	50
SO4_IC	mg/L	80	84	76	72	
SR	µg/L	5.7	4.6	4.5	4.7	
TDS	mg/L	222	256	239	232	
Temperature	°C	24.8	24.7	18.3	19.8	
TSS	mg/L	2.5	2.5	2.5	2.5	
Turbidity	NTU	1	1	1	1	
V	µg/L	3.4	2.7	2.1	2.8	
Well depth	ft	3.07	4.73	4.91	3.33	
ZN	µg/L	2.9	2.2	2.7	2.9	

Note: µg/L = microgram per liter.
 NTU = Nephelometric turbidity units.
 pcu = platinum-cobalt units.
 mv = millivolts.
 ft = foot.

s.u. = standard unit.
 mg/L = milligram per liter.
 pCi/L = picoCurrie per liter.
 °C = degree centigrade.
 µS/cm = microSiemen per centimeter.

Source: ECT, 2009.

Table 3.3.2-3. Available Groundwater Data Compared to the Drinking Water Standards—Well DER10T8

Analyte	Unit	Sample Date				Primary Drinking Water Standards
		07/15/08	10/03/08	01/14/09	04/06/09	
AG	µg/L	0.5	0.4	0.4	0.4	
AL	µg/L	22.2	26.3	14.8	30.9	
AS	µg/L	4	4	4	4	10
BA	µg/L	6.7	7.8	7.2	10.2	2,000
BE	µg/L	0.06	0.06	0.06	0.06	4
CA	mg/L	13.9	15	14.2	15.6	
CD	µg/L	0.3	0.3	0.3	0.3	5
CL-	mg/L	5.6	5.5	3.9	4.5	
CO	µg/L	1	1	1	1	
Color	pcu	5	5	5	6	
Conductivity	µS/cm	119.8	117	112.9	123.4	
CR	µg/L	1	1	1	1	100
CU	µg/L	1	1	1	1	
DO	mg/L	4.3	0.3	0.4	0.2	
FE	µg/L	4.4	28.4	171	330	
Gross alpha	pCi/L	0.2	7.3	6.1	1	15
HG	µg/L	0.1	0.1	0.1	0.1	2
K	mg/L	0.234	0.3	0.22	0.17	
MG	mg/L	2.54	2.97	2.7	2.94	
MN	µg/L	8.6	11.9	13.6	16.7	
MO	µg/L	2	1	1	1	
NA	mg/L	2.7	2.68	3.73	2.14	160
NI	µg/L	1	1	1	1	100
NPDOC	mg/L	1.8	1.9	1.9	2.2	
PB	µg/L	4	4	4	4	15
PH	s.u.	5.7	5.36	5.45	5.47	
REDOX	mv	507.7	89	17	-139.2	
SE	µg/L	4	4	4	4	50
SO4_IC	mg/L	20	21	21	19	
SR	µg/L	8.5	9.9	10	10.9	
TDS	mg/L	65	66	63	72	
Temperature	°C	24.5	25.6	19.5	17.4	
TSS	mg/L	2.5	2.5	2.5	2.5	
Turbidity	NTU	1	1	1	1	
V	µg/L	28.4	12.6	1.5	1	
Well depth	ft	4.55	7.43	6.53	5.4	
ZN	µg/L	3.5	3.3	6.9	3	

Note: µg/L = microgram per liter.
 NTU = Nephelometric turbidity units.
 pcu = platinum-cobalt units.
 mv = millivolts.
 ft = foot.

s.u. = standard unit.
 mg/L = milligram per liter.
 pCi/L = picoCurrie per liter.
 °C = degree centigrade.
 µS/cm = microSiemen per centimeter.

Source: ECT, 2009.

Table 3.3.2-4. Available Groundwater Data Compared to the Drinking Water Standards—Well DER9T5

Analyte	Unit	Sample Date				Primary Drinking Water Standards
		07/15/08	10/03/08	01/14/09	04/06/09	
AG	µg/L	0.5	0.4	0.4	0.4	
AL	µg/L	23.3	35.3	1	13.5	
AS	µg/L	4	4	4	4	10
BA	µg/L	25.2	21	20.4	21.3	2,000
BE	µg/L	0.06	0.06	0.06	0.06	4
CA	mg/L	11.3	10.3	13.9	11.3	
CD	µg/L	0.3	0.3	0.3	0.3	5
CL-	mg/L	25	22	17	10	
CO	µg/L	1	1	1	1	
Color	pcu	5	5	5	11	
Conductivity	µS/cm	223	205.6	160.7	145.5	
CR	µg/L	1	1	1	1	100
CU	µg/L	1	1	1	1	
DO	mg/L	0.2	0.4	1.1	0.2	
FE	µg/L	1,520	1,600	1,200	2,010	
Gross alpha	pCi/L	3.6	4.9	5.3	3.4	15
HG	µg/L	0.1	0.1	0.1	0.1	2
K	mg/L	4.1	4.25	3.11	2.65	
MG	mg/L	2.78	2.9	3.08	2.6	
MN	µg/L	29.3	22.9	22.8	24	
MO	µg/L	2	1	1	1	
NA	mg/L	20.6	19.8	13.9	5.89	160
NI	µg/L	1	1	1	1	100
NPDOC	mg/L	3.3	3.7	3	3.4	
PB	µg/L	4	4	4	4	15
PH	s.u.	5.57	5.34	5.61	5.57	
REDOX	mv	68.5	-6.9	62.7	18.6	
SE	µg/L	4	4	4	4	50
SO4_IC	mg/L	12	20	12	12	
SR	µg/L	71.3	65.7	74.6	58.6	
TDS	mg/L	117	108	83	86	
Temperature	°C	27	25	16.9	17.3	
TSS	mg/L	2.5	2.5	2.5	2.5	
Turbidity	NTU	1	1	1	1	
V	µg/L	2	1	1	1	
Well depth	ft	4.52	5.64	6.07	4.58	
ZN	µg/L	3.1	2.6	4.8	3.9	

Note: µg/L = microgram per liter.
 NTU = Nephelometric turbidity units.
 pcu = platinum-cobalt units.
 mv = millivolts.
 ft = foot.

s.u. = standard unit.
 mg/L = milligram per liter.
 pCi/L = picoCurrie per liter.
 °C = degree centigrade.
 µS/cm = microSiemen per centimeter.

Source: ECT, 2009.

Table 3.3.2-5. Available Groundwater Data Compared to the Drinking Water Standards—Well DER7T2

Analyte	Unit	Sample Date				Primary Drinking Water Standards
		07/15/08	10/03/08	01/14/09	04/06/09	
AG	µg/L	0.5	0.4	0.4	0.4	
AL	µg/L	91.9	130	81.7	122	
AS	µg/L	4	4	4	4	10
BA	µg/L	87.8	46.7	22.3	88.7	2,000
BE	µg/L	0.06	0.06	0.06	0.06	4
CA	mg/L	32.2	19.6	16.1	57.7	
CD	µg/L	0.3	0.3	0.3	0.3	5
CL-	mg/L	200	140	18	220	
CO	µg/L	1	1	1	1	
Color	pcu	5	32	30	47	
Conductivity	µS/cm	908	590	166.9	975	
CR	µg/L	1	3.5	3	1	100
CU	µg/L	1	1	1	1	
DO	mg/L	1.4	0.3	0.4	1	
FE	µg/L	431	8,000	4,000	1,340	
Gross alpha	pCi/L	2.6	4.3	1.1	3.3	15
HG	µg/L	0.1	0.1	0.1	0.1	2
K	mg/L	0.19	0.6	0.17	0.57	
MG	mg/L	11	8.92	4.21	19.7	
MN	µg/L	7.2	12.1	6	10.7	
MO	µg/L	2	1	1	1.5	
NA	mg/L	70.8	69.4	13.5	101	160
NI	µg/L	1	2.9	1	1	100
NPDOC	mg/L	3.5	12	9.3	18	
PB	µg/L	4	4	4	4	15
PH	s.u.	5.1	5.36	5.8	5.84	
REDOX	mv	487	7	78.5	219.7	
SE	µg/L	4	4	4	4	50
SO4_IC	mg/L	4,700	20	16	62	
SR	µg/L	122	76.6	52.9	235	
TDS	mg/L	395	362	105	551	
Temperature	°C	26.6	24.6	18.2	17.9	
TSS	mg/L	2.5	2.5	2.5	2.5	
Turbidity	NTU	1	1	2.87	1	
V	µg/L	2	1	1	2.8	
Well depth	ft	3.75	5.22	5.96	2.93	
ZN	µg/L	1,180	125	212	1,540	

Note: µg/L = microgram per liter.
 NTU = Nephelometric turbidity units.
 pcu = platinum-cobalt units.
 mv = millivolts.
 ft = foot.

s.u. = standard unit.
 mg/L = milligram per liter.
 pCi/L = picoCurrie per liter.
 °C = degree centigrade.
 µS/cm = microSiemen per centimeter.

Source: ECT, 2009.

Table 3.3.2-6. Available Groundwater Data Compared to the Drinking Water Standards—Well DER6T8

Analyte	Unit	Sample Date				Primary Drinking Water Standards
		07/15/08	10/03/08	01/14/09	04/06/09	
AG	µg/L	0.5	0.4	0.4	0.4	
AL	µg/L	365	1,830	32.1	1,560	
AS	µg/L	4	4	4	4	10
BA	µg/L	11.6	14	19.3	16.6	2,000
BE	µg/L	0.06	0.06	0.06	0.06	4
CA	mg/L	22.4	28.7	61.4	19.4	
CD	µg/L	0.3	0.3	0.3	0.3	5
CL-	mg/L	10	11	9.2	9.7	
CO	µg/L	1	1	1.7	1	
Color	pcu	17	50	12	55	
Conductivity	µS/cm	273.7	286.9	568	194.6	
CR	µg/L	7.6	2.1	1	3.6	100
CU	µg/L	1	1	1	1	
DO	mg/L	4.2	0.6	0.7	3.2	
FE	µg/L	316	1,510	386	1,850	
Gross alpha	pCi/L	0.8	6	3.5	4.8	15
HG	µg/L	0.1	0.1	0.1	0.1	2
K	mg/L	0.17	0.38	0.17	0.65	
MG	mg/L	12.7	17.2	36.9	10.2	
MN	µg/L	2.9	31.8	82.8	18.7	
MO	µg/L	2	1	1	1	
NA	mg/L	8.02	8.2	15.2	7.23	160
NI	µg/L	7.3	2	1	1.9	100
NPDOC	mg/L	6.9	7.5	2.6	15	
PB	µg/L	4	4	4	4	15
PH	s.u.	6.39	6.38	6.77	6.04	
REDOX	mv	238	162.8	99.9	132.5	
SE	µg/L	4	4	4	4	50
SO4_IC	mg/L	11	6	1.2	4.4	
SR	µg/L	31.9	43.9	94.7	29.6	
TDS	mg/L	140	182	293	127	
Temperature	°C	28.1	26.1	15.5	21	
TSS	mg/L	2.5	14	2.5	15.7	
Turbidity	NTU	2.7	15.6	1.1	11.3	
V	µg/L	3.2	1.8	1	3.3	
Well depth	ft	2.73	2.96	6.2	2.38	
ZN	µg/L	3.5	5.8	4.5	3.3	

Note: µg/L = microgram per liter.
 NTU = Nephelometric turbidity units.
 pcu = platinum-cobalt units.
 mv = millivolts.
 ft = foot.

s.u. = standard unit.
 mg/L = milligram per liter.
 pCi/L = picoCurrie per liter.
 °C = degree centigrade.
 µS/cm = microSiemen per centimeter.

Source: ECT, 2009.

Table 3.3.2-7. Available Groundwater Data Compared to the Drinking Water Standards—Well DER6T1

Analyte	Unit	Sample Date				Primary Drinking Water Standards
		07/15/08	10/03/08	01/14/09	04/06/09	
AG	µg/L	0.5	0.4	0.4	0.4	
AL	µg/L	144	113	83.2	114	
AS	µg/L	4	4	4	4	10
BA	µg/L	10.4	9.1	7.7	13.1	2,000
BE	µg/L	0.06	0.06	0.06	0.06	4
CA	mg/L	3.14	2.26	2.81	3.84	
CD	µg/L	0.3	0.3	0.3	0.3	5
CL-	mg/L	20	17	19	13	
CO	µg/L	1	1	1	1	
Color	pcu	5	5	5	7	
Conductivity	µS/cm	88	96.2	96.9	83.2	
CR	µg/L	1	1	1	1	100
CU	µg/L	1	1	1	1	
DO	mg/L	0.3	0.3	0.2	0.2	
FE	µg/L	219	119	129	212	
Gross alpha	pCi/L	0	1.3	0.6	0	15
HG	µg/L	0.1	0.1	0.1	0.1	2
K	mg/L	0.01	0.05	0.05	0.03	
MG	mg/L	1	0.61	0.86	0.76	
MN	µg/L	1.8	1	1	1.2	
MO	µg/L	2	1	1	1	
NA	mg/L	8.3	12.8	19.5	9.4	160
NI	µg/L	1.6	1	1	1	100
NPDOC	mg/L	0.75	0.96	1.1	1.1	
PB	µg/L	4	4	4	4	15
PH	s.u.	5.2	5.29	5.21	5.31	
REDOX	mv	243.5	133.9	147	139.3	
SE	µg/L	4	4	4	4	50
SO4_IC	mg/L	1.2	9	7.1	7.2	
SR	µg/L	4.7	3.1	3.8	3.7	
TDS	mg/L	30	45	43	45	
Temperature	°C	24.8	25.6	19.1	20.1	
TSS	mg/L	2.5	2.5	2.5	2.5	
Turbidity	NTU	1	1	1	1	
V	µg/L	2	1	1	1	
Well depth	ft	6.38	6.38	7.58	4.78	
ZN	µg/L	4.3	3.6	4	4.2	

Note: µg/L = microgram per liter.
 NTU = Nephelometric turbidity units.
 pcu = platinum-cobalt units.
 mv = millivolts.
 ft = foot.

s.u. = standard unit.
 mg/L = milligram per liter.
 pCi/L = picoCurrie per liter.
 °C = degree centigrade.
 µS/cm = microSiemen per centimeter.

Source: ECT, 2009.

Table 3.3.2-8. Available Groundwater Data Compared to the Drinking Water Standards—Well DER6T4

Analyte	Unit	Sample Date				Primary Drinking Water Standards
		07/15/08	10/03/08	01/14/09	04/06/09	
AG	µg/L	0.5	0.4	0.4	0.4	
AL	µg/L	650	971	290	1,650	
AS	µg/L	4	4	4	4	10
BA	µg/L	31.7	26.1	29.7	29.4	2,000
BE	µg/L	0.06	0.06	0.06	0.13	4
CA	mg/L	61.9	56.9	69.9	58.7	
CD	µg/L	0.3	0.3	0.3	0.3	5
CL-	mg/L	150	150	130	210	
CO	µg/L	1	1.5	1	2.9	
Color	pcu	13	12	10	12	
Conductivity	µS/cm	877	2,248	2,069	3,802	
CR	µg/L	1	1.6	1	1.5	100
CU	µg/L	1.2	1	1	1	
DO	mg/L	1.4	0.2	0.4	0.2	
FE	µg/L	4,500	10,700	2,700	8,800	
Gross alpha	pCi/L	41	24	12.3	22	15
HG	µg/L	0.1	0.1	0.1	0.1	2
K	mg/L	15.2	5.75	10.1	12.9	
MG	mg/L	24.5	34.3	28.1	37.4	
MN	µg/L	31.8	62	33.2	55	
MO	µg/L	10.7	1	2.9	1	
NA	mg/L	656	337	414	735	160
NI	µg/L	11.6	9.7	7.4	12.8	100
NPDOC	mg/L	10	10	7.8	13	
PB	µg/L	4	4	4	4	15
PH	s.u.	5.99	4.89	5.93	5.3	
REDOX	mv	7.7	11.5	92.8	-14.1	
SE	µg/L	4	4	4	4	50
SO4_IC	mg/L	1,200	890	890	1,600	
SR	µg/L	367	198	454	270	
TDS	mg/L	2,190	1,820	1,790	2,750	
Temperature	°C	26.1	24.3	18.1	18.5	
TSS	mg/L	2.5	2.5	2.5	2.5	
Turbidity	NTU	1.78	9.76	1	1	
V	µg/L	31.5	35.6	16.5	46.5	
Well depth	ft	2.98	4.28	3.23	3.49	
ZN	µg/L	4.9	8.2	4.2	5.4	

Note: µg/L = microgram per liter.
 NTU = Nephelometric turbidity units.
 pcu = platinum-cobalt units.
 mv = millivolts.
 ft = foot.

s.u. = standard unit.
 mg/L = milligram per liter.
 pCi/L = picoCurrie per liter.
 °C = degree centigrade.
 µS/cm = microSiemen per centimeter.

Source: ECT, 2009.

Table 3.3.2-9. Available Groundwater Data Compared to the Drinking Water Standards—Well DER4T5

Analyte	Unit	Sample Date				Primary Drinking Water Standards
		07/15/08	10/03/08	01/14/09	04/06/09	
AG	µg/L	0.5	0.4	0.4	0.4	
AL	µg/L	202	234	96.4	168	
AS	µg/L	4	4	4	4	10
BA	µg/L	20.7	21.4	15.7	22.9	2,000
BE	µg/L	0.06	0.06	0.06	0.06	4
CA	mg/L	67.4	79	75.7	93.1	
CD	µg/L	4.6	2.3	1	1.2	5
CL-	mg/L	9.5	5.5	8.3	3.7	
CO	µg/L	1	1	1	1	
Color	pcu	160	150	60	90	
Conductivity	µS/cm	716	637	545	676	
CR	µg/L	1	1.8	1	1.6	100
CU	µg/L	1	1	1	1	
DO	mg/L	0.2	0.2	0.3	0.3	
FE	µg/L	63,800	35,000	20,000	31,300	
Gross alpha	pCi/L	1.5	3.7	1.6	1.6	15
HG	µg/L	0.1	0.1	0.1	0.1	2
K	mg/L	0.8	1.21	0.59	0.81	
MG	mg/L	22.6	18.7	17.6	25	
MN	µg/L	146	121	103	139	
MO	µg/L	2	1	1	1	
NA	mg/L	17.4	14.9	12.9	13.1	160
NI	µg/L	1	1	1	1	100
NPDOC	mg/L	49	46	20	38	
PB	µg/L	4	4	4	4	15
PH	s.u.	6.07	5.57	5.94	6.06	
REDOX	mv	-7.1	-32.6	2.2	-53.8	
SE	µg/L	4	4	4	4	50
SO4_IC	mg/L	0.055	0.055	9.6	5.3	
SR	µg/L	65.7	75	68.6	83.6	
TDS	mg/L	458	422	339	430	
Temperature	°C	25.5	24.8	20.7	20.1	
TSS	mg/L	2.5	2.5	2.5	2.5	
Turbidity	NTU	1	1	1.39	1	
V	µg/L	2	1	1	1	
Well depth	ft	9.81	10.68	10.79	10.18	
ZN	µg/L	8.6	8	5.2	6.2	

Note: µg/L = microgram per liter.
 NTU = Nephelometric turbidity units.
 pcu = platinum-cobalt units.
 mv = millivolts.
 ft = foot.

s.u. = standard unit.
 mg/L = milligram per liter.
 pCi/L = picoCurrie per liter.
 °C = degree centigrade.
 µS/cm = microSiemen per centimeter.

Source: ECT, 2009.

Table 3.3.2-10. Available Groundwater Data Compared to the Drinking Water Standards—Well DER3T7

Analyte	Unit	Sample Date				Primary Drinking Water Standards
		07/15/08	10/03/08	01/14/09	04/06/09	
AG	µg/L	0.5	0.4	0.4	0.4	
AL	µg/L	39.9	30.6	1	5.5	
AS	µg/L	4	4	4	4	10
BA	µg/L	6.2	4.1	4.6	13.3	2,000
BE	µg/L	0.06	0.06	0.06	0.06	4
CA	mg/L	36.6	27.1	28.2	74.4	
CD	µg/L	0.3	0.3	0.3	0.3	5
CL-	mg/L	15	18	15	100	
CO	µg/L	1	1	1	1	
Color	pcu	15	15	10	17	
Conductivity	µS/cm	398.1	497	359.8	1204	
CR	µg/L	1	1	1	1	100
CU	µg/L	1	1	1	1	
DO	mg/L	1.1	0.4	1.8	1.3	
FE	µg/L	353	4,100	4,100	1,220	
Gross alpha	pCi/L	1.2	7.8	1.5	0.8	15
HG	µg/L	0.1	0.1	0.1	0.1	2
K	mg/L	3.42	1.79	1.21	4.82	
MG	mg/L	6.36	6.19	5.94	16.3	
MN	µg/L	15.8	47.6	39	25	
MO	µg/L	10.3	1.4	1.5	15.5	
NA	mg/L	32.3	56	40	153	160
NI	µg/L	3.6	7.2	4.6	7.3	100
NPDOC	mg/L	4.1	2.8	2.1	4.4	
PB	µg/L	4	4	4	4	15
PH	s.u.	6.47	6.02	6.13	6.22	
REDOX	mv	174.5	-16.4	38.1	136.5	
SE	µg/L	4	4	4	4	50
SO4_IC	mg/L	65	110	55	340	
SR	µg/L	189	156	149	340	
TDS	mg/L	241	295	205	774	
Temperature	°C	27.5	25.1	15.9	19.8	
TSS	mg/L	2.5	2.5	2.5	2.5	
Turbidity	NTU	1.81	1	1	1	
V	µg/L	11.5	7.7	6	7.3	
Well depth	ft	1.57	5.23	6.4	3.1	
ZN	µg/L	3.7	5.8	6.9	4.5	

Note: µg/L = microgram per liter.
 NTU = Nephelometric turbidity units.
 pcu = platinum-cobalt units.
 mv = millivolts.
 ft = foot.

s.u. = standard unit.
 mg/L = milligram per liter.
 pCi/L = picoCurrie per liter.
 °C = degree centigrade.
 µS/cm = microSiemen per centimeter.

Source: ECT, 2009.

F.A.C., because DGS is an existing installation as defined in FDEP Rule 62-520.200(10), F.A.C.

GRU's DGS also samples a deep Floridan aquifer supply well No. 4 (location shown on Figure 3.3.2-1 as DWELL) on a quarterly basis for the same set of analytes as the shallow SAS wells. Table 3.3.2-11 shows the results of sampling that well from January 2004 to October 2008. Of all the analytes reported, no analytes exceeded a primary groundwater standard. Thus, the analytical data indicates that the deeper FAS groundwater quality has been within Florida's groundwater quality standards.

The analytical groundwater quality data suggests that the FAS underlying the DGS site is not affected by the levels of certain analytes in the site's shallow groundwater (SAS). This is probably due to the presence of the IAS that effectively separates the SAS from the FAS.

FAS groundwater quality data are also available from two samples collected on May 27, 2009, from the GRU DGS supply well Nos. 2 and 4 to support the GREC SCA efforts. Those samples were analyzed for a wide range of parameters, many of particular interest for systems engineering purposes. Those FAS groundwater quality results are summarized in Tables 3.3.2-12 and 3.3.2-13 for supply well Nos. 2 and 4, respectively. For the parameters analyzed, these results show the water is of potable quality.

FAS groundwater quality data as a function of depth is available from the deep injection test well constructed at the GRU facility in 1977. Select data results for chloride, TDS, and sulfate are summarized in milligrams per liter (mg/L) as a function of depth in ft bls (G/ACRESUB, 1977):

<u>Depth</u>	<u>Chloride</u>	<u>TDS</u>	<u>Sulfate</u>
700	8	338	48
1,000	13	490	115
1,260	74	646	133
1,500	17	583	165
1,600	22	1,514	575
1,776	455	—	575

Table 3.3.2-11. Well No. 4 (DWELL) Sampling Results—January 2004 to October 2008

Sample date: Analyte	MWC-DEEP (DEEP-1) Unit	Primary Drinking Water Standards	01/28/04	04/06/04	07/13/04	10/26/04	01/19/05	04/27/05	07/12/05	10/18/05	01/10/06	05/08/06	07/26/06	10/03/06	01/16/07	04/10/07	07/10/07	10/24/07	01/11/08	04/01/08	07/15/08	10/01/08
			1Q04	2Q04	3Q04	4Q04	1Q05	2Q05	3Q05	4Q05	1Q06	2Q06	3Q06	4Q06	1Q07	2Q07	3Q07	4Q07	1Q08	2Q08	3Q08	4Q08
AG	µg/L		0.7	0.7	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4
AL	µg/L		6	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	10.9
AS	µg/L	10	4	4	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4
BA	µg/L	2,000	11	12.5	13.5	13.4	15.1	14.9	14.8	14.7	12.4	15.3	16.6	14.8	15.7	16.8	14.4	14.7	15.9	16.7	14.7	15.7
BE	µg/L	4	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
CA	mg/L		59.9	66.7	63.5	63	61.9	64.1	63.4	66	60.9	62.5	59.7	50.9	66.5	63.3	64.3	58.6	52.2	65.1	64.7	60.1
CD	µg/L	5	0.5	0.5	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.3	0.3	0.3	0.06	0.3	0.3	0.3	0.3	0.3
CL-	mg/L		9.6	11	10	10	9.6	10	11	10	10	10	9.5	9.4	9.6	10	9.8	9.4	9.8	9.7	9.1	9.4
CO	µg/L		2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Color	pcu		4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Conductivity	µS/cm		478	513	471.3	481	473.5	479.5	464	473.5	481	478	470.4	471.5	485.3	507	472	452	484.5	503	475.9	477
CR	µg/L	100	4	4	2	2	2	2	2	1	2	2	2	1	1	1	1	1	1	1	1	1
CU	µg/L		2	4	3	2	2	2	1.1	1.5	1	1.9	1	1	1	8.2	1	1	1	15.5	3.6	1
DO	mg/L		0.18	0.27	0.25	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
FE	µg/L		20	74	28	25	14.2	13	15.1	19.9	12.8	21.2	10.4	14.1	33.9	72.4	14.9	12.3	9.8	51	22.6	19.8
Gross alpha	pCi/L	15	3.9	4.8	5.8	5.7	7.1	3.5	4.2	4.5	4.4	3.4	5.2	1.4	4.6	2.9	2.3	3.2	5.3	3.4	2.5	3
HG	µg/L	2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
K	mg/L		0.94	0.87	0.79	0.69	0.691	0.739	0.857	0.777	0.821	0.89	0.79	0.741	0.857	0.968	0.857	0.811	0.806	0.87	0.72	0.86
MG	mg/L		22.7	25.2	22.3	21.4	21.2	22.1	21.2	21.4	21.4	20.2	20.3	19	23.4	22.3	22.1	20	18.2	21.7	20.9	21.6
MN	µg/L		5	11	7	7	6.9	7	7.8	7.8	6.8	7.6	6.4	6.5	8.7	7.2	7.3	7.2	6.9	9.2	7.6	7.7
MO	µg/L		4	4	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	1
NA	mg/L	160	7.46	7.77	8.19	7.17	7.34	7.77	9.48	10.3	16.2	15.6	7.72	7.48	8.18	10.3	9.97	9.28	6.87	8.81	7.96	8.27
NI	µg/L	100	4	4	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
PB	µg/L	15	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
PH	s.u.		7.41	7.31	7.32	7.36	6.73	7.4	7.41	7.44	7.43	7.39	7.43	7.42	7.42	7.43	7.4	7.41	7.37	7.38	7.38	7.36
REDOX	mv		-121.3	-126.7	-113.5	-220	-123	-140	-103	-95.4	-127.9	-108	-128	-249.6	-165.4	-71.9	-153	135.7	-114.2	-104.2	-97	-138.6
SE	µg/L	50	6	6	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
SO4	mg/L		45	60	47	47	43	44	48	46	47	47	41	42	45	51	41	41	44	50	42	44
SR	µg/L		1040	1340	1080	1110	1080	1050	1070	1050	1130	1140	1043	990	1140	1280	1080	1120	1080	1240	1120	1090
TDS	mg/L		289	329	273	295	300	302	292	356	311	306	301	289	272	305	273	278	298	290	262	295
Temperature	°C		22.6	22.5	23.3	22.5	21.9	22.6	22.8	22.9	22.2	23	23.2	22.4	22.6	22.3	22.9	22.7	22.5	22.8	23.6	23.3
TSS	mg/L		2.3	2.3	2.3	2.7	2.7	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Turbidity	ntu		1	1.22	1	0	1	1	0.28	1	1	1	1	1	1	1.09	1	1	1	1	1	1
V	µg/L		4	4	2	2	2	2	1	1	1	1	1	2	2	2	2	2	2	2	2	1
ZN	µg/L		2	2	1	1	1.3	3	3.1	2.3	3.4	1	3.9	2.5	6.1	3.8	1	1	1	4.3	5.4	2.8
NO3-NO2	µg/L		0.110	0.013	0.006	0.004	0.005	0.005	0.005	0.005	0.019	0.005	0.005	0.005	0.005	0.008	0.011	0.011	0.032	0.008	0.025	0.025

Note: NS = no standard.
 µg/L = microgram per liter.
 NTU = Nephelometric turbidity unit.
 pcu = platinum-cobalt unit.
 mv = millivolt.
 ft = foot.

s.u. = standard unit.
 mg/L = milligram per liter.
 pCi/L = picoCurie per liter.
 °C = degree Centigrade.
 µS/cm = microSiemen per centimeter.

Source: GRU, 2009.

Table 3.3.2-12. FAS Groundwater Quality Results—GRU DGS Supply Well No. 2

Parameter	Unit	Result	Primary Standard	Secondary Standard
Classicals				
5-day biochemical oxygen demand (BOD ₅)	mg/L	2.0 U		
Alkalinity, total (M alkalinity)	mg/L	186		
Ammonia, total as N	mg/L	0.125		
Bicarbonate alkalinity (P alkalinity)	mg/L	186		
Chemical oxygen demand (COD)	mg/L	6 U		
Chloride	mg/L	10		250
Color	cpu	5		15
Fecal coliform	col/100 mL	1 U		
Fluoride	mg/L	0.40	4.0	2.0
Hardness, noncarbonate	mg/L	74		
Hardness, total as CaCO ₃	mg/L	260		
Nitrate, total as NO ₃	mg/L	0.1 U	10	
Nitrite	mg/L	0.1	1	
Nitrogen, Kjeldahl	mg/L	0.09 I		
Nitrogen, total organic	mg/L	0.080 U		
Odor	t.o.n.	3,250		3
Oil & grease	mg/L	2.3		
pH	s.u.	7.2		6.5 to 8.5
Phosphate as PO ₄	mg/L	0.022		
Phosphorus, total	mg/L	0.022		
Potassium, total	mg/L	0.91		
Specific conductance	uS/cm	483		
Sulfate	mg/L	50.0		250
Sulfide	mg/L	0.49		
Sulfites	mg/L	2.0		
Surfactants	mg/L	0.0561		
TDS	mg/L	303		500
Total organic carbon (TOC)	mg/L	1.0 I		
TSS	mg/L	3.0		
Metals				
Aluminum	mg/L	0.061 U		0.2
Antimony	mg/L	0.00027 I	0.006	
Arsenic	mg/L	0.0013	0.010	
Barium	mg/L	0.014	2.0	
Beryllium	mg/L	0.00013 U	0.004	
Cadmium, total	mg/L	0.000084 U	0.005	
Chromium, total	mg/L	0.00021 U	0.1	
Copper, total	mg/L	0.00019 U		1
Cyanide	mg/L	0.005 U	0.2	
Hexavalent chromium	mg/L	0.004 U		
Iron	mg/L	0.038 U		0.3
Lead, total	mg/L	0.00012 I	0.015	
Magnesium	mg/L	22		
Manganese	mg/L	0.0075		0.05

Table 3.3.2-12. FAS Groundwater Quality Results—GRU DGS Supply Well No. 2 (Continued,
Page 2 of 2)

Parameter	Unit	Result	Primary Standard	Secondary Standard
Mercury (low level method)	mg/L	0.0 U	0.002	
Molybdenum	mg/L	0.0041		
Nickel, total	mg/L	0.00027 I	0.1	
Selenium	mg/L	0.00084 U	0.05	
Silver, total	mg/L	0.000086 I		0.1
Sodium	mg/L	9.3 V	160	
Thallium	mg/L	0.000044 U	0.002	
Trivalent chromium	mg/L	0.00021 U		
Vanadium	mg/L	0.00025 I		
Zinc, total	mg/L	0.012 V		5
Other Parameters				
Boron	mg/L	0.029		
Calcium as CaCO ₃	mg/L	65		
Gross alpha	pCi/L	3.5	15	
Radium 226	pCi/L	1.4		
Radium 228	pCi/L	0.9 U		
Silica, dissolved	mg/L	25.9		
Strontium	mg/L	1.3		

Note: U = Compound analyzed for but not detected.

I = Value is between the laboratory method detection limit and the laboratory practical quantitation limit.

V = Method blank contamination.

Note: mg/L = milligram per liter.

cpu = color units.

col/100 mL = colony per 100 milliliters.

t.o.n. = threshold odor number.

s.u. = standard unit.

μS/cm = microSiemen per centimeter.

pCi/L = picoCuries per liter.

Sources: Advanced Environmental Laboratories, Inc., 2009.
ECT, 2009.

Table 3.3.2-13. FAS Groundwater Quality Results—GRU DGS Supply Well No. 4

Parameter	Unit	Result	Primary Standard	Secondary Standard
Classicals				
5-day biochemical oxygen demand (BOD ₅)	mg/L	2.0 U		
Alkalinity, total (M alkalinity)	mg/L	194		
Ammonia, total as N	mg/L	0.119		
Bicarbonate alkalinity (P alkalinity)	mg/L	194		
Chemical oxygen demand (COD)	mg/L	6 U		
Chloride	mg/L	10		250
Color	cpu	5		15
Fecal coliform	col/100 mL	1 U		
Fluoride	mg/L	0.42	4.0	2.0
Hardness, noncarbonate	mg/L	56		
Hardness, total as CaCO ₃	mg/L	250		
Nitrate, total as NO ₃	mg/L	0.1 U	10	
Nitrite	mg/L	0.1	1	
Nitrogen, Kjeldahl	mg/L	0.081		
Nitrogen, total organic	mg/L	0.080 U		
Odor	t.o.n.	2,050		3
Oil & grease	mg/L	1.4 U		
pH	s.u.	7.2		6.5 to 8.5
Phosphate as PO ₄	mg/L	0.022		
Phosphorus, total	mg/L	0.035		
Potassium, total	mg/L	0.89		
Specific conductance	uS/cm	463		
Sulfate	mg/L	45.0		250
Sulfide	mg/L	0.71		
Sulfites	mg/L	2.0 U		
Surfactants	mg/L	0.0521		
TDS	mg/L	291		500
Total organic carbon (TOC)	mg/L	1.0 I		
TSS	mg/L	2.0		
Metals				
Aluminum	mg/L	0.061 U		0.2
Antimony	mg/L	0.00020 I	0.006	
Arsenic	mg/L	0.0014	0.010	
Barium	mg/L	0.014	2.0	
Beryllium	mg/L	0.00013 U	0.004	
Cadmium, total	mg/L	0.000084 U	0.005	
Chromium, total	mg/L	0.00021 U	0.1	
Copper, total	mg/L	0.0046		1
Cyanide	mg/L	0.005 U	0.2	
Hexavalent chromium	mg/L	0.004 U		
Iron	mg/L	0.038 U		0.3
Lead, total	mg/L	0.000070 U	0.015	
Magnesium	mg/L	22		
Manganese	mg/L	0.0076		0.05

Table 3.3.2-13. FAS Groundwater Quality Results—GRU DGS Supply Well No. 4 (Continued,
Page 2 of 2)

Parameter	Unit	Result	Primary Standard	Secondary Standard
Mercury (low level method)	mg/L	0.0000008 U	0.002	
Molybdenum	mg/L	0.0041 U		
Nickel, total	mg/L	0.00043 I	0.1	
Selenium	mg/L	0.00084 U	0.05	
Silver, total	mg/L	0.000048 I		0.1
Sodium	mg/L	9.0 V	160	
Thallium	mg/L	0.000044 U	0.002	
Trivalent chromium	mg/L	0.00021 U		
Vanadium	mg/L	0.00050 I		
Zinc, total	mg/L	0.012 V	§	5
Other Parameters				
Boron	mg/L	0.028		
Calcium as CaCO ₃	mg/L	65		
Gross alpha	pCi/L	3.5	15	
Radium 226	pCi/L	1.6		
Radium 228	pCi/L	0.8 U		
Silica, dissolved	mg/L	24.9		
Strontium	mg/L	1.2		

Note: U = Compound analyzed for but not detected.

I = Value is between the laboratory method detection limit and the laboratory practical quantitation limit.

V = Method blank contamination.

Note: mg/L = milligram per liter.

cpu = color units.

col/100 mL = colony per 100 milliliters.

t.o.n. = threshold odor number.

s.u. = standard unit.

μS/cm = microSiemen per centimeter.

pCi/L = picoCuries per liter.

Sources: Advanced Environmental Laboratories, Inc., 2009.
ECT, 2009.

The base of the FAS occurs at a depth of 1,550 ft bls. That depth corresponds with the top of the Cedar Keys formation that is part of the SFCU (Schneider *et al.*, 2008). SRWMD has defined *fresh water* as an aqueous solution with a chloride concentration equal to or less than 250 mg/L. On that basis, the entire thickness of the FAS is considered fresh water at the GREC Site. Nevertheless, a TDS concentration exceeding 500 mg/L is generally considered to be nonpotable water. On that basis, the FAS water appears to remain potable to a depth of approximately 1,000 ft bls, and nonpotable from 1,000 to 1,550 ft bls. Water quality in the underlying SFCU deteriorates quickly as a function of depth, due to the presence of minerals such as gypsum and anhydrite in the Cedar Keys formation.

3.3.2.2 Karst Hydrogeology

The entire state of Florida is underlain by a continuous sequence of carbonate-based sedimentary units (i.e., limestones and dolomites). These sedimentary rocks are typically weathered by acidic rainfall percolating through its natural porous features as groundwater. One effect of the passage of groundwater through limestone is the dissolution and development of secondary porosity in the rock in the form of cavities. Eventually, subsidence, collapse, and/or dissolution result in a distinctive terrain with characteristic relief and drainage features that are known as karst (Bloom, 1978).

The GREC Site is located within a geomorphologic sub-district that has been mapped and referred to as the Alachua Karst Hills (Green *et al.*, 2005). The Alachua Karst Hills area is characterized by land surface elevations typically ranging from 100 to 200 ft or more above sea level, well drained sediments, and features that formed in response to karstification of uplands covered by Hawthorn Group and undifferentiated sediments (Green *et al.*, 2005). However, in contrast to this typical description for the area, the GREC Site soil types are described by USDA (1985) as being nearly level, poorly drained, and somewhat poorly drained soils, as further described in Subsection 3.3.1.3.

Hoenstine and Lane (1991) indicate that the relatively soft and porous limestones that underlie Alachua County have been extremely karstified, and that sinkholes are common features in the Gainesville area.

In Florida in particular, karst is associated with large circular features commonly called sinkholes. Some of those features may appear as circular lakes like those common to Polk and Lake Counties, Florida. Locally, the most impressive sinkhole is the Devil's Millhopper, which is approximately 4 miles due south of the GREC Site (see Figure 3.3.2-1). That major cover-collapse feature developed (in Alachua County) as a result of a complex history (Kuo, 2007). The Hawthorn Group clays and sands (approximately 90 ft thick there) overly the limestones of the Floridan aquifer, and surficial sands and clayey sands overly the Hawthorn Group sediments (approximately 20 to 30 ft thick there). As dissolution of the underlying limestones proceeds and vertical channels are formed in those sediments, the Hawthorn Group sediments may both settle into the channels and form a bridge over those channels. Eventually, a sizable void may develop in the clays that remain overhead from the washing of the clays to fill the channels in the limestone. When the void enlarges so much that it nears the top of the Hawthorn Group sediments, the remaining thin clay roof may suddenly collapse allowing rapid subsidence into the large void (Kuo, 2007).

Sinclair and Stewart (1985) published a map showing the dominant sinkhole types, of which there are three (cover-collapse, cover-subsidence, and solution), across Florida. The dominant types in north-central Alachua County are cover-collapse sinkholes like the Devil's Millhopper. Thus, it is typical for these features to develop over a long period of time without overlying physical evidence of their existence until near the moment of collapse.

ECT personnel have reviewed aerial maps of the Site, and there appears to be no indication of obvious depressional features that signal the initiation of that type of sinkhole. Additionally, Spencer and Lane (1995) listed the reported sinkholes in a county-by-county index with geographical data in latitude-longitude and township, range, section formats. A review of the data for Alachua County from that sinkhole database and a more recent edition downloaded from the Florida Geological Survey's Web site (FDEP, 2009) shows no indexed sinkholes in the GREC Site's township and range of Township 8 south, Range 19 east.

As stated in Subsection 3.3.1.1, the previous site characterization plan for the DGS site (G/ACRESUB, 1977) indicated no faulting has been identified in the area of the Site, which has been occupied by DGS continuously since 1972 without evidence of subsidence due to faulting. However, that site characterization plan stated it is likely that fracture sets exist in the limestones of the underlying Ocala Group. This statement is supported by the following sets of information:

- Vernon (1951) identified regional fracture sets trending northeast-southwest and northwest-southeast that he attributed to tensional stresses associated with the formation of the Ocala Uplift.
- Puri, Yon, and Oglesby (1967, Figure 26) identified a similar pattern to Vernon's (1951, Figure 11) through fracture trace analysis of aerial photographs that showed the fractures trend northeast-southwest and northwest-southeast.
- Nearby Warren's Cave (see location on Figure 3.3.2-1) shows joint-controlled dissolution that can be observed in the overall trends of passage-ways in that dry cave system. Again, those trends are northeast-southwest and northwest-southeast.

Puri, Yon, and Oglesby (1967) inferred from their fracture data that unconsolidated sediments deposited to depths exceeding 50 ft over a previously fractured or slightly faulted area would not reflect the underlying pattern unless there was continued postdepositional movement along the same trends. Considering the thickness of the Hawthorn Group and surficial sediments is greater than 100 ft at the GREC Site, coupled with the lack of historical, observable subsidence and sinkhole activity in the immediate vicinity of the Site, it would seem there is a low probability that a major karst feature (like a potential cover-collapse sinkhole) exists beneath the GREC Site.

Figure 3.3.2-1 is a map showing the elevation of the top of the IAS. As shown, the slope of the underlying clay bed is toward the west at the GREC Site. Those elevation data suggest a relatively smooth sloping surface at the GREC Site; those data do not suggest the presence of any obvious karst depressions or any other such anomalies.

3.3.3 SITE WATER BUDGET AND AREA USERS

3.3.3.1 Site Water Budget

Meteorological data representative of the hydrological characteristics of the Site area were obtained from Southeast Regional Climate Center (SRCC) Web site (SRCC, 2009). These data contain historical monthly average precipitation and temperatures measured at High Springs, Florida, from 1944 to 2008. Monthly average precipitation for the period of record varied from 2.15 (November) to 7.72 inches (August) with an annual average of 52.49 inches. The annual average maximum temperature measured for the same period of record was 81.9 degrees Fahrenheit (°F), and the average annual minimum temperature was 56.7°F. A printout of the monthly and annual maximum and minimum temperatures as well as the total precipitation for that station in High Springs is provided in Appendix 10.7.2.8.

According to Schiffer (1998), annual lake evaporation for the central Florida area was estimated to be approximately 51 inches based on 28 years (1960 through 1988) of pan evaporation data recorded at the Lisbon and Gainesville weather stations. Ms. Schiffer also reported that pan coefficients used to convert pan evaporation data to lake evaporation data were determined by Kohler (1954) in studies completed at Lake Hefner near Lake Okeechobee. A range of 47 to 58 inches was also cited by Schiffer for annual lake evaporation rates based on research in central Florida by others.

Evapotranspiration (ET) is the largest water consumption component in the water budget and is the most difficult to measure. ECT researched ET rates on a similar project in 2006 for the Taylor Energy Center in Taylor County, Florida, and the annual potential ET rate for managed pine forests in north-central Florida and north Florida was cited at 39.3 to 44.1 inches, respectively. The average of the two, 41.7 inches per year that was inferred as the estimated potential ET, will be used herein for the GREC Site.

Streams draining the area of the Site were identified in the DGS SCA (1977) as Turkey, Celson, and Rocky Creeks. However, ECT hydrologists have determined that only the basin for Turkey Creek is affected by the area covered by the GREC Site. Appen-

dix 10.7.2.9 contains a map from the 1977 SCA showing the drainage basins for the creek in the vicinity of the DGS site. A personal communication with a representative from SRWMD indicates that they do not have any gauging stations on those surface water bodies. However, the district representative did provide the table of the available drainage area and discharge measurements (included in Appendix 10.7.2.9) for two of the water bodies as derived by USGS during the time period between 1990 and 1996 (see Appendix 10.7.2.9). Three USGS stations (02320858, 02320870, and 02320873) along Rocky Creek were gauged in 1995 through 1996, and the results were principally dry or no flow for a total drainage basin area of 36.25 square miles (mi²). One USGS station (02322020) along Turkey Creek at Hague, Florida, was gauged during the same time period with a resulting flow range of 0.94 to 1.68 cubic feet per second (cfs). The drainage area for that station accounted for 1.68 mi². That flow rate equates to a range of 7.6 to 13.6 inches of annual surface and subsurface runoff for that watershed that drains at that Turkey Creek gauging station.

SRWMD has computed design rainfall totals for peak storm events that are used in stormwater design and permitting. A copy of those parameters is provided in a table in Appendix 10.7.2.9. The peak discharge calculated from the GREC Site to Turkey Creek would be 171 cfs.

Recharge to the Upper Floridan aquifer in this portion of Alachua County is limited by poorly drained surficial soils and underlying those soils exist approximately 90 ft of confining, clayey beds of the Hawthorn Group. Thus, the recharge rate of 12 inches or less annually from the surficial aquifer to the Upper Floridan aquifer indicated by Grubbs (1998) fits the hydrogeologic profile for the area. The local FAS recharge rate may be approximately 0.7 ft/yr as suggested by SRWMD's calibrated regional groundwater flow model for the area of the Site (Schneider *et al.*, 2008). That rate is consistent with the rate of downward vertical movement of groundwater of 0.6 ft/yr from the SAS, through the IAS, into the FAS as calculated for the GREC Site.

3.3.3.2 Area Uses

Chapter 373.036, F.S., requires that each water management district assess water supplies within its jurisdiction for long range water supply planning. Data for each partial county, of which Alachua County is partially within SRWMD, only include the water use for that portion of the county that is within that district.

Water use within the SRWMD area is analyzed according to six broad categories or types of use, including industrial/commercial/mining/power, agriculture, domestic self-supply, public supply, and recreational/aesthetic (golf course irrigation) (SRWMD, 2004). In 2000, an average of approximately 323 MGD of fresh water was withdrawn within the SRWMD area (Marella, 2004). Approximately 66 percent of this amount was from groundwater sources, with the remainder coming from surface water sources. According to SRWMD (2004), Alachua County is one of the five counties in the SRWMD area with the highest freshwater use. The county used approximately 17.7 MGD of fresh water in the year of 2000.

In Alachua County, increases are expected in all areas of water use between 2000 and 2020, except for recreational use. The following table compares calendar year 2000 water use with the projected 2020 water use for each use category for Alachua County (SRWMD, 2004):

<u>Water Use Category</u>	<u>Water Use 2000 (MGD)</u>	<u>Projected Water Use 2020 (MGD)</u>	<u>Percent Increase (+)/ Decrease (-) from 2000 Water Use</u>
Agricultural	9.3	21.6	+232
Industrial/commercial/ mining/power	3.0	4.7	+57
Public supply (withdrawal)	2.4	3.9	+63
Domestic self-supply	2.8	4.4	+57
Recreational	<u>0.2</u>	<u>0.2</u>	<u>0</u>
Total Water Use	17.7	34.8	+97

Regional groundwater users (within approximately 10 miles of the Site) with average permitted withdrawal rates exceeding 0.5 MGD are shown in Figure 3.3.3-1. Those users and their corresponding permitted withdrawal rates are as follows (SRWMD, 2004):

- Eveready Battery Company—0.5 MGD (facility is currently not operating).
- GRU (DGS [groundwater only])—6.5 MGD.
- University of Florida—2.0 MGD.
- City of Alachua—1.2 MGD.

Table 3.3.3-1 lists the permitted groundwater users located within 1 mile of the GREC Site. Of these users, only DGS has been permitted for average withdrawal rates exceeding 0.5 MGD. Approximately 145 other groundwater wells exist within a 1-mile radius of the Site that use water for a variety of purposes including public supply, domestic or private supply, irrigation, and industrial. Figure 3.3.3-2 provides an approximate location by section for those 146 permitted wells. An evaluation of the local water wells and the well depths (Table 3.3.3-1) suggests that less than 10 percent of these nearby water wells use the IAS, and none use the SAS, while the FAS is used by more than 90 percent of these wells.

3.3.4 SURFICIAL HYDROLOGY

3.3.4.1 Hydrologic Characteristics

Site Location

The GREC Site encompasses approximately 131 acres and is situated approximately 8 miles northwest of downtown Gainesville. The northern boundary of the Site parallels Northwest 128th Lane, whereas the southern boundary runs along U.S. 441 in a northwest-southeast direction (Figure 3.1.1-3). The rural community of Hague lies northwest of the Site. Gainesville is an economic, educational, and governmental focal point of north-central Florida, housing the University of Florida, numerous branches of both state and federal governmental agencies, and various commercial service-oriented businesses and financial institutions. Much of the area near the Site is predominantly agricultural and natural land (G/ACRESUB, 1977).

Table 3.3.3-1. Summary of Permitted Wells Within 1 Mile of the GREC Site Boundaries (Page 1 of 5)

Number	Name	Use	Quarter	Quarter	Section	Casing Diameter (inches)	Casing Depth (ft)	Well Depth (ft)	Wells Present
1	All Pro Fiberglass	Industrial	NE	SE	21	4	165	240	1
2	Andrews Paving Inc.	Irrigation	SW	SE	21	4	160	180	1
3	Bob Bratcher	Private Supply			21	4	105	120	1
4	Buddy Horner	Private Supply			21	4	100	125	1
5	Charles and Colleen Sapp	Private Supply			21	4	126	157	1
6	Cliff Harrell	Private Supply	SW	SW	21	4	160	170	1
7	Cliff Harrell	Private Supply		NE	21	4	180	200	1
8	Contempra Dev. Corp.	Private Supply			21	4	95	155	1
9	Dairy Research Unit/UF	Irrigation			21	4	93	185	1
10	Don Calvert	Private Supply			21	4	98	160	1
11	Donald King	Private Supply			21	4	193	240	1
12	Donald King	Domestic	NW	SW	21	4	106	120	1
13	Edith Riley	Domestic	NW	SW	21	4	78	140	1
14	Edwin Cherena	Domestic	SW	SW	21	4	96	139	1
15	El Don Inc.	Private Supply		SE	21	4	--	150	1
16	F. D. Oliver	Private Supply			21	4			1
17	F. D. Oliver	Private Supply			21	4	102	120	1
18	F. D. Oliver	Private Supply			21	4	100	135	1
19	F. D. Oliver	Private Supply			21	4	72	150	1
20	F. D. Oliver	Private Supply			21	4	72	140	1
21	Home Town Homes	Domestic	SW	SW	21	4	167	180	1
22	House Craft Homes (Parades)	Domestic	NW	SW	21	4	110	130	1
23	Houston Construction	Private Supply			21	4	84	125	1
24	Inez S. McElroy	Private Supply			21	4	145	190	1
25	Jackie English	Private Supply			21	4	105	162	1
26	James Petty	Private Supply			21	4	59	157	1
27	Joe Willis	Private Supply			21	4	100	125	1
28	Joe Willis	Private Supply		NE	21	4	120	180	1
29	Jose E. Vertig	Domestic	SE	SE	21	4	106	170	1
30	Joyner Construction	Private Supply			21	4	115	130	1
31	LaMonta Douglas	Domestic	SW	SW	21	4	95	120	1
32	Lewis Munn	Private Supply		SW	21	2	42	70	1

Table 3.3.3-1. Summary of Permitted Wells Within 1 Mile of the GREC Site Boundaries (Page 2 of 5)

Number	Name	Use	Quarter	Quarter	Section	Casing Diameter (inches)	Casing Depth (ft)	Well Depth (ft)	Wells Present
33	Lonnie Vann	Private Supply		SW	21	2	60	70	1
34	Michael Gillett	Private Supply			21	4	105	145	1
35	Mike Coullais	Private Supply			21	4	95	125	1
36	Mildred Burmann	Private Supply			21	4	145	185	1
37	Oliver Const. Co.	Domestic			21	4	63	100	1
38	Q. N. Riley Jr.	Domestic	SW	SE	21	4	183	200	1
39	Ray Carter	Private Supply			21	4	120	170	1
40	Rick R. Bumpus	Private Supply			21	4	105	150	1
41	Robertson Const. Co.	Private Supply			21	4	95	152	1
42	Ronald Clark Const.	Domestic	SW	SW	21	4	128	160	1
43	S&L Const. Co.	Private Supply			21	4	60	140	1
44	Sara Wright	Domestic	SW	SW	21	4	174	210	1
45	UF/Dept of Ent.&Nem.	Other			21	4	104	188	1
46	Buddy Horner	Private Supply			22	4	104	135	1
47	Larry Cheshire	Private Supply			22	4	110	150	1
48	Gregory Marzak	Private Supply	NW	SE	26	4	200	240	1
49	GRU	Industrial	NW	SW	26	10	2000	3400	1
50	Wallace Cain Realty	Private Supply			26	4	85	150	1
51	Dick McGinley	Private Supply			27	4	62	178	1
52	Jerry Smith	Private Supply			27	4	63	125	1
53	Swiftly Suwannee Convenience Store	Private Supply			27	4	104	168	1
54	Turkey Creek Utilities	Public Supply			27	10	100	300	1
55	Turkey Creek Utilities	Public Supply			27	10	100	300	1
56	Turkey Creek, Inc.	Public Supply	SW	SW	27	10	150	300	1
57	Turkey Creek, Inc.	Public Supply	SW	SW	27	10	150	300	1
58	Turkey Creek, Inc.	Public Supply	SW	SW	27	10	147	300	1
59	Arthur Reed	Private Supply	SE	SW	28	4	103	125	1
60	B&C Crane Service	Public Supply			28	4	72	230	1
61	B&C Crane Service	Irrigation	NW	NE	28	6	40	100	1
62	Betty Seal	Private Supply			28	4	126	170	1
63	Bill Vernon	Private Supply			28	4	59	75	1
64	Dan Strosnider	Private Supply			28	4	107	195	1

Table 3.3.3-1. Summary of Permitted Wells Within 1 Mile of the GREC Site Boundaries (Page 3 of 5)

Number	Name	Use	Quarter	Quarter	Section	Casing Diameter (inches)	Casing Depth (ft)	Well Depth (ft)	Wells Present
65	Darrell Douglas	Domestic	NW	NE	28	4	182	220	1
66	Elanor Robert	Private Supply	SE	NW	28	4	160	200	1
67	Hague Cemetary Assoc.	Irrigation	NW	NE	28	4	189	200	1
68	Hague Methodist Church	Public Supply			28	4	143	200	1
69	Harry Daugherty	Private Supply	SE	NE	28	4	118	140	1
70	Hatch Construction	Private Supply	SE	NW	28	4	180	220	1
71	House Craft Homes	Domestic	NE	NW	28	4	189	200	1
72	House Craft Homes	Domestic/Irrigation	SE	SE	28	4	150	180	1
73	Ivan Park	Private Supply			28	4	60	185	1
74	J. A. Henderson, Jr.	Private Supply	NE	NW	28	4	86.5	168	1
75	J. Douglas	Private Supply			28	4	79	135	1
76	Jerry Sweringen	Private Supply			28	4	62	131	1
77	John V. Smith	Irrigation	SW	SE	28	4	84	125	1
78	John Van Mills	Private Supply			28	4	105	125	1
79	Mid Florida Htg. & A/C	Public Supply			28	4	49	98	1
80	Mid State Const. Prod.	Private Supply			28	4	47	85	1
81	Mike Kelly	Domestic	NW	NW	28	4	149	170	1
82	Nelson Citta	Private Supply			28	4	74	175	1
83	New-Way Construction	Private Supply	NE	NW	28	4	147	240	1
84	Richard McGinly	Public Supply	SE	NE	28	4	160	217	1
85	Richard McGinly	Public Supply	SE	NE	28	4	175	197	1
86	Robert Espenship	Private Supply			28	4	50	66	1
87	Steve O'Grady	Domestic	NE	SW	28	4	126	160	1
88	Turkey Creek Inc.	Irrigation	SE	NW	28	4	168	210	1
89	Turkey Creek Inc.	Irrigation	SW	SE	28	4	147	190	1
90	Turkey Creek Inc.	Public Supply	NE	SW	28	8	97.5	184	1
91	William R. Seaton	Domestic	NW	NW	28	4	153	170	1
92	Fred O. Thomas	Private Supply			33	4	102	140	1
93	Gary Johnson	Private Supply			33	4	79	145	1
94	R. M. Cherry	Private Supply			33	2	30	63	1
95	Allen Stine	Private Supply			34	4	112	150	1
96	American Fence Co.	Private Supply/Industrial			34	4	120	175	1

Table 3.3.3-1. Summary of Permitted Wells Within 1 Mile of the GREC Site Boundaries (Page 4 of 5)

Number	Name	Use	Quarter	Quarter	Section	Casing Diameter (inches)	Casing Depth (ft)	Well Depth (ft)	Wells Present
97	Ann Schmidt	Domestic	SW	NE	34	4	181	220	1
98	Bob McKibben	Private Supply			34	4	95	180	1
99	Carolyn Hopkins	Irrigation	NW	NW	34	4	120	200	1
100	Dale Holt	Private Supply			34	4	139	180	1
101	Dale Holt	Private Supply			34	4	140	185	1
102	Diann Dimitri	Domestic	NW	NW	34	4	154	185	1
103	Donald Lopez	Private Supply	NW	SE	34	4	180	220	1
104	Donald Youngblood	Private Supply			34	4	82	172	1
105	Dr. Charles Guarino	Private Supply			34	4	85	184	1
106	Ed Mendle	Domestic	SW	NE	34	4	180	200	1
107	Edward Prevatt	Private Supply	NW	NE	34	4	185	200	1
108	Eric Williams	Domestic	SW	NE	34	4	189	220	1
109	Erma Chisholm	Private Supply			34	4	83	200	1
110	Fred Lyons	Domestic	SW	SE	34	4	--	180	1
111	General Builders	Private Supply			34	4	42	180	1
112	General Builders	Private Supply			34	4	180	--	1
113	Horne	Private Supply			34	4	125	160	1
114	House Craft (Giambronie)	Domestic	NW	NE	34	4	159	180	1
115	James A. Greenewald	Domestic	NE	NW	34	4	154	200	1
116	Jerry Chisholm	Domestic	SE	NE	34	4	140	178	1
117	Joe Smith	Domestic	NE	NW	34	4	168	200	1
118	John Murphy	Domestic	NW	NW	34	4	92	190	1
119	Juel Schmidt	Private Supply			34	4	158	188	1
120	Kate Ruzicka (Fla. Venture Builders)	Private Supply			34	4	97	180	1
121	Lois Bailey	Domestic	SE	SE	34	4	180	220	1
122	Loyce Jones (Atlantic Design)	Private Supply	NE	NE	34	4	180	220	1
123	Lyle Wilson	Private Supply			34	4	76	200	1
124	Margaret Youngblood	Private Supply			34	4	120	160	1
125	Marshall Stark	Domestic	SW	NE	34	4	167	200	1
126	Marshall Stark	Domestic	SW	NE	34	4	176	200	1
127	McKibben-Banks Const.	Private Supply	NW	SW	34	4	55	160	1
128	McKibben-Banks Const.	Private Supply			34	4	90	185	1

Table 3.3.3-1. Summary of Permitted Wells Within 1 Mile of the GREC Site Boundaries (Page 5 of 5)

Number	Name	Use	Quarter	Quarter	Section	Casing Diameter (inches)	Casing Depth (ft)	Well Depth (ft)	Wells Present
129	Mike Friis	Private Supply	NW	NW	34	4	180	220	1
130	Mike Marks	Private Supply			34	4	153	195	1
131	Olympic Const. Co.	Private Supply			34	4	100	172	1
132	Pamela P. Neff	Domestic	SW	SW	34	4	178	210	1
133	Phil Olin	Private Supply			34	4	71	170	1
134	Randall Flage	Private Supply			34	4	74	200	1
135	Randy Myer	Private Supply			34	4	133	180	1
136	Richard Simmons	Domestic	SW	NE	34	4	157	200	1
137	Robert Luke	Private Supply			34	2	120	150	1
138	Shawn B. Gaston	Domestic	NE	SW	34	4	150	216	1
139	Sun Country Homes	Private Supply			34	4	63	80	1
140	Ted Douglas	Private Supply			34	4	135	165	1
141	W. W. McKibben, Jr.	Private Supply			34	4	95	172	1
142	Wallace Cain	Private Supply			34	4	100	130	1
143	Will Colloto	Domestic	SE	NE	34	4	138	170	1
144	Will Marquis	Private Supply			34	4	135	185	1
145	Randy Law	Private Supply			35	2	85	100	1
146	Robertson Const. Co.	Private Supply			35	4	91	138	1

Source: SRWMD, 2009.

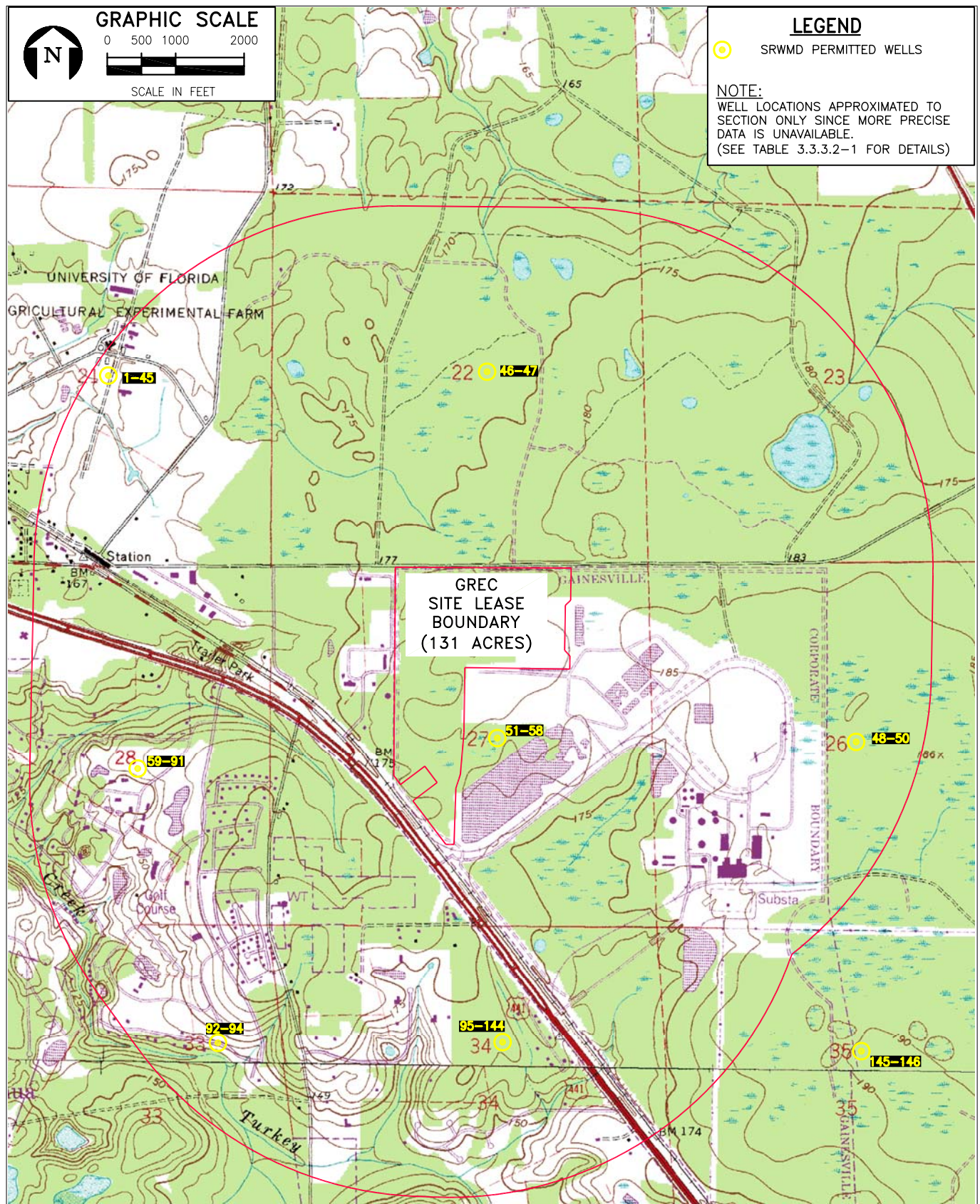


FIGURE 3.3.3-2.

PERMITTED WELLS WITHIN 1-MILE RADIUS OF SITE

Sources: USGS Quads, Alachau and Gainesville West, FL, 1993;
SRWMD, 2009; ECT, 2009.

Regional Land Use

According to 2004 land use data of the St. John River Water Management District (SJRWMD) and SRWMD, the majority of land in the vicinity of the Site is undeveloped or agricultural in nature with scattered concentrations of residential and commercial development. The industrial and commercial development includes the warehouses, commercial industrial park, and retail businesses southeast of the Site. Other major land uses include managed land for pulp and timber production to the north and east of the Site; San Felasco Hammock, a state-owned tract southwest of the Site that is managed as a preservation and conservation area; and the Devil's Millhopper, a state geological site. Most of the area in the vicinity of the Site is covered by coniferous pine, freshwater marshes, wetlands, and wet prairies (G/ACRESUB, 1977).

The following subsections present in detail the surface hydrology of the area in the vicinity of the GREC Site.

Hydrology of the Area

The City of Gainesville and Alachua County lie along a peninsular drainage divide (G/ACRESUB, 1977). The Hatchett Creek Watershed is located east of Gainesville and south of Waldo. It flows south through lakes and creeks to the Oklawaha River and then continues through St. Johns River to the Atlantic. The northern areas of the county generally drain through small surface streams such as Rocky Creek to Santa Fe River, which flows in a westerly direction to Suwannee and then to the Gulf of Mexico (*ibid.*). The GREC Site drains into the Turkey Creek basin on the south (see Figure 3.3.4-1). The northern boundary of the GREC Site is located on the drainage divide between the Turkey Creek and Rocky Creek basins.

Turkey Creek basin is generally aligned in a northwest-southeast direction. Elevations in this basin range from 190 to 80 ft-NGVD. Turkey Creek basin also includes Blues Creek on the south, which serves as a principal drainage path for the south-central one third of this basin, while Turkey Creek and its tributaries drain the northern and eastern one-half. The remaining area drains directly to Sanchez Prairie and Split Rock Sink (G/ACRESUB, 1977).

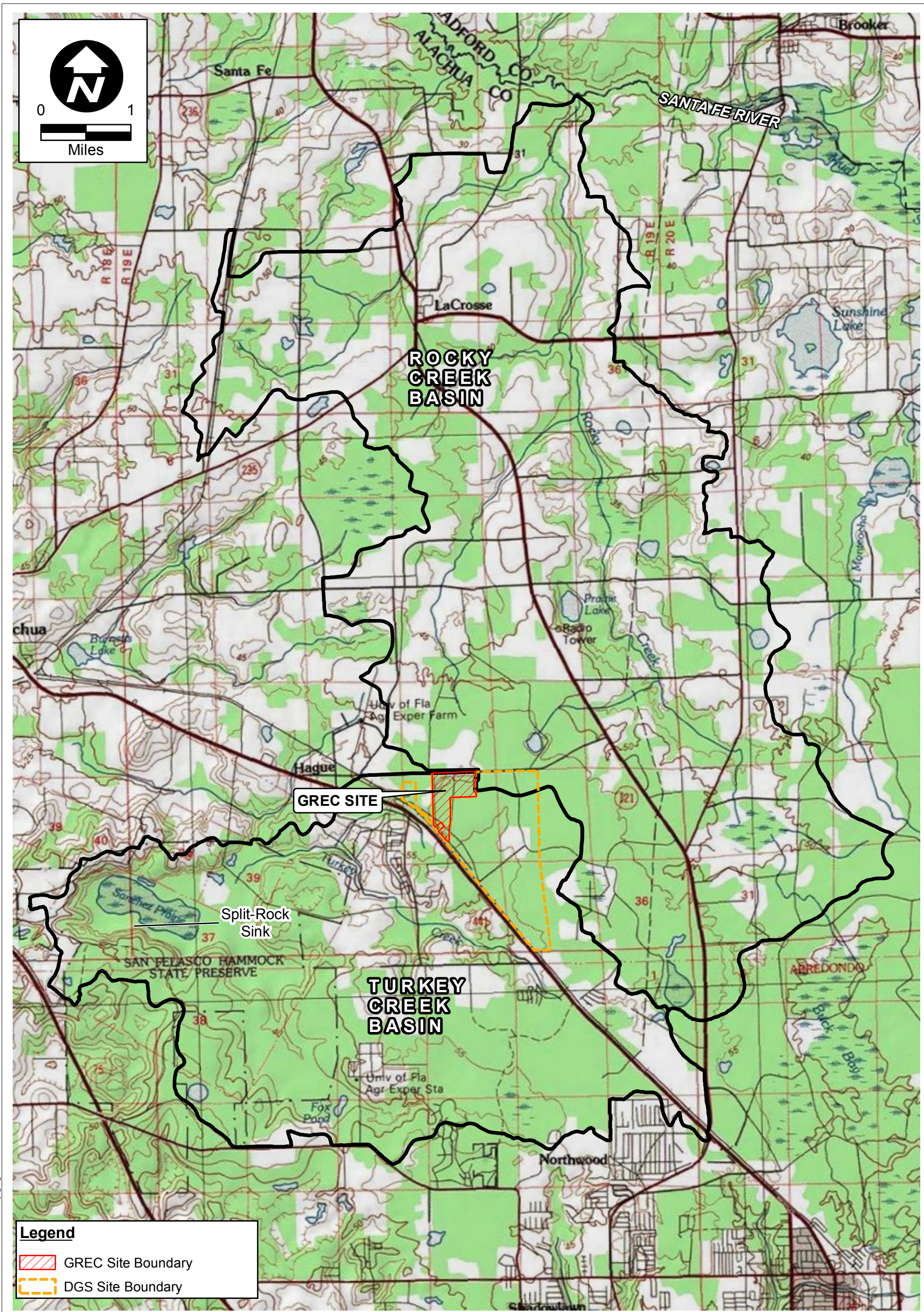


FIGURE 3.3.4-1.

DRAINAGE BASINS ADJACENT TO GREC SITE

Sources: FEMA, 2006; FDOT, 2008; GREC, 2009; ECT, 2009.

The Rocky Creek basin is aligned in a north-south direction. The basin averages 3 to 4 miles in width and is approximately 10 miles in length. The Rocky Creek basin is primarily composed of farmlands, woodlands, and swamp with scattered homes and farmsteads. The southern portion of the basin is relatively flat and contains numerous cypress heads, swamps, and ponds. The northern portion of the basin is mixed agricultural, forest, and wetlands (G/ACRESUB, 1977). Rocky Creek basin elevations range from 190 to 65 ft-NGVD. Rocky Creek generally flows in a northerly direction over a distance of approximately 10 miles before discharging into the Santa Fe River. Rocky Creek is mostly a meandering, well-defined channel, occasionally interrupted by cypress ponds.

Soils

The soils in the Turkey Creek basin range from very poorly drained (Surrency sand and Montechoa sand) to well-drained (Arrendondo fine sands, Fort Meade fine sand, Kendrick sand). Poorly drained soils in this basin include Kanapaha, Biven, Blichton, Pomona, and Wauchula sands, which are predominant in the flatwoods areas. Taveras and Millhopper sands are moderately drained sands found in the basin. Arrendondo and Taveras soils are found in pasture and cropland areas.

Soils in the Rocky Creek basin are similar to those found in the Turkey Creek basin. Most of the surface soils in this basin are fine sand or loamy fine sands. The southern portion of the basin is composed primarily of poorly drained soils such as Pomona, Chipley, Wauchula, and Lochloosa sands to very poorly drained soils such as Montechoa and Surrency. The northern portion of the basin is composed of very poorly drained soils (Surrency and Montechoa sands), poorly drained soils (Blichton, Pomona, and Wauchula sands), and moderately drained soil such as Milhopper sand.

Soils within the GREC Site are composed of predominantly Chipley and Wauchula sands with lesser extents of Montechoa and Pomona sands.

Surface Water Quantity

Turkey Creek originates in a series of cypress heads found in the pine flatwoods in the eastern end of the basin. The main channel flows to the west in a meandering fashion over a distance of 5.5 miles before entering Sanchez Prairie. Within Sanchez Prairie, Turkey Creek rapidly spreads and becomes a slow-moving flow. Flow becomes briefly channelized before entering the Split Rock Sink (G/ACRESUB, 1977).

The Rocky Creek system is a tributary to the Santa Fe River. The discharge in Rocky Creek varies seasonally with rainfall. During the winter months, portions of the creek and its tributaries remain dry, while the middle and lower reaches contain ponded water with slight flows. During the summer months, the creek may vary from zero to several hundred cfs during heavy storms (G/ACRESUB, 1977).

The northern boundary of the proposed GREC Site is on the basin divide between the Rocky Creek and Turkey Creek basins. The entire GREC Site drains into the Turkey Creek basin and ultimately into the Split Rock Sink.

USGS maintains two stream gauging stations located near the Site with long-term flow records. The gauge on the Santa Fe River near Graham, Florida (USGS #02320700), is located approximately 12 miles northeast of the Site (see Figure 3.3.4-2). The total drainage area at this station is 95 mi² and has a daily flow record from 1957 to 1998. Another gauge, Santa Fe River at Worthington Springs, Florida (USGS #02321500), is approximately 11 miles north of the Site. The drainage area at this station is 575 mi², and the period of record is from 1931 to 2009. Details of these gauging stations are provided in Table 3.3.4-1.

Daily Flows

Summary statistics based on mean daily flows over the period of record at these two stations are provided in Table 3.3.4-2. Mean Santa Fe River flow over the period of record near Graham is 52 cfs with maximum and minimum flows of 1,870 and 0 cfs, respectively. The average, maximum, and minimum flows of the Santa Fe River at Worthington

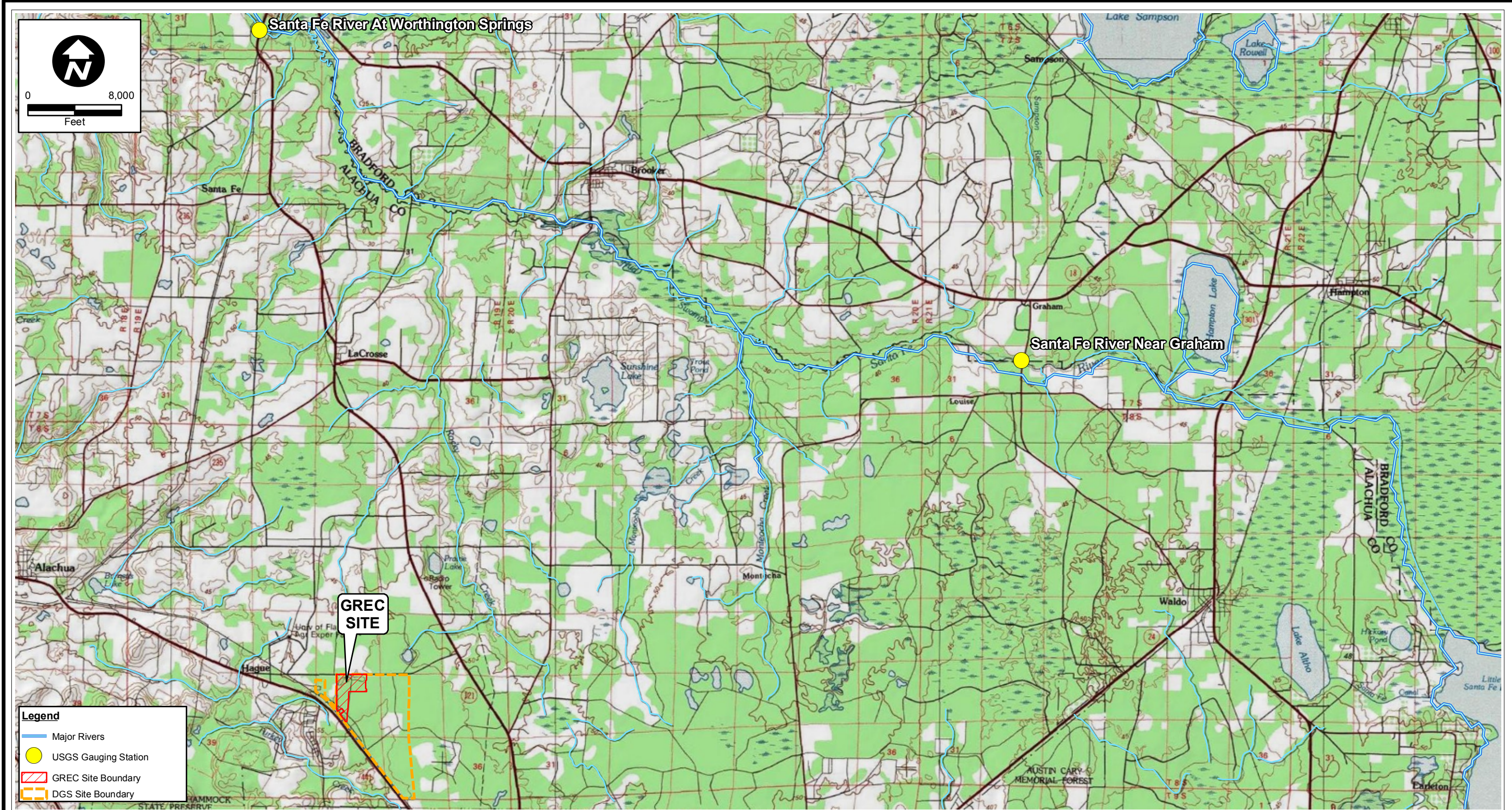


FIGURE 3.3.4-2.

USGS GAUGING STATIONS

Sources: USGS Topo Maps; USEPA, 1999, 2009; GREC, 2009; ECT, 2009.

Table 3.3.4-1. Selected USGS Gauging Stations on the Santa Fe River

USGS Gauge No.	Station	Period of Record	Drainage Area (mi ²)
02320700	Santa Fe River near Graham	1957 to 1998	95
02321500	Santa Fe River at Worthington Springs	1931 to 2009	575

Sources: USGS, 2009.
ECT, 2009

Table 3.3.4-2. Summary Statistics of Daily Flows at Selected Gauging Stations

Statistics	USGS Gauging Stations—Santa Fe River	
	Near Graham	At Worthington Springs
Mean (cfs)	52	410
Maximum (cfs)	1,870	19,000
Minimum (cfs)	0	0.03
95th percentile (cfs)	213	1,759
5th percentile (cfs)	0	6
Standard deviation	97	858

Source: ECT, 2009

Springs are 410, 19,000, and 0.03 cfs, respectively. Figures 3.3.4-3 and 3.3.4-4 present daily flow data of the Santa Fe River at the two selected gauging stations.

Monthly Flows

Figures 3.3.4-5 and 3.3.4-6 illustrate monthly mean flows of the Santa Fe River for the period of record near Graham and at Worthington Springs, respectively. The Santa Fe River mean monthly flow data at Worthington Springs, with a longer data record, indicate that the months of May and November are the driest months (170 and 181 cfs, respectively), and the months of March and September are the wettest months (641 and 696 cfs, respectively).

Low Flow Characteristics

Tables 3.3.4-3 and 3.3.4-4 present the low flow characteristics (USGS, 1996) for Santa Fe River flows near Graham and at Worthington Springs, respectively. The analyses indicate that the 10-year, 7-day low flows, or 7Q10, of the Santa Fe River near Graham and at Worthington Springs are 0.07 and 3.3 cfs, respectively.

Flood Frequency Analysis

Table 3.3.4-5 presents the flood frequency analysis conducted by Bridges (1982) for the Santa Fe River near Graham and at Worthington Springs. The results indicated that the 100-year peak flows near Graham and at Worthington Springs are 3,040 and 27,400 cfs, respectively.

Flood Zones

Figure 3.1.4-1 shows the 100-year flood zones on the GREC Site according to FEMA FIRM of 2006. The 100-year flood zone map for the Site shows that the majority of the GREC Site is located above the existing 100-year flood plain. However, small areas near northern and southern project boundaries lie within the 100-year floodplain as shown on the map. No flow data in the Turkey Creek basin were available.

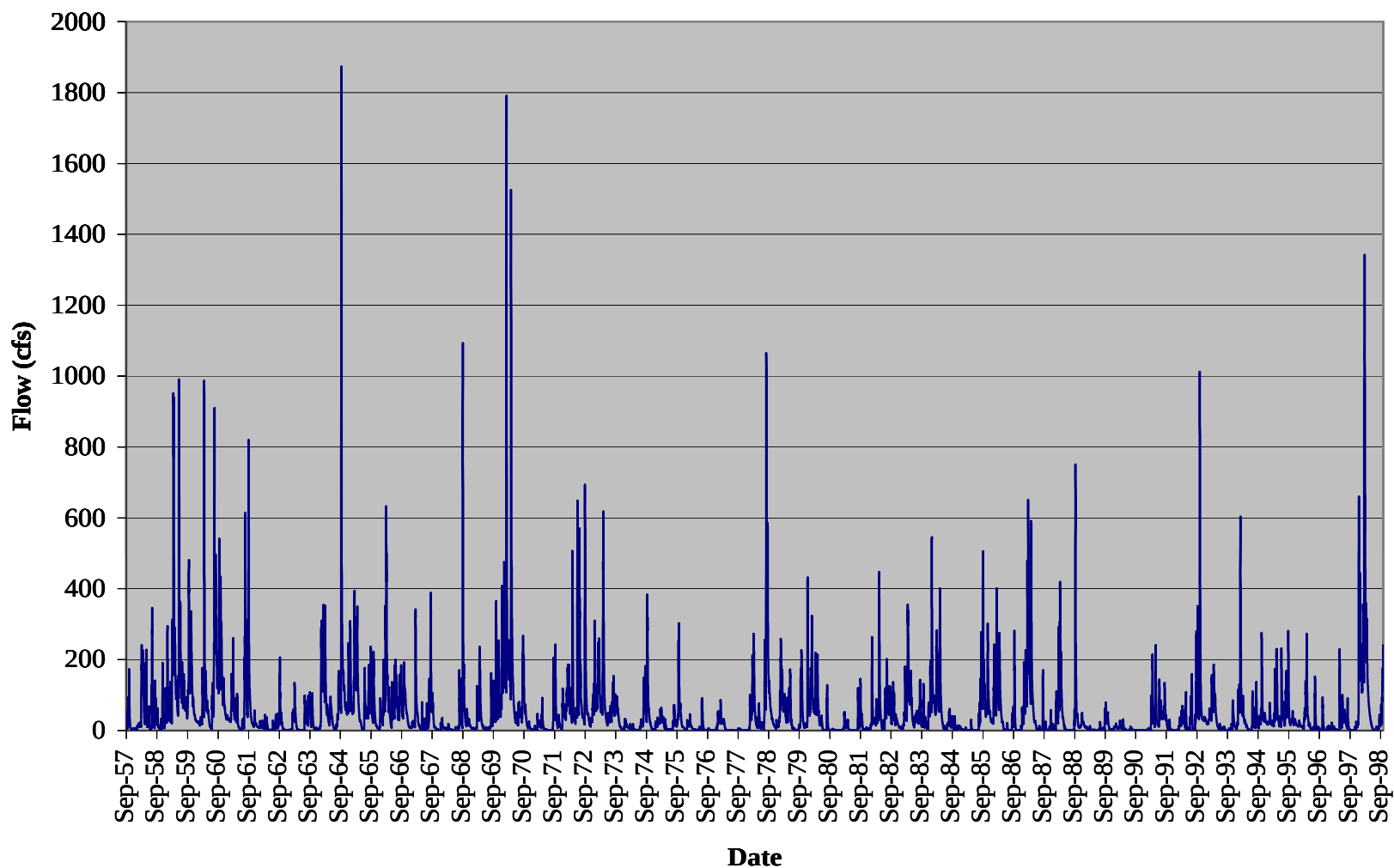


FIGURE 3.3.4-3.

DAILY FLOW DATA AT SANTA FE RIVER NEAR GRAHAM (1957 TO 1998)

Source: ECT, 2009.

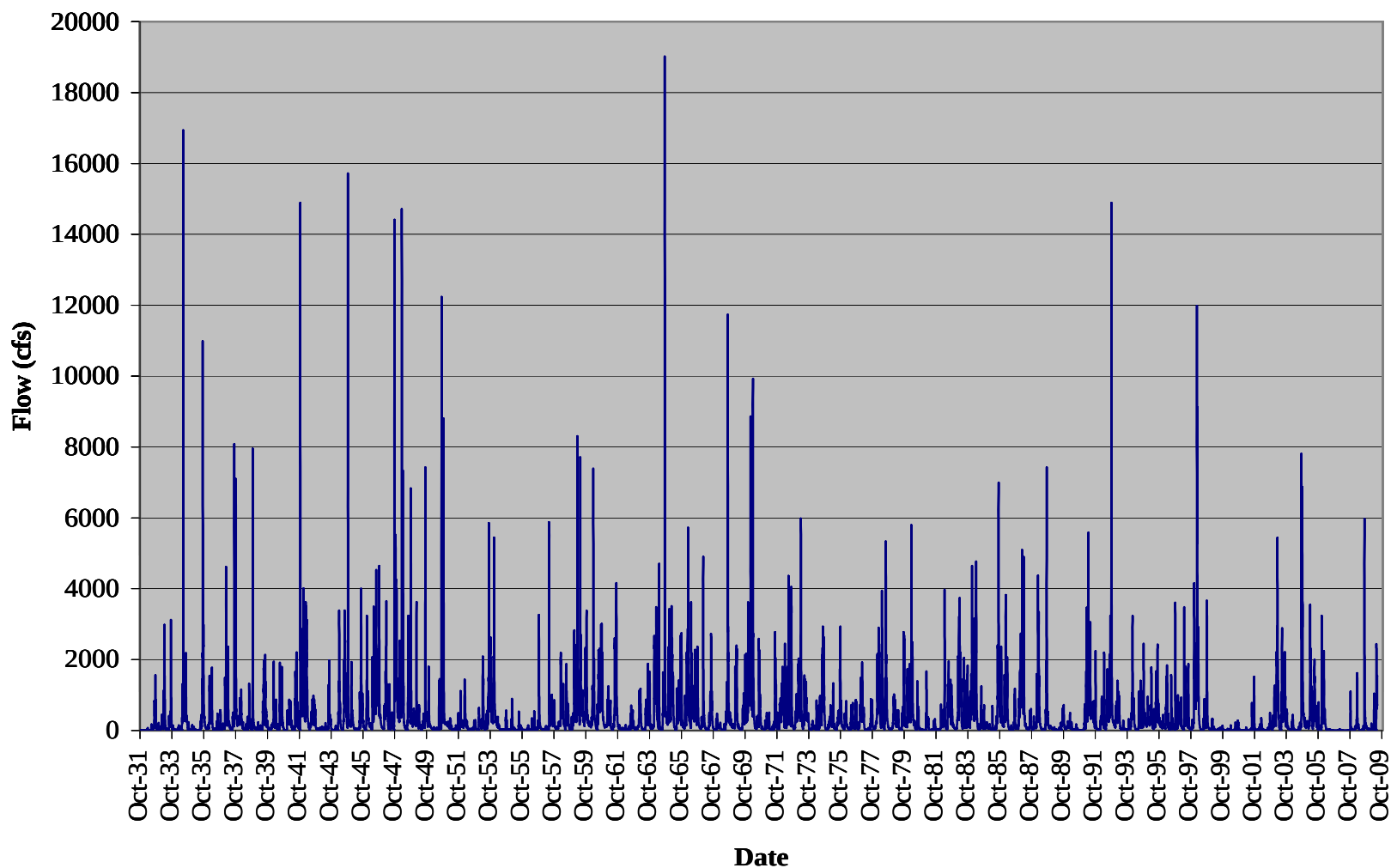


FIGURE 3.3.4-4.

DAILY FLOW DATA AT SANTA FE RIVER AT WORTHINGTON SPRINGS
(1931 TO 2009)

Source: ECT, 2009.

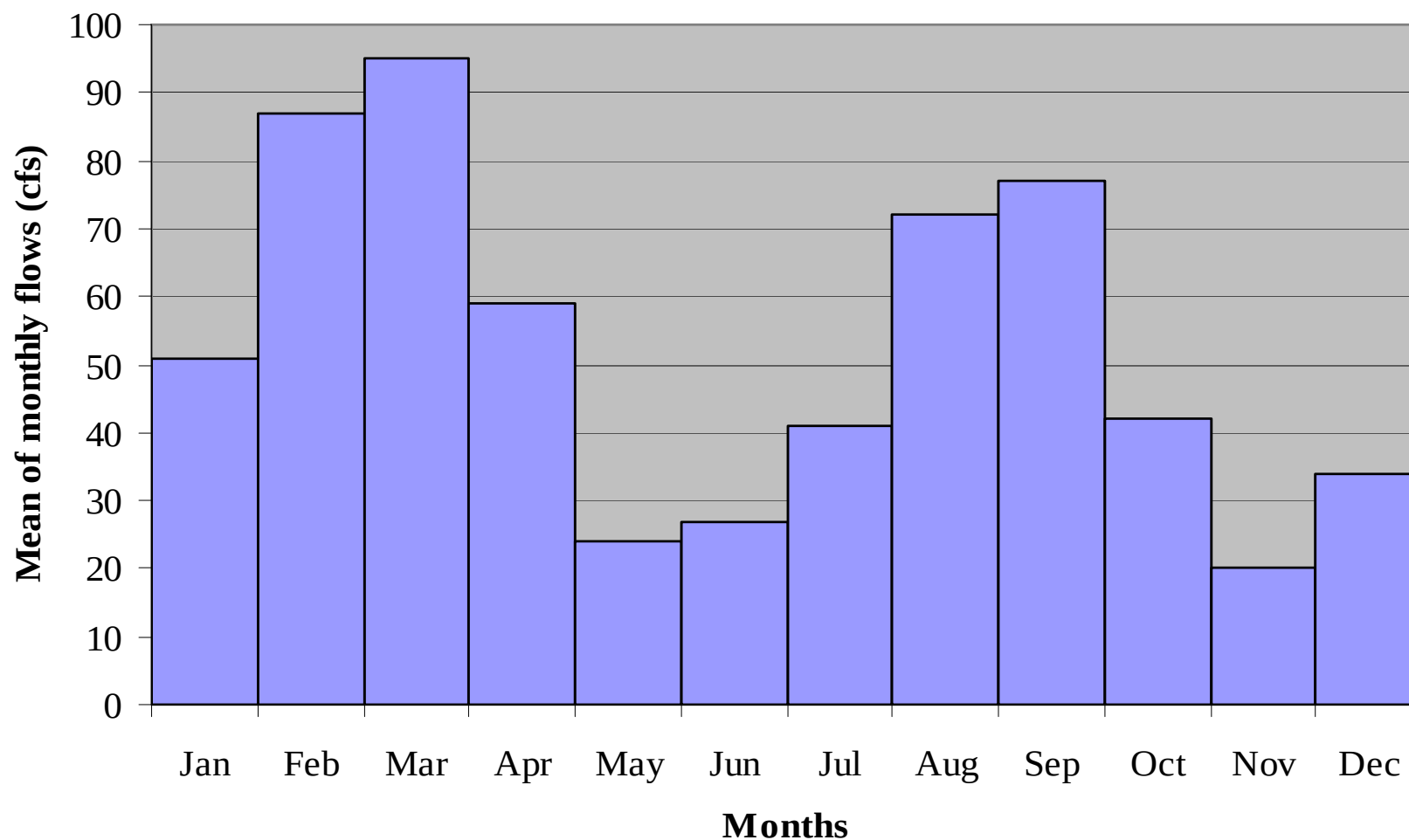


FIGURE 3.3.4-5.

SANTA FE RIVER MEAN OF MONTHLY FLOWS FOR THE PERIOD OF
RECORD NEAR GRAHAM (1957 TO 1998)

Source: ECT, 2009.

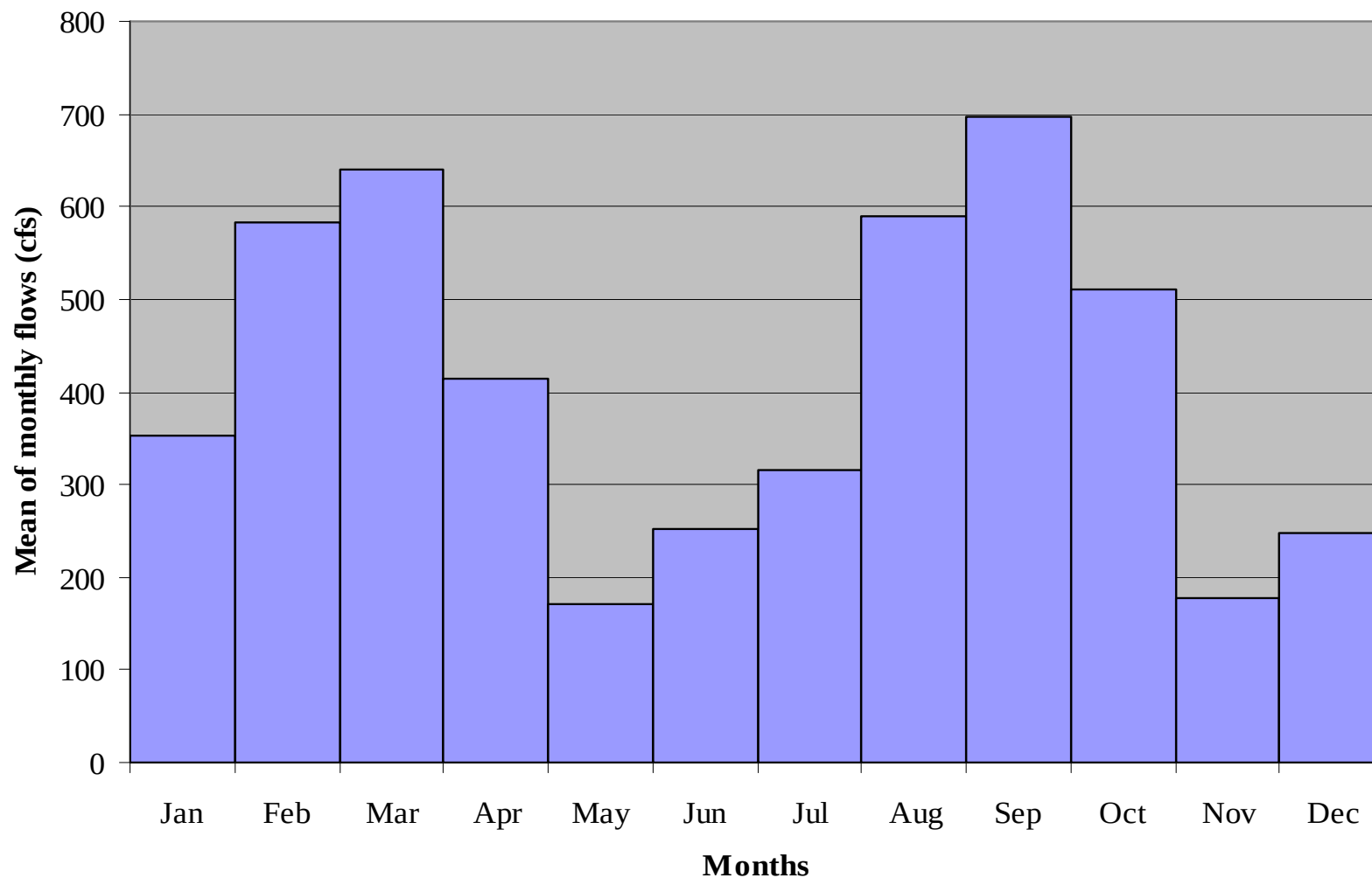


FIGURE 3.3.4-6.

SANTA FE RIVER MEAN OF MONTHLY FLOWS FOR THE PERIOD OF
RECORD AT WORTHINGTON SPRINGS (1931 TO 2009)

Source: ECT, 2009.

Table 3.3.4-3 Low Flow Characteristics for Santa Fe River Flows near Graham

Percentile of Annual Low Flow	Lowest Average Flow (cfs) for Indicated Number of Consecutive Days								
	1	3	7	14	30	60	90	120	183
50	0.56	0.62	0.74	0.94	1.7	2.5	5.3	10	22
10	0.06	0.06	0.07	0.10	0.15	0.21	0.40	0.96	3.1

Source: USGS, 1996

Table 3.3.4-4 Low Flow Characteristics for Santa Fe River Flows at Worthington Springs

Percentile of Annual Low Flow	Lowest Average Flow (cfs) for Indicated Number of Consecutive Days								
	1	3	7	14	30	60	90	120	183
50	12	12	14	16	22	33	52	90	205
10	2.3	2.6	3.3	4.4	6.5	9.6	14	22	50

Source: USGS, 1996

Table 3.3.4-5. Flood-Frequency Relationship at Selected Gauging Stations

USGS Gauging Stations Santa Fe River	Years of Record	Flow (cfs) for Indicated Recurrence Interval (Years)							
		2	5	10	25	50	100	200	500
Near Graham	21	471	949	1,380	1,920	2,470	3,040	3,560	4,430
At Worthington Springs	46	4,480	8,960	12,900	17,800	22,600	27,400	32,200	39,500

Source: Bridges, 1982

Surface Water Quality

According to Chapter 62-302, F.A.C., the surface waters on and around the GREC Site are classified Class III fresh waters, and the designated uses are recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife.

Impaired Waters

FDEP's total maximum daily load (TMDL) program identifies the water bodies of the state that are considered impaired by pollutants. FDEP's 2009 final impaired water list, or 303(d) list, indicates that water body identification (WBID) 3671 in the Turkey Creek basin is impaired for fecal coliform.

Water Quality Data

Five representative water quality monitoring stations were identified in the vicinity of the Site. Figure 3.3.4-7 presents the location of these representative water quality monitoring stations. Two of these stations are located along the Santa Fe River (Santa Fe River near Brooker at SR 231 and Santa Fe River at Worthington Springs); one station lies along Rocky Creek (Rocky Creek at CR 235); and the remaining two are located along Turkey Creek (Turkey Creek at San Felasco State Preserve and Turkey Creek at San Felasco State Preserve at bridge). Statistical summaries of water quality data for these five representative stations are presented in Tables 3.3.4-6 through 3.3.4-10, along with the water quality standards.

3.3.4.2 Measurement Programs

Currently, GRU's DGS implements a ZLD system, which eliminates discharges of wastewater into surface water bodies. Therefore, no surface water measurement programs are currently conducted in the vicinity of the GREC Site. GREC also plans to use a ZLD system that will not have any wastewater discharge. Therefore, surface water measurement programs are not anticipated for the Project.

3.3.5 VEGETATION/LAND USE

Land use and vegetation types at the GREC Site consist of primarily forested communities including pine plantations, mixed pine and hardwoods, and several wetland types.

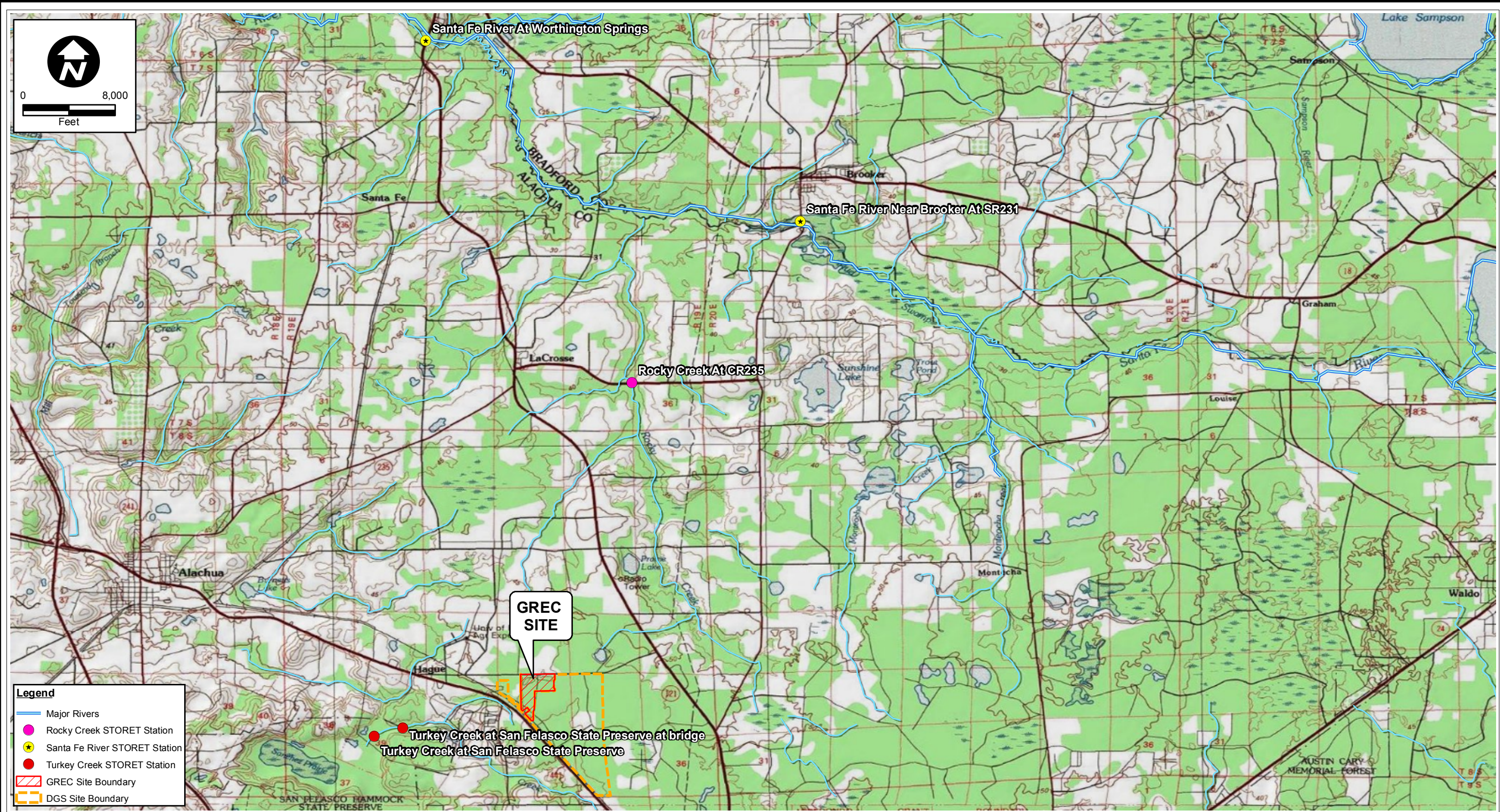


FIGURE 3.3.4-7.

WATER QUALITY MONITORING STATIONS

Sources: USGS Topo Maps; USEPA, 1999, 2009; GREC, 2009; ECT, 2009.

Table 3.3.4-6. Summary Statistics of Rocky Creek Water Quality Parameters at CR 235

Water Quality Parameter	Units	Class III Freshwater Quality Standard	Mean	Maximum	Minimum	Standard Deviation	95 th Percentile	5 th Percentile	Number of Samples
Apparent color	PCU		125	250	50	96	235	50	4
DO	%		41.2	85.0	2.0	21.9	74.2	9.0	23
Fecal coliform	#/100 mL		200	1133	12	274	653	19	19
pH	s.u.	6.0 to 8.5	6.4	7.0	5.7	0.3	6.8	6.0	24
Salinity	ppt		0.10	0.10	0.10	0.00	0.10	0.10	7
Secchi disk depth	meter		0.5	1.6	0.2	0.3	0.9	0.3	21
Specific conductance	µS/cm	≤ 50% above background	164.8	231.0	75.0	49.1	227.8	90.4	25
Water temperature	°C		17.7	25.0	9.6	5.0	24.4	10.8	24
Total coliform	#/100mL		1,338	12,000	184	2,623	2,760	252	19
Turbidity	NTU	≤ 29 above natural background	1.6	2.2	1.0	0.4	2.2	1.1	7

Note: PCU = platinum-cobalt units.
 #/100 mL = number per 100 milliliters.
 s.u. = standard unit.
 ppt = part per thousand.
 µS/cm = microsiemen/centimeter.
 °C = degree Celsius.
 NTU = nephelometric turbidity unit.

Sources: FDEP, 2009.
 ECT, 2009

Table 3.3.4-7. Summary Statistics of Santa Fe River Water Quality Parameters near Brooker at SR 231

Water Quality Parameter	Units	Class III Freshwater Quality Standard	Mean	Maximum	Minimum	Standard Deviation	95 th Percentile	5 th Percentile	Number of Samples
Alkalinity	mg/L		30.5	136.0	1.7	25.0	82.6	5.3	178
Apparent color	PCU		207.7	800.0	10.0	144.6	450.0	45.0	202
Calcium	mg/L		14.9	39.1	3.9	7.0	27.6	7.1	194
Chloride	mg/L		27.0	88.3	9.0	14.9	57.8	12.0	194
DO	mg/L	≥ 5.0	6.3	10.2	1.2	1.7	9.3	3.6	207
Dissolved solids	mg/L		153.7	290.0	54.0	49.8	256.9	91.5	190
Fecal coliform	#/100mL	≤ 200	204	1500	26	432	820	30	11
Fluorides	mg/L		0.12	0.41	0.04	0.06	0.22	0.06	149
Magnesium	mg/L		4.4	11.5	0.8	2.4	9.0	1.7	194
Nitrogen, ammonia+ammonium	mg/L		0.048	0.277	0.001	0.050	0.139	0.012	83
Total Kjeldahl nitrogen	mg/L		0.9	2.0	0.2	0.4	1.6	0.4	201
Nitrogen, nitrite + nitrate	µg/L		0.09	0.37	0.01	0.07	0.21	0.01	142
pH	s.u.	6.0 to 8.5	6.4	7.9	4.6	0.7	7.4	5.3	206
Phosphorus	mg/L		0.12	0.36	0.03	0.06	0.23	0.05	191
Ortho phosphate	mg/L		0.08	0.51	0.01	0.05	0.17	0.03	197
Potassium	mg/L		1.0	2.4	0.2	0.4	1.8	0.4	172
Salinity	ppt		0.11	0.20	0.04	0.05	0.20	0.05	31
Secchi disk depth	meter		0.8	1.5	0.3	0.2	1.2	0.5	135
Sodium	mg/L		11.1	33.3	4.3	5.6	24.2	5.8	194
Specific conductance	µS/cm	≤ 50% above background	175.6	1948.0	48.0	134.7	334.6	80.4	409
Sulfur, sulfate	mg/L		11.8	34.0	1.2	6.6	22.5	2.5	181
Temperature, water	°C		19.7	28.2	5.6	5.2	26.1	10.3	207
Total coliform	#/100mL		218	640	60	186	550	60	10
Total organic carbon	mg/L		25.7	63.4	4.5	11.4	47.3	9.2	251
Total suspended solids	mg/L		4.5	18.0	1.0	3.8	12.1	1.0	60
Turbidity	NTU	≤ 29 above natural background	1.8	7.8	0.5	1.4	4.7	0.6	200

Note: mg/L = milligram per liter.

PCU = platinum-cobalt units.

#/100mL = number per 100 milliliters.

µg/L = microgram per liter.

s.u. = standard unit.

ppt = part per thousand.

µS/cm = microsiemen/centimeter.

°C = degree Celsius.

NTU = nephelometric turbidity unit.

Sources: FDEP, 2009.

ECT, 2009

Table 3.3.4-8. Summary Statistics of Santa Fe River Water Quality Parameters at Worthington Springs

Water Quality Parameter	Units	Class III Freshwater Quality Standard	Mean	Maximum	Minimum	Standard Deviation	95 th Percentile	5 th Percentile	Number of Samples
Apparent color	PCU		246.3	800.0	5.0	159.9	600.0	50.0	239
Biochemical oxygen demand	mg/L		2.0	8.0	1.0	1.6	5.0	1.0	26
Chlorophyll a	µg/L		0.7	3.5	0.1	0.8	2.1	0.1	26
DO	mg/L	≥ 5.0	6.9	12.1	1.7	1.6	9.8	4.9	240
Field conductivity	µS/cm	≤ 50% above background	143.4	319.0	40.0	60.1	247.1	66.9	240
Nitrogen, nitrite + nitrate	mg/L		0.2	1.5	0.0	0.2	0.5	0.0	241
pH	s.u.	6.0 to 8.5	6.7	8.3	5.3	0.6	7.7	5.6	240
Salinity	ppt		0.0	0.1	0.0	0.0	0.1	0.0	213
Secchi depth	meter		0.8	2.0	0.1	0.3	1.3	0.4	240
Total calcium	mg/L		14.0	27.5	3.5	5.9	24.2	6.0	231
Total chloride	mg/L		18.9	52.8	6.0	7.2	35.8	9.8	231
Total flouride	mg/L		0.2	1.3	0.0	0.1	0.3	0.1	231
Total Kjeldahl nitrogen	mg/L		1.0	2.7	0.2	0.4	1.8	0.4	238
Total phosphorus	mg/L		0.3	2.1	0.1	0.2	0.6	0.1	239
Total potassium	mg/L		1.4	4.7	0.0	0.6	2.5	0.6	231
Total residue	mg/L		129.9	190.0	47.0	32.7	164.5	59.8	18
Total sodium	mg/L		8.7	36.8	2.5	4.3	16.1	4.6	231
Total sulfate	mg/L		8.9	31.0	0.2	6.0	21.3	1.0	231
Turbidity	NTU	≤ 29 above natural background	4.3	151.0	0.3	13.1	8.4	0.8	239
Water temperature	°C		19.8	31.3	5.0	5.6	27.3	10.8	240

Note: PCU = platinum-cobalt units.
 mg/L = milligram per liter.
 µg/L = microgram per liter.
 µS/cm = microsiemen/centimeter.
 s.u. = standard unit.
 ppt = part per thousand.
 NTU = nephelometric turbidity unit.
 °C = degree Celsius.

Sources: FDEP, 2009.
 ECT, 2009

Table 3.3.4-9. Summary Statistics of Turkey Creek Water Quality Parameters at San Felasco State Preserve

Water Quality Parameter	Units	Class III Freshwater Quality Standard	Mean	Maximum	Minimum	Standard Deviation	95 th Percentile	5 th Percentile	Number of Samples
Alkalinity, total	mg/L		113.0	150.0	64.0	38.3	147.9	69.7	4
Calcium	mg/L		33.2	54.6	14.0	14.3	52.4	15.7	8
Dissolved oxygen	mg/L	≥5.0	5.7	8.3	3.7	1.3	7.7	3.9	22
Dissolved solids	mg/L		202.6	272.0	166.0	60.1	261.8	166.4	3
Fecal coliform	cfu/100mL	≤200	181.1	400.0	40.0	133.1	357.5	41.7	6
Iron	µg/L		114.7	170.0	74.3	49.5	163.0	76.8	3
Magnesium	mg/L		10.9	15.3	6.3	4.9	15.2	6.4	4
Nitrogen, ammonia	mg/L		0.10	0.43	0.01	0.15	0.33	0.01	7
Nitrogen, Kjeldahl	mg/L		0.58	1.20	0.34	0.30	1.05	0.34	7
Nitrite + nitrate	mg/L		0.193	0.350	0.003	0.139	0.347	0.023	7
pH	s.u.	6.0 to 8.5	7.6	9.8	6.9	0.71	8.6	7.15	22
Phosphorus as P	mg/L		0.50	0.64	0.37	0.11	0.64	0.38	8
Orthophosphate	mg/L		0.46	0.61	0.30	0.12	0.61	0.32	7
Potassium	mg/L		2.03	3.30	1.22	0.71	3.11	1.3	7
Specific conductance	µmho/cm	≤50% above background	305.6	430.0	98.0	92.7	415.1	152.4	23
Sulfur, sulfate	mg/L		22.6	41.3	5.0	15.3	39.1	6.8	4
Temperature, water	°C		19.5	25.5	7.2	5.9	25.5	10.5	22
Total organic carbon	mg/L		15.3	31.0	6.9	10.6	28.2	7.5	4
TSS	mg/L		4.2	7.0	2.0	1.9	6.6	2.2	5
True color	PCU		83.7	250.0	25.0	110.8	217.0	25.7	4
Turbidity	NTU	≤29 above natural background	3.7	14.7	0.6	3.9	10.5	0.8	23

Note:

- °C = degree Celsius.
- µg/L = microgram per liter.
- µmho/cm = micromhos per centimeter.
- mg/L = milligram per liter.
- cfu/100 mL = colony-forming unit per 100 milliliters.
- NTU = nephelometric turbidity unit.
- PCU = platinum-cobalt units.
- s.u. = standard unit.

Sources: FDEP, 2009.
ECT, 2009

Table 3.3.4-10. Summary Statistics of Turkey Creek Water Quality Parameters at San Felasco State Preserve at bridge

Water Quality Parameter	Units	Class III Standard	Mean	Maximum	Minimum	Standard Deviation	95 th Percentile	5 th Percentile	Number of Samples
Dissolved oxygen	mg/L		6.6	9.2	4.3	1.5	9.1	4.4	13
pH	s.u.	6.0 to 8.5	7.4	7.7	6.1	0.4	7.7	6.7	13
Specific conductance	µmho/cm	≤50% above background	315.4	431.0	217.0	61.9	404.5	235.5	11
Water temperature	°C		18.0	24.3	10.3	5.6	24.2	11.4	13
Turbidity	NTU	≤29 above natural background	2.7	5.4	0.8	1.7	5.3	0.9	13

Note: °C = degree Celsius.
µmho/cm = micromhos per centimeter.
mg/L = milligram per liter.
NTU = nephelometric turbidity unit.
s.u. = standard unit.

Sources: FDEP, 2009.
ECT, 2009

Nonforested communities include manmade swales, trails/roads, open land, and herbaceous dry prairie (old field). Most of the Site is actively managed for timber production and has been altered by land preparation (furrowing) and periodic harvesting of timber. The Site is transected by numerous unpaved roads/trails and is surrounded by manmade swales/ditches.

Land use types and vegetation communities were described and mapped for the Site and offsite construction laydown areas in July 2008 and May through September 2009. FLUCFCS GIS data were overlain on a 1-inch-to-200-ft scale aerial photograph and used as a base map for the fieldwork. The GREC Site was intensively surveyed by field biologists to delineate vegetation community boundaries and identify dominant or indicator plant species found in the canopy, subcanopy, and ground cover of each community type. The quality and condition of each plant community was characterized, and existing stressors noted. Community types are classified using the FLUCFCS Level III and IV categories (FDOT, 1999).

3.3.5.1 GREC Site

Overall, 12 vegetation communities/land uses were identified on the Site as presented in Table 3.3.5-1 and described in detail in the following. Figure 3.3.5-1 shows the location and extent of each of the vegetation/land use types on the Site, and Figure 3.3.5-2 presents photographs of the various land use and vegetation communities onsite. A plant species inventory for the Site is presented in Table 3.3.5-2.

Other Open Land—194

Approximately 4.4 acres (3.4 percent) of the Site is covered by the land use type Other Open Land. This upland community is located along the edges of access roads and along the eastern side of the GREC Site, adjacent to the GRU DGS; it represents the outer limits of clearing for the existing GRU DGS. This land use type is characterized by cleared, primarily grassy open land that is used for vehicular traffic or open areas adjacent to roads or stormwater facilities. The dominant vegetation species is bahia grass.

Table 3.3.5-1. FLUCFCS Vegetation/Land Use Types at the GREC Site

FLUCFCS Code	Vegetation/Land Use Type	Area (acres)	Percent of Site
194	Other Open Land	4.4	3.4
310	Herbaceous Dry Prairie	2.7	2.1
434	Hardwood-Conifer Mix	49.3	37.7
441	Coniferous Plantation	44.9	34.3
512	Manmade Ditch/Swale	1.2	0.9
621	Cypress Wetland	6.3	4.8
626	Hydric Pine Plantation	1.1	0.8
630	Wetland Forested Mixed	14.2	10.9
631	Wetland Shrub	0.2	0.02
641	Freshwater Marsh	0.2	0.2
643	Wet Prairie	0.04	0.03
814	Roads and Highways (Unpaved Roads, trails)	<u>6.2</u>	<u>4.7</u>
	Total	130.8	100.0

Source: ECT, 2009.

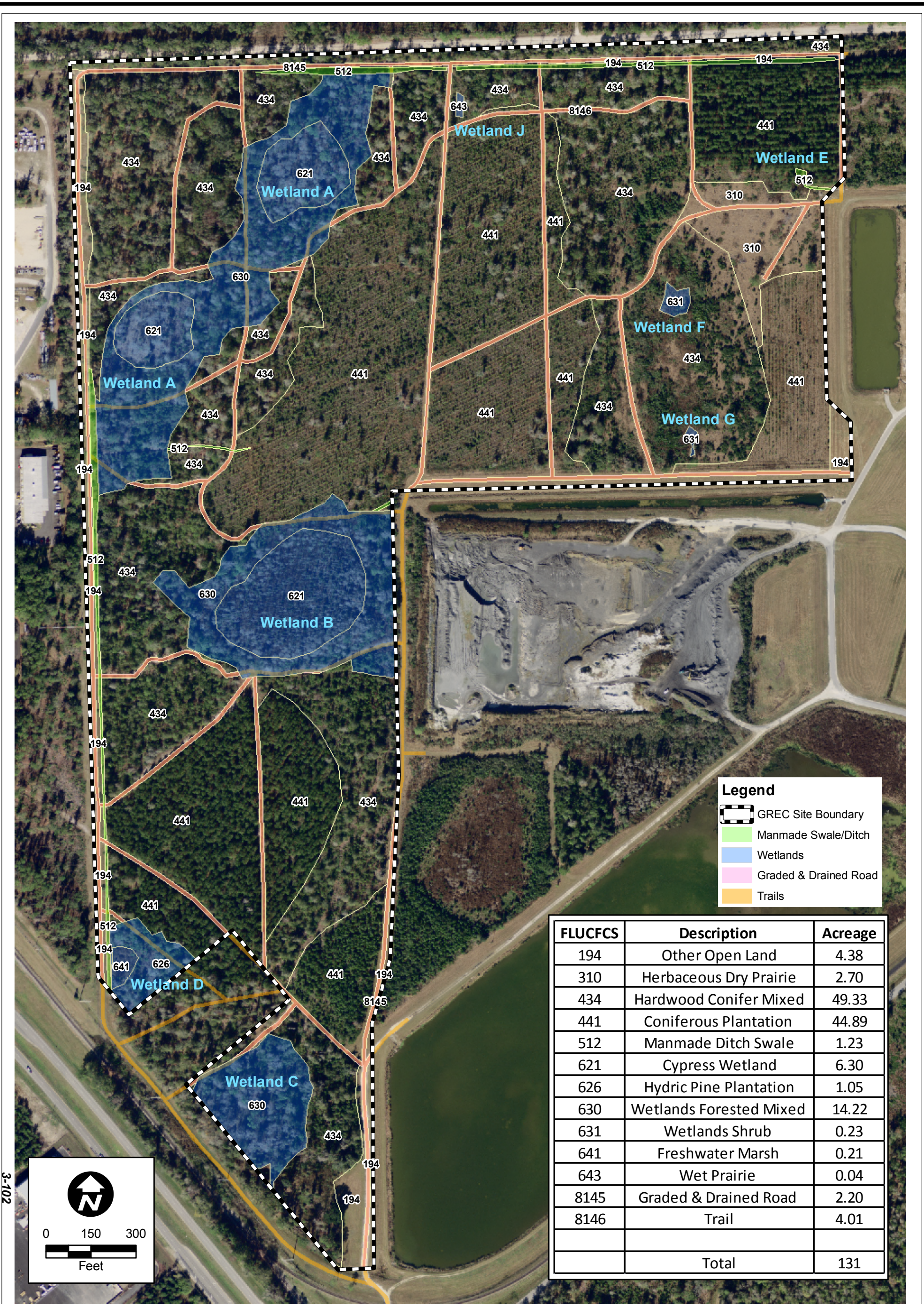


FIGURE 3.3.5-1.
GREC LAND USE/COVER TYPES USING FLUCFCS

Sources: FDOT,2008; Genesis, 2009; ECT, 2009.



Other Open Land—194



Herbaceous Dry Prairie—310 (in foreground)



Herbaceous Dry Prairie—310 (in foreground)



Pine Plantation—441 (younger stand, north-central part of site)

FIGURE 3.3.5-2. (Sheet 1 of 5)

PHOTOGRAPHS OF VEGETATION COMMUNITIES AND LAND COVER
TYPES AT THE GREC SITE

Source: ECT, 2009.



Pine Plantation—441 (older stand, northeast corner of site)



Hardwood Conifer Mixed—434



Hardwood Conifer Mixed—434



Swale—512

FIGURE 3.3.5-2. (Sheet 2 of 5)

PHOTOGRAPHS OF VEGETATION COMMUNITIES AND LAND COVER
TYPES AT THE GREC SITE

Source: ECT, 2009.



Cypress – 621 (Wetland A)



Cypress—621 (canopy with dead cypress trees) (Wetland B)



Cypress—621 (interior of cypress swamp with dead trees, open canopy and prolific duckweed) (Wetland B)



Hydric Pine Plantation—626 (Wetland D)

FIGURE 3.3.5-2. (Sheet 3 of 5)

PHOTOGRAPHS OF VEGETATION COMMUNITIES AND LAND COVER TYPES AT THE GREC SITE

Source: ECT, 2009.



Wetland Forested Mixed—630 (Wetland C)



Wetland Forested Mixed—630 (Wetland A)



Wetland Shrub—631 (Wetland G)



Freshwater Marsh—641 (Wetland D)

FIGURE 3.3.5-2. (Sheet 4 of 5)

PHOTOGRAPHS OF VEGETATION COMMUNITIES AND LAND COVER
TYPES AT THE GREC SITE

Source: ECT, 2009.



Wet Prairie—643 (Wetland F)



Roads/Trails—814

FIGURE 3.3.5-2. (Sheet 5 of 5)

PHOTOGRAPHS OF VEGETATION COMMUNITIES AND LAND COVER
TYPES AT THE GREC SITE

Source: ECT, 2009.

Table 3.3.5-2. Plant Species Observed on the GREC Site—July 2008 to June 2009

Scientific Name	Common Name
Trees	
<i>Acer rubrum</i>	Red maple
<i>Diospyros virginiana</i>	Persimmon
<i>Juniperus virginiana</i>	Red cedar
<i>Liquidambar styraciflua</i>	Sweetgum
<i>Magnolia grandiflora</i>	Southern magnolia
<i>Nyssa sylvatica</i>	Blackgum
<i>Nyssa sylvatica</i> var. <i>biflora</i>	Swamp tupelo
<i>Persea palustris</i>	Swamp red bay
<i>Pinus elliottii</i>	Slash pine
<i>Pinus palustris</i>	Longleaf pine
<i>Pinus taeda</i>	Loblolly pine
<i>Prunus caroliniana</i>	Carolina laurelcherry
<i>Prunus serotina</i>	Black cherry
<i>Quercus geminata</i>	Sand live oak
<i>Quercus laurifolia</i>	Laurel oak
<i>Quercus nigra</i>	Water oak
<i>Quercus virginiana</i>	Live oak
<i>Sabal palmetto</i>	Cabbage palm
<i>Salix caroliniana</i>	Carolina willow
<i>Sapium sebiferum</i>	Chinese tallow
<i>Taxodium ascendens</i>	Pond cypress
Shrubs	
<i>Asimina pygmaea</i>	Dwarf pawpaw
<i>Baccharis halimifolia</i>	Groundsel tree
<i>Callicarpa americana</i>	Beautyberry
<i>Cephalanthus occidentalis</i>	Buttonbush
<i>Hypericum fasciculatum</i>	Sandweed
<i>Hypericum gentianoides</i>	St. Johnswort
<i>Hypericum hypericoides</i>	St. Andrew's cross
<i>Hypericum</i> spp.	St. Johnswort
<i>Ilex coriacea</i>	Large gallberry
<i>Ilex glabra</i>	Gallberry
<i>Itea virginica</i>	Virginia willow
<i>Lyonia ferruginea</i>	Rusty staggerbush
<i>Lyonia fruticosa</i>	Rusty lyonia
<i>Lyonia lucida</i>	Fetterbush
<i>Myrica cerifera</i>	Wax myrtle
<i>Quercus minima</i>	Dwarf live oak
<i>Rhus copallina</i>	Winged sumac

Table 3.3.5-2. Plant Species Observed on the GREC Site—July 2008 to June 2009
(Continued, Page 2 of 4)

Scientific Name	Common Name
<i>Rubus argutus</i>	Sawtooth blackberry
<i>Rubus cuneifolius</i>	Sand blackberry
<i>Rubus trivialis</i>	Southern dewberry
<i>Serenoa repens</i>	Saw palmetto
<i>Stillingia sylvatica</i>	Queensdelight
<i>Vaccinium arboreum</i>	Sparkleberry
<i>Vaccinium corymbosum</i>	Highbush blueberry
<i>Vaccinium myrsinites</i>	Shiny blueberry
<i>Vaccinium stamineum</i>	Deerberry
<u>Herbs</u>	
<i>Andropogon brachystachys</i>	Shortspike bluestem
<i>Andropogon glomeratus</i>	Bushy bluestem
<i>Andropogon virginicus</i>	Broomsedge bluestem
<i>Aristida stricta</i>	Wiregrass
<i>Asclepia lanceolata</i>	Blue flower coyote thistle
<i>Axonopis furcatus</i>	Carpet grass
<i>Axonopus fissifolius</i>	Common carpetgrass
<i>Bacopa caroliniana</i>	Blue water hyssop
<i>Carex albolutescens</i>	Caric sedge
<i>Carex camosa</i>	Caric sedge
<i>Centella asiatica</i>	Spade leaf
<i>Cirsium nuttallii</i>	Thistle
<i>Cladium jamaicense</i>	Sawgrass
<i>Cynodon dactylon</i>	Bermuda grass
<i>Cyperus croceus</i>	Baldwin's flatsedge
<i>Cyperus haspan</i>	Haspan flatsedge
<i>Cyperus odoratus</i>	Fragrant flatsedge
<i>Cyperus polystachyos</i>	Manyspike flatsedge
<i>Cyperus retrorsus</i>	Pinebarren flatsedge.
<i>Cyperus suranaminsis</i>	Flatsedge
<i>Dichanthelium commutatum</i>	Variable witchgrass
<i>Dichanthelium dichotomum</i>	Cypress witchgrass
<i>Dichanthelium portoricense</i>	Hemlock witchgrass
<i>Dichanthelium</i> spp.	Witchgrass
<i>Digitaria ciliaris</i>	Crabgrass
<i>Diodia virginiana</i>	Virginia buttonweed
<i>Eleocharis</i> spp.	Spikerushes
<i>Elephantopus elatus</i>	Tall elephantsfoot
<i>Erechtites hieracifolia</i>	Fireweed

Table 3.3.5-2. Plant Species Observed on the GREC Site—July 2008 to June 2009
(Continued, Page 3 of 4)

Scientific Name	Common Name
<i>Eriocaulon</i> sp.	Pipeworts
<i>Eryngium integrifolium</i>	Blue flower coyote thistle
<i>Eupatorium capillifolium</i>	Dog fennel
<i>Euthamia minor</i>	Flattop goldenrod
<i>Galium tinctorum</i>	Stiff marsh bedstraw
<i>Hydrocotyle umbellata</i>	Dollar weed
<i>Imperata cylindrica</i>	Cogon grass
<i>Juncus effusus</i>	Soft rush
<i>Juncus marginatus</i>	Shore rush
<i>Juncus megacephalus</i>	Bighead rush
<i>Lachnocaulon anceps</i>	Whitehead bogbutton
<i>Lachnocaulon minus</i>	Small's bogbutton
<i>Lemna minor</i>	Duck weed
<i>Ludwigia arcuata</i>	Piedmont primrosewillow
<i>Ludwigia octavalis</i>	Primrose willow
<i>Ludwigia repens</i>	Creeping primrosewillow
<i>Medicago lupulina</i>	Black medic
<i>Micromeria brownei</i>	Rustweed
<i>Osmunda cinnamomea</i>	Cinnamon fern
<i>Osmunda regalis</i>	Royal fern
<i>Oxalis stricta</i>	Sorrel
<i>Panicum hemitomon</i>	Maidencane
<i>Panicum repens</i>	Torpedo grass
<i>Paspalum notatum</i>	Bahia grass
<i>Paspalum setaceum</i>	Thin paspalum
<i>Paspalum urvillei</i>	Vasey grass
<i>Peltandra virginica</i>	Green arum
<i>Phylla nodiflora</i>	Frogfruit
<i>Phytolacca americana</i>	Pokeweed
<i>Pluchea odorata</i>	Camphor weed
<i>Polygala lutea</i>	Orange milkwort
<i>Polygala nana</i>	Candyroot
<i>Polygonum hydropiperoides</i>	Mild waterpepperwort
<i>Polygonum punctatum</i>	Smartweed
<i>Polypremum procumbens</i>	Rustweed
<i>Pontederia cordata</i>	Pickereelweed
<i>Proserpinaca pectinata</i>	Combleaf mermaidweed
<i>Pteridium aquilinum</i>	Bracken fern
<i>Pterocaulon pycnostachyum</i>	Blackroot

Table 3.3.5-2. Plant Species Observed on the GREC Site—July 2008 to June 2009
(Continued, Page 4 of 4)

Scientific Name	Common Name
<i>Ptilimnium capillaceum</i>	Mock bishops weed
<i>Rhexia mariana</i>	Pale meadowbeauty
<i>Rhynchospora</i> spp.	Beaksedges
<i>Sagittaria graminea</i>	Grassy arrowhead
<i>Sagittaria lancifolia</i>	Bulltongue arrowhead
<i>Saururus cernuus</i>	Lizard's tail
<i>Scirpus cyperinus</i>	Woolgrass
<i>Scleria</i> sp.	Nutsedge
<i>Solidago fistulosa</i>	Pinebarren goldenrod
<i>Solidago odora</i> var. <i>chapmanii</i>	Chapman's goldenrod
<i>Typha latifolia</i>	Broadleaf cattail
<i>Woodwardia areolata</i>	Netted chainfern
<i>Woodwardia virginica</i>	Virginia chainfern
<i>Xyris</i> spp.	Yellow-eyed grasses
Vines	
<i>Ampelopsis arborea</i>	Pepper vine
<i>Gelsemium sempervirens</i>	Carolina jasmine
<i>Lonicera japonica</i>	Japanese honeysuckle
<i>Parthenocissus quinquefolia</i>	Virginia creeper
<i>Passiflora incarnata</i>	Purple passionflower
<i>Smilax auriculata</i>	Earleaf greenbrier
<i>Smilax bona-nox</i>	Saw greenbrier
<i>Smilax glauca</i>	Cat greenbrier
<i>Smilax laurifolia</i>	Bamboo vine
<i>Smilax pumila</i>	Sarsaparilla vine
<i>Smilax walteri</i>	Coral greenbrier
<i>Toxicodendron radicans</i>	Poison ivy
<i>Vitis rotundifolia</i>	Muscadine grape
Epiphytes	
<i>Tillandsia recurvata</i>	Ball moss
<i>Tillandsia usneoides</i>	Spanish moss

Source: ECT, 2009.

Herbaceous Dry Prairie—310

Herbaceous dry prairie occurs covers approximately 2.7 acres or 2.1 percent of the Site and is limited to one location on the northeast side of the Site. Based on review of historic aerial photographs, it has been used for timber production in the past but at present is not planted in pine. It is establishing as an old field community, vegetated with a variety of mainly herbaceous species like bahia grass, rustweed, broomsedge, beak rushes, dog fennel, pokeweed, purple thistle, and flattop goldenrod, as well as scattered clumps of blackberry, a few scattered sand live oak and slash pine saplings, wax myrtle, and groundsel tree. This portion of the Site is relatively level and well drained. There are signs of vehicular use through this community, although no obviously graded road is present.

Mixed Hardwood/Conifer—434

This classification describes those areas on the GREC Site that have had timber selectively cut rather than clear-cut and are presently comprised of a combination of pine and hardwood species. This community has also been either planted or allowed to naturally reseed with pine. This vegetation type occurs on approximately 49.3 acres (37.7 percent) of the Site. The canopy is comprised of numerous semi-mature (20+ years) oaks, primarily water oak with a few laurel and live oaks intermixed, along with a few scattered blackgums and slash, longleaf, and loblolly pines. Subcanopy and shrub species include slash pine, longleaf pine, wax myrtle, groundsel tree, persimmon, winged sumac, saw palmetto, sabal palm, paw paw, beautyberry, highbush blueberry, rusty lyonia, gallberry, blackberry, queen's delight, and shiny blueberry, among others. Herbs include broomsedge, wiregrass, witch grasses, bracken fern, milkworts, blackroot, and numerous more.

Coniferous Plantation—441

Pine plantation, a human altered community, occurs on 44.9 acres (34.3 percent) of the Site. This classification is used for the tree stands that have been furrowed and planted with slash and occasionally longleaf pine. Several age classes of planted pine exist at various locations onsite ranging from 3- to 5-year-old stands in the north-central part of the Site to older stands (15 to 20+ years) in the northeast and southern portions of the GREC Site. The younger stands have a greater diversity of shrub and herbaceous species than the older communities, which have more well developed canopies that shade out herba-

ceous vegetation. Shrub species in the younger stands include groundsel tree, wax myrtle, gallberry, blueberry, St. Johns wort, as well as scattered longleaf pine saplings. The dominant understory species include broomsedge, rushes, bahia grass, Bermuda grass, dog fennel, purple thistle, blackberry, and beak rushes. Understory in the oldest stands consists of scattered clumps of wax myrtle, gallberry, saw palmetto, grapevine, bracken fern, cinnamon fern, and Virginia chain fern.

Swale and Ditch—512

Since the FLUCFCS Handbook does not have a category suitable for ditches, the designation 512 was created to identify manmade swales and ditches on the Site. Swales occur on approximately 1.2 acres (less than 1 percent) of the Site. The swales were created in conjunction with access road construction. Most are vegetated and convey water only seasonally. Typical swale vegetation includes cattail, maidencane, pickerelweed, bedstraw, soft rush, spikerush, creeping primrose willow, frog fruit, arrowheads, and beak rushes.

Cypress—621

The FLUCFCS designation for cypress swamps describes domes and sloughs where the canopy is dominated by cypress trees. There are three cypress wetlands onsite, which combined comprise 6.3 acres (4.8 percent) of the GREC Site. These cypress-dominated wetlands are surrounded by mixed forested wetlands (630) that occupy a slightly higher landscape position. The dominant canopy species in the cypress portion of the wetland is pond cypress, with a scattered mix of swamp tupelo, sweet gum, and red maple. Typical shrub species include wax myrtle, buttonbush, Virginia willow, and highbush blueberry. Common herbaceous species include maidencane, Virginia chain fern, caric sedges, and sawgrass. Wetland hydrology in each of the wetlands appears to be relatively unaffected by nearby ditching. The seasonal high water elevation appears to be approximately 48 inches above ground surface. During the 2009 surveys, which were conducted in the early part of the wet season, water levels were approximately 24 to 30 inches above the ground surface.

A significant number of dead cypress trees were observed in the southernmost and largest of the three cypress wetlands. According to environmental staff at GRU, the trees died several years ago due to extended drought conditions. Duckweed has become prevalent in the ponded areas due to gaps in the canopy. Also the invasive Chinese tallow is becoming established. The cypress trees in the two northern cypress wetlands appeared to be unaffected and in good condition.

Hydric Pine Flatwood/Plantation—626

This category delineates a zone of wet pine plantation surrounding freshwater marsh (641) in the southwestern part of the Site. It occupies approximately 1.1 acres (less than 1 percent) of the Site. It represents a transition between the marsh and the upland pine plantation and mixed hardwood conifer uplands. The canopy consists of planted slash pine. Shrub species include wax myrtle, fetterbush, highbush blueberry, gallberry, water oak, and St. Johns wort. The herbaceous layer is sparse and consists primarily of Virginia chain fern.

Wetland Forested Mixed—630

Wetland forests classified as FLUCFCS 630 occur on 14.2 acres (10.8 percent) of the Site. This community type is located in the higher landscape position surrounding the cypress wetlands onsite and is a distinct wetland community along the southern boundary. The southernmost wetland is a relatively mature swamp forest with little disturbance except for the access road to the south. Elsewhere onsite, this community is in a younger successional stage and has a larger pine component. Dominant canopy and subcanopy species for this cover type include water oak, swamp tupelo, pond cypress, red maple, sweetgum, and slash pine. Dominant subcanopy and shrub species include swamp red bay, Carolina willow, wax myrtle, groundsel tree, gallberry, fetterbush, highbush blueberry, St. Johns wort, and buttonbush. Herbaceous species include Virginia chain fern, cinnamon fern, royal fern, beak rushes, caric sedges, and sawgrass. The seasonal high water elevation varies from 36+ inches above ground surface in Wetland C in the southern part of the GREC Site to only approximately 2 inches above ground surface in the mixed forested wetlands surrounding the cypress wetlands (621) in Wetlands A and B (see Figure 3.3.5-1 for wetland locations). The portion of this community type surrounding much

of Wetland B is more disturbed than the rest. It has been logged and is reestablished as a dense mangle of weedy herbs, vines, and invasive Chinese tallow.

Wetland Shrub—631

Two wetlands onsite are classified as a nonforested wetland dominated by shrubs. These wetlands cover approximately 0.23 acre (less than 0.2 percent) of the Site and are situated in the eastern part of the Site. They occur in areas that appear to have been previously upland, but have been disturbed by logging practices to the point that they hold water for a sufficient duration to allow for the establishment of wetland indicators. These wetlands are isolated from other wetlands and are of average to low quality, highly furrowed, and dominated by weedy vegetation. The dominant vegetation species include Carolina willow, wax myrtle, groundsel tree, Chinese tallow, wool grass, soft rush, sand blackberry, creeping primrose willow, thistle, dog fennel, vasey grass, and golden rod.

Freshwater Marsh—641

Wetlands dominated by herbaceous vegetation and that are typically ponded on a seasonal basis are categorized as freshwater marshes. This community type is limited to one place in the southwest part of the GREC Site; it covers approximately 0.2 acre (0.2 percent) of the Site. It is situated at the lower elevations of an isolated depressional wetland and is surrounded by hydric pine plantation. Dominant plant species include Virginia chain fern, maidencane, soft rush, and saw grass. Other species present include dog fennel, smartweed, creeping primrose, pickerel weed, dollarweed, woolgrass, frogfruit, arrowheads, and scattered buttonbush.

Wet Prairie—643

One small wetland area, comprising 0.04 acre (0.03 percent) of the Site, is classified as wet prairie. This wetland occurs within a disturbed portion of the Site and was likely formed incidentally to silvaculture activities in previously upland areas. Dominant vegetation species include woolgrass, Virginia chain fern, blackberry, broomsedge, beak rushes, goldenrod, spade leaf, and Virginia buttonweed. This area does not appear to pond water for significant durations and is more likely to be seasonally saturated.

3.3.5.2 Offsite Construction Laydown Areas

Approximately 8 acres of land, just east of the GREC Site lease boundary will be used for construction laydown purposes. The laydown area is located within the limits of the GRU DGS power plant site and is primarily cleared grassy fields surrounded by access roads and manmade swales. The field is mowed on a regular basis to keep the grass in a lawn-type state. Two land use types were identified within the construction laydown areas including other open land (194) and freshwater marsh (641). Figure 3.3.5-3 shows the FLUCFCS land cover types for the construction laydown area, and Figure 3.3.5-4 presents photographs of the laydown area.

The vast majority (98 percent) of the laydown area is other open land (194), which comprises 7.89 acres. The dominant vegetation species is bahia grass, interspersed with others such as vasey grass, crowfoot grass, Bermuda grass, and various sedges. Two very small isolated depressions within the field hold water for a longer duration than the rest of the area and are vegetated with wetland species. These two low spots, Wetland Q (0.03) and Wetland R (0.08 acre) are classified as freshwater marsh (641) since they are vegetated by herbaceous wetland species, including alligator weed, torpedo grass, Bermuda grass, bahia grass, pennywort, creeping primrose willow, vasey grass, smartweed, star grass, and flatsedges.

Manmade swales drain the fields that will be used for construction laydown into the large existing stormwater management pond on the GRU DGS site. The swales will not be used for the construction laydown purposes.

Road and Highway (Unpaved Road, Logging Road, and Trail)—814

This classification is used to designate all interior roads on the Site. All are dirt and periodically graded. Roads occupy 6.2 acres (4.7 percent) of the Site. The perimeter roads and central north to south access roads are graded and drained. The other roads onsite are ungraded dirt trails likely due to silviculture activities. Many are impassable when wet.

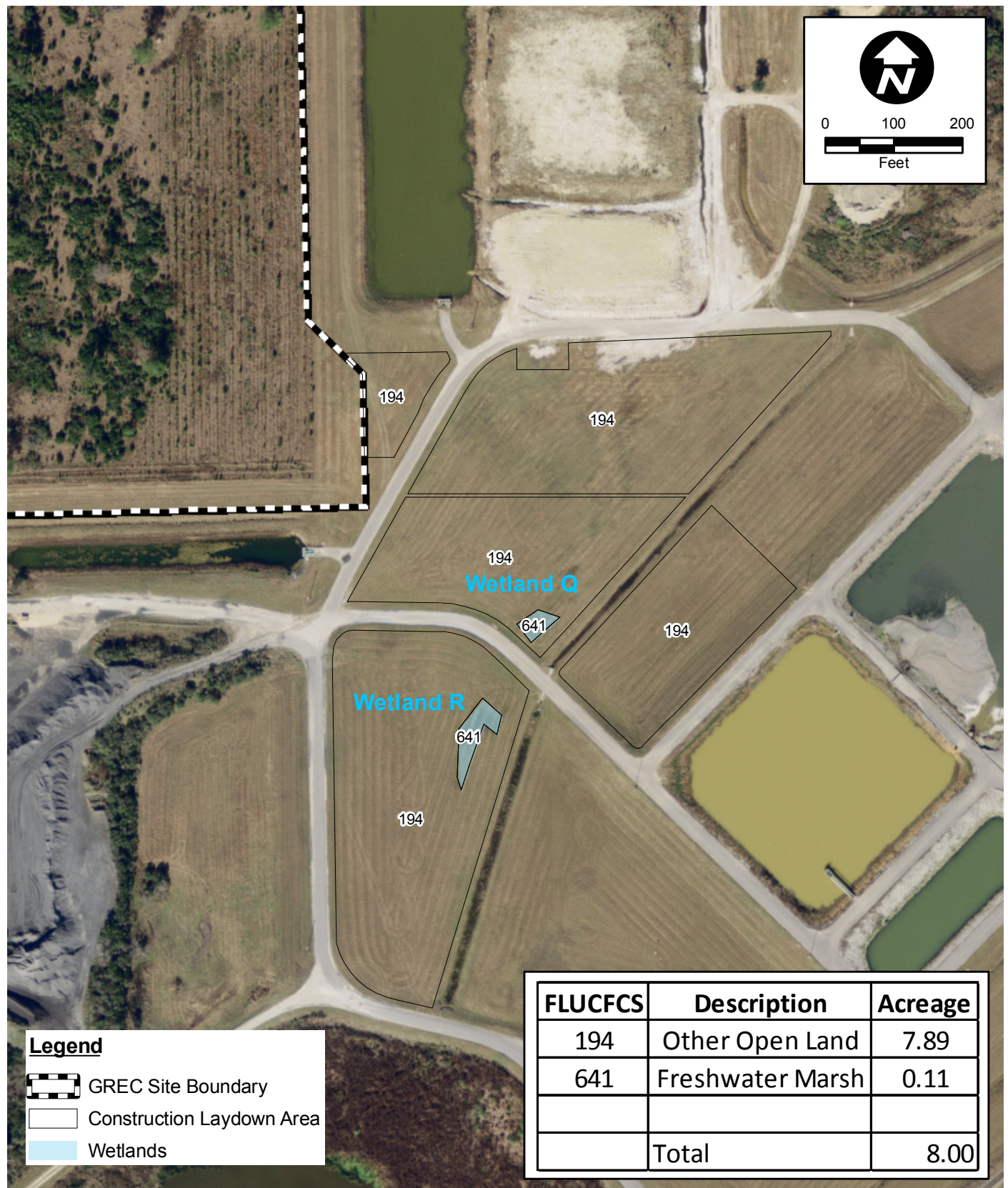


FIGURE 3.3.5-3.

OFFSITE CONSTRUCTION LAYDOWN AREA
LAND USE/COVER USING FLUCFCS

Sources: FDOT, 2008; Genesis, 2009; ECT, 2009.



Grassed fields (Other Open Land [194]) to be used for construction laydown area



Manmade swale draining grassed fields to be used for construction laydown area

FIGURE 3.3.5-4. (Sheet 1 of 2)
PHOTOGRAPHS OF VEGETATION COMMUNITIES AND
LAND COVER TYPES ON OFFSITE CONSTRUCTION
LAYDOWN AREAS

Sources: FDEP, 2009. ECT, 2009.



**Wetland Q, a small low spot (freshwater marsh) within
a field to be used for construction laydown area**



**Wetland R, a small low spot (freshwater marsh) within
a field to be used for construction laydown area**

FIGURE 3.3.5-4. (Sheet 2 of 2)
PHOTOGRAPHS OF VEGETATION COMMUNITIES AND
LAND COVER TYPES ON OFFSITE CONSTRUCTION
LAYDOWN AREAS

Sources: FDEP, 2009. ECT, 2009.

 Gainesville
Renewable Energy Center
An American Renewables Company

3.3.6 ECOLOGY

The ecological descriptions for the GREC Site primarily come from site reconnaissance and field studies conducted in 2008 and 2009. All information presented is deemed accurate within 12 months of filing this SCA.

3.3.6.1 Species—Environmental Relationships

The important flora and fauna of the region were researched through a variety of data sources, including but not limited to: Florida Natural Areas Inventory (FNAI) and Web sites of the Florida Fish and Wildlife Conservation Commission (FWC), U.S. Fish and Wildlife Service (USFWS), Florida Department of Agriculture and Consumer Services (FDACS), and Alachua County Environmental Protection Department (ACEPD). Specific information on plant and animal species is provided in the following paragraphs.

Aquatic Communities

There are no naturally occurring aquatic systems on the GREC Site. Therefore no aquatic faunal species would be expected. Manmade swales surrounding perimeter access roads were designed to hold excess stormwater runoff but are not hydrologically connected to other streams or aquatic systems beyond the Site. They are only seasonally wet and not large enough to support aquatic life for significant durations.

Terrestrial Systems

Flora

Plant communities on the GREC Site are typical of the region and are heavily influenced by silviculture activities. No unique vegetation assemblages are present. Subsection 3.3.5 previously described the various plant communities and species found on the Site.

Wildlife Communities

Subsection 3.3.5 previously described the various plant communities found on the GREC Site. All these communities provide some degree of wildlife habitat to local species. The GRU DGS site, while fenced, contains a variety of high-quality upland and wetland habitats used by species in the region.

Wildlife species were surveyed in two separate surveys during the mornings of May 27 and 28, 2009. Surveys consisted of a senior wildlife biologist and a biologist performing pedestrian transects across the Site, making sure all representative habitat types were observed. All species observed by direct sighting were noted as well as indirect observations of species through calls, tracks, burrows, dens, nests, or scat. Species were recorded by general habitat type in which they were observed. Listed species were noted and are described in the following subsections. All wildlife species observed on the Site are listed in Table 3.3.6-1.

The uplands onsite are primarily forested in pine-oak woods or various-aged stands of planted pine. Understory varies from thick and impenetrable to open and parklike. Common wildlife species observed in these upland communities included squirrel treefrog, black racer, black vulture, northern cardinal, blue jay, pileated woodpecker, red-bellied woodpecker, mockingbird, Carolina chickadee, rufous-sided towhee, Carolina wren, white-eyed vireo, armadillo, white-tailed deer, and feral hog.

Wetlands onsite generally are comprised of mixed hardwood swamp or cypress swamp and smaller areas of wet prairie or herbaceous marsh. Common species include many of the same listed previously but also brown-headed cowbird, opossum, and raccoon. Many nearby wetland habitats and open water areas just offsite also attract a great many bird species including most species of wading birds, wood stork, osprey, cormorant, boat-tailed grackle, and red-winged blackbird.

Game animals on the Site include white-tailed deer, wild turkey, and bobwhite quail, as well as the feral hog. However hunting is not allowed within the fenced GRU DGS property, so the presence of these animals does not provide for any special recreational or commercial value.

Threatened and Endangered Species—Flora

Based on element occurrence records for the Site and surrounding area provided by FNAI, review of the FNAI and Florida Atlas of Vascular Plants databases, and review of the USFWS list of protected species in Alachua County, there are no federally listed plant

Table 3.3.6-1. Wildlife Observed on the GREC Site—May 2009

Common Name	Scientific Name	Onsite Habitat in Which Observed				
		Cutover Pine/ Planted Pine	Oak-Pine Woods	Nonforested Wetlands	Forested Wetlands	Other*
<u>Amphibians</u>						
Cricket frog	<i>Acris gryllus</i>	H		H	H	
Green treefrog	<i>Hyla cinerea</i>		H			
Barking treefrog	<i>Hyla gratiosa</i>	H				
Squirrel treefrog	<i>Hyla squirella</i>	H	H			
<u>Reptiles</u>						
American alligator †	<i>Alligator mississippiensis</i>					Offsite
Green anole	<i>Anolis carolinensis</i>		V			
Black racer	<i>Coluber constrictor</i>	V				
Gopher tortoise †	<i>Gopherus polyphemus</i>	S‡				
Eastern garter snake	<i>Thamnophis sirtalis</i>	V				
<u>Birds</u>						
Red-winged blackbird	<i>Agelaius phoeniceus</i>					Offsite
American anhinga	<i>Anhinga anhinga</i>	V				
Great blue heron	<i>Ardea herodias</i>					Offsite
Cattle egret	<i>Bubulcus ibis</i>					Offsite
Red-shouldered hawk	<i>Buteo lineatus</i>	V			H	Offsite
Northern cardinal	<i>Cardinalis cardinalis</i>		V			
Great egret	<i>Casmerodius albus</i>					Offsite
Killdeer	<i>Charadrius vociferous</i>					Offsite
Common bobwhite quail	<i>Colinus virginianus</i>	V				
Black vulture	<i>Coragyps atratus</i>	V			H	
Fish crow	<i>Corvus ossifragus</i>					Offsite
Blue jay	<i>Cyanocitta cristata</i>	V	V			
Pileated woodpecker	<i>Dryocopus pileatus</i>	V			H	
Little blue heron †	<i>Egretta caerulea</i>					Offsite
Snowy egret †	<i>Egretta thula</i>					Offsite
White ibis †	<i>Eudocimus albus</i>					Offsite
Black-necked stilt	<i>Himantopus mexicanus</i>					Offsite
Tree swallow	<i>Iridoprocne bicolor</i>	V				Offsite
Red-bellied woodpecker	<i>Melanerpes carolinus</i>	V			H	
Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>	V				
Wild turkey	<i>Meleagris gallopavo</i>					Offsite
Northern mockingbird	<i>Mimus polyglottos</i>	V				
Brown-headed cowbird	<i>Molothrus ater</i>	V			V	
Wood stork †	<i>Mycteria americana</i>					Offsite
Great-crested flycatcher	<i>Myiarchus crinitus</i>	V	V			
Osprey	<i>Pandion haliaetus</i>					Offsite
Northern parula	<i>Parula americana</i>	V			H	
Tufted titmouse	<i>Parus bicolor</i>	V				
Carolina chickadee	<i>Parus carolinensis</i>	V				
Double-crested cormorant	<i>Phalacrocorax auritus</i>					Offsite

Table 3.3.6-1. Wildlife Observed on the GREC Site—May 2009 (Continued, Page 2 of 2)

Common Name	Scientific Name	Onsite Habitat in Which Observed				
		Cutover Pine/ Planted Pine	Oak-Pine Woods	Nonforested Wetlands	Forested Wetlands	Other*
Downy woodpecker	<i>Picoides pubescens</i>	V				
Rufous-sided towhee	<i>Pipilo erythrophthalmus</i>	V				
Blue-gray gnatcatcher	<i>Poliophtila caerulea</i>	V				
Boat-tailed grackle	<i>Quiscalus major</i>					Offsite
Eastern bluebird	<i>Sialia sialis</i>					Offsite
Carolina wren	<i>Thryothorus ludovicianus</i>	V	V			
White-eyed vireo	<i>Vireo griseus</i>	V				
Mourning dove	<i>Zenaida macroura</i>	V	V			
<u>Mammals</u>						
Coyote	<i>Canis latrans</i>	S				
Nine-banded armadillo	<i>Dasypus novemcinctus</i>	S				
Opossum	<i>Didelphis virginiana</i>				S	
White-tailed deer	<i>Odocoileus virginianus</i>		V		V	Offsite
Raccoon	<i>Procyon lotor</i>		S			
Eastern gray squirrel	<i>Sciurus carolinensis</i>		V			
Feral hog	<i>Sus scrofa</i>	S				

*Other species observed flying over the Site or along adjacent roads/habitats.

†Federal- or state-listed species.

‡Abandoned burrow.

Note: V = visual siting.

H = auditory identification.

S = other physical evidence.

Source: ECT, 2009.

species known to occur in Alachua County, Florida; however, there are 18 state-listed threatened or endangered plant species known to occur there. Table 3.3.6-2 lists important flora species with the potential to occur on or within 5 miles of the Site. Most of these are not expected to be present within the Project footprint based on the absence of preferred habitat. Five species have a moderate potential to occur on the Site based on presence of moderately suitable habitat: Flyr's brickell-bush, poppy mallow, giant orchid, Florida mountain mint, and pond spice. None of these was observed on the GREC Site during the July 2008 or May to June 2009 surveys. Surveys were conducted by a qualified biologist, familiar with the target plant species, who performed pedestrian surveys of all potentially suitable habitat. A description of these five species, including key identifying characteristics and preferred habitats, is provided in the following.

Flyr's Brickell-Bush (*Brickellia cordifolia*)—This species is a state-endangered perennial herb that occurs in upland habitats. It has one to several erect, faintly ribbed stems, is 1.5 to 5 ft tall, and is often fallen when flowering. Its leaves are 2.5 to 4 inches long, opposite at mid-stem, but may be alternate upward on stem, toothed, triangular with rounded or squared bases; lower leaf surfaces are gland-dotted and slightly hairy. Flower heads are at the top of stems with long purplish bristles and approximately 45 purplish-pink disc flowers. The plant flowers from late August to late October. Seven populations are known to occur in Florida, of which five are currently under protection. This species occurs in dry, upland pine-oak woods, often with southern red oak and loblolly pine, ravine slopes with spruce pine, white oak, and southern magnolia, usually in sunny openings or along edges of trails, but may persist in shady, overgrown woods. Habitat for this species on the GREC Site is present, but not ideal. The oak-pine communities (434) onsite are routinely disturbed by silvaculture activities and are somewhat densely vegetated. This species was not observed onsite but is known to occur in San Felasco Hammock Preserve State Forest, approximately 1.5 miles west of the GREC Site.

Poppy Mallow (*Callirhoe papaver*)—This species is a state-endangered perennial herb that occurs in upland habitats. It has a sprawling to prostrate form with stems from 5 to 10 ft long. It has large poppy-like flowers that are a deep magenta color, 2 to 3 inches across, and solitary and scattered along long peduncles. Leaves are variable and usually

Table 3.3.6-2. Important Plant Species That Occur or Have the Potential to Occur on the GREC Site

Scientific Name	Common Name	Federal Status	State Status*	Habitat	Likelihood of Occurrence Onsite†
<i>Adiantum tenerum</i>	Brittle maidenhair fern		E	Sinkhole, rockland hammock, upland hardwood forest. Found on limestone or soil over limestone. Found on upland hardwood forest stream banks.	Low
<i>Agrimonia incisa</i>	Incised groove-bur		E	Sandy, dry-mesic, usually upland in the lower Coastal Plain; longleaf pine-deciduous scrub oak, sandy or sandy loam. Open pine woods or mixed pine-oak woods, bluffs, small clearings and old roads, sometimes at the edge of more mesic habitats	Low
<i>Asplenium monanthes</i>	Single-sorus spleenwort		E	Limestone outcrops, limesinks, and cave openings	Low
<i>Asplenium pumilum</i>	Dwarf spleenwort		E	Upland mixed forest, hydric hammock. Found on limestone.	Low
<i>Blechnum occidentale</i>	Sinkhole fern		E	Moist woodlands, hammocks, rocky creek banks, woodlands w/ open shade, over limestone, near seasonally dry streams	Low
<i>Brickellia cordifolia</i>	Flyr's brickell-bush		E	Dry, upland pine-oak woods, often with southern red oak and loblolly pine; ravine slopes with spruce pine, white oak, and southern magnolia. Usually in sunny openings or along edges of trails, but may persist in shady, overgrown woods.	Moderate
<i>Callirhoe papaver</i>	Poppy mallow		E	Pinelands; calcareous fields; roadsides. Dry sites. Upland mixed forest. Found in edges or understory and on roadsides.	Moderate
<i>Cheilanthes microphylla</i>	Southern lip fern		E	Epipetric in crevices of limestone outcrops and terrestrial on shell mounds in partial to full sun	Low
<i>Coelorachis tuberculosa</i>	Piedmont jointgrass		T	Confined to karst areas in Florida and Alabama and there may be abundant locally on the margins or shallow of lakes and ponds or in wet savanna swales. Its shallow roots are in sandy peat or sandy peat-muck, a substratum that is usually at least moist, generally saturated. It may be in pure stands or scattered in an essentially grass-sedge meadow. Such areas are typically very unstable as regards to water level, during some seasons drying completely, during others filling up to surrounding forest. Thus, Coelorachis may be part of a large belt or expanse of waving grass-sedge or not much in evidence at all during times of extreme drought or extreme flooding. This makes meaningful population estimates difficult	Low
<i>Forestiera godfreyi</i>	Godfrey's swampprivet		E	Upland hardwood forests with limestone at or near the surface, often on slopes above lakes and rivers.	Low

Table 3.3.6-2. Important Plant Species that Occur or Have the Potential to Occur on the GREC Site (Continued, Page 2 of 2)

Scientific Name	Common Name	Federal Status	State Status*	Habitat	Likelihood of Occurrence Onsite†
<i>Litsea aestivalis</i>	Pondspice		E	Edges of baygalls, flatwoods ponds, and cypress domes. May form thickets around edges of ponds.	Moderate
<i>Malaxis unifolia</i>	Green adder's-mouth		E	Moist-wet sites, acidic soils. Slope forest, upland mixed forest, floodplain forest. Well-drained, cool, damp banks of streams in dense forests.	Low
<i>Matelea floridana</i>	Florida spiny-pod		E	Upland hardwood forests, with laurel oak, red oak, pignut or mockernut hickory, spruce, pine, and southern magnolia. A variety of wooded habitats from fairly moist woods, such as those in limesink areas, to dry, open oak-hickory or oak-hickory-pine upland forests. The most vigorous flowering populations occur where there has been a recent, canopy-opening disturbance; the plants may not flower at all in areas where the understory and overstory are continuous.	Low
<i>Najas filifolia</i>	Narrowleaf naiad		T	Freshwater lakes and river reaches that are darkwater habitats, i.e., the waters are tea-colored or darker due to high levels of leached organic acids.	Low
<i>Pteroglossaspis ecristata</i>	Giant orchid		T	Old fields, pine savanna, and scrub oak lands (Variety of upland habitats)	Moderate
<i>Pycnanthemum floridanum</i>	Florida mountain-mint		T	Wet swales/depressions in pine flatwoods; wet prairies, floodplain forest, soils are typically black sandy peats.	Moderate
<i>Salvia urticifolia</i>	Nettle-leaved sage		E	Rocky woodlands, most frequently on basic or circumneutral soil.	Low
<i>Sideroxylon alachuense</i>	Silver buckthorn		E	Upland hardwood forests around limesinks and on shell mounds	Low

*E = endangered.

T = threatened.

† Low = occurrence within or in proximity to area of proposed development highly unlikely because of species range, unsuitable habitat, or both.

Moderate = may occur within or in proximity to the area of proposed development since range and suitable habitat exists.

High = good possibility of occurrence within or in proximity to area of proposed development since range and suitable to optimal habitat exists.

Sources: USFWS, 2009.

FNAI, 2009.

ECT, 2009

divided into three to five linear to elliptic segments. This species blooms from May to July. It occurs in disturbed dry hammocks along edges of pinelands or upland mixed forest, calcareous fields, and roadsides. Habitat for this species on the Site is present, but not ideal. The oak-pine communities (434) and pine plantations (441) onsite are routinely disturbed by silviculture activities and are somewhat densely vegetated. This species was not observed onsite but is known to occur in San Felasco Hammock Preserve State Forest.

Pond Spice (*Litsea aestivalis*)—This is a state-endangered shrub or small tree that occurs in wetlands. It reaches heights of 15 ft and has zig-zag odorless twigs. Leaves are 0.5 to 1.5 inches long, deciduous, simple, alternate, somewhat leathery, smooth, oblong to lance shape, entire margins, and slightly thickened. Tiny flowers with six yellow sepals are located at the tips of branches. Fruits are fleshy, red, and round. It flowers in late winter through early spring and fruits throughout the fall. Preferred habitats include edges of baygalls, flatwood ponds, and cypress domes; it may also form thickets around the edges of ponds. There is potential habitat in the cypress wetlands (621) onsite but the species was not observed during the site surveys.

Giant Orchid (*Pteroglossaspis ecristata*)—This species is a state-threatened perennial orchid. Its leaves are long, narrow, and overlapping and clustered at the base. Its flowers are yellowish-green with dark purple markings and occur on a terminal cluster. It flowers from June to September. It occurs in numerous coastal plain habitats and tolerates a wide range of moisture conditions but is most often found in upland areas. Typical habitats include old fields, fire-maintained pine flatwoods, and scrub oak lands. On the GREC Site, habitat for this species is present within the herbaceous dry prairie (310) or along upland forest edges. However, this species was not observed during the site visits.

Florida Mountain Mint (*Pycnanthemum floridanum*)—This is a state threatened perennial shrublike species that occurs in wetlands. It is erect, loosely branched, grows up to 4 ft tall and dies back in the winter. Stems are square and leaves are approximately 2 inches long, opposite, and very aromatic. Mature leaves are covered with a whitish bloom, which gives an ashy gray appearance. The tiny lavender flowers are arranged in

dense terminal clusters approximately 1 inch in diameter. It blooms all summer. Typical habitats include wet swales or depressions in pine flatwoods, wet prairies, and floodplain forest. It prefers black sandy peat soils. There is some potential habitat for this plant on the Site in small wet prairies (643) or roadside swales (512); however, it was not observed during the site surveys.

According to the FNAI element occurrence records, there are also five important plant species known to occur within 5 miles of the Site. As shown on Figure 3.3.6-1, all of these are located within or nearby the boundaries of the San Felasco Hammock Preserve State Park, which is approximately 1.5 miles west of the Site, west of U.S. 441. The species known to occur there include Flyr's brickell-bush, poppy mallow, Godfrey's swamp privet, Florida mountain mint, and nettle-leaved sage. Three of these were described previously herein. Descriptions of the remaining two, Godfrey's swamp privet and nettle-leaved sage, follow.

Godfrey's Swamp Privet (*Forestiera godfreyi*)—This is a state-endangered deciduous shrub to small tree that occurs in uplands. It reaches heights of 16 ft and has main stems that are arching or leaning. Its leaves are 2 to 3 inches long, opposite, simple, oval, toothed above the middle, and hairy beneath. Flowers are tiny and yellow; fruits are waxy and blue. Flowers between January and February with fruits present through May. It occurs in upland hardwood forests with limestone just beneath the surface; frequently on sloping land above rivers or lakes. There is no suitable habitat for this plant on the GREC Site; it was not observed during the site visits.

Nettle-Leaved Sage (*Salvia urticifolia*)—This is a state-endangered perennial herb that occurs in upland habitats. It has an erect habit to 2.5 ft, pubescent stems, abruptly cuneate leaves, and dark blue to purplish flowers that bloom from April to June. It occurs in rocky woodlands, mostly on basic or circumneutral soils. Suitable habitat for this plant is lacking on the Site; it was not observed during the GREC Site visits.

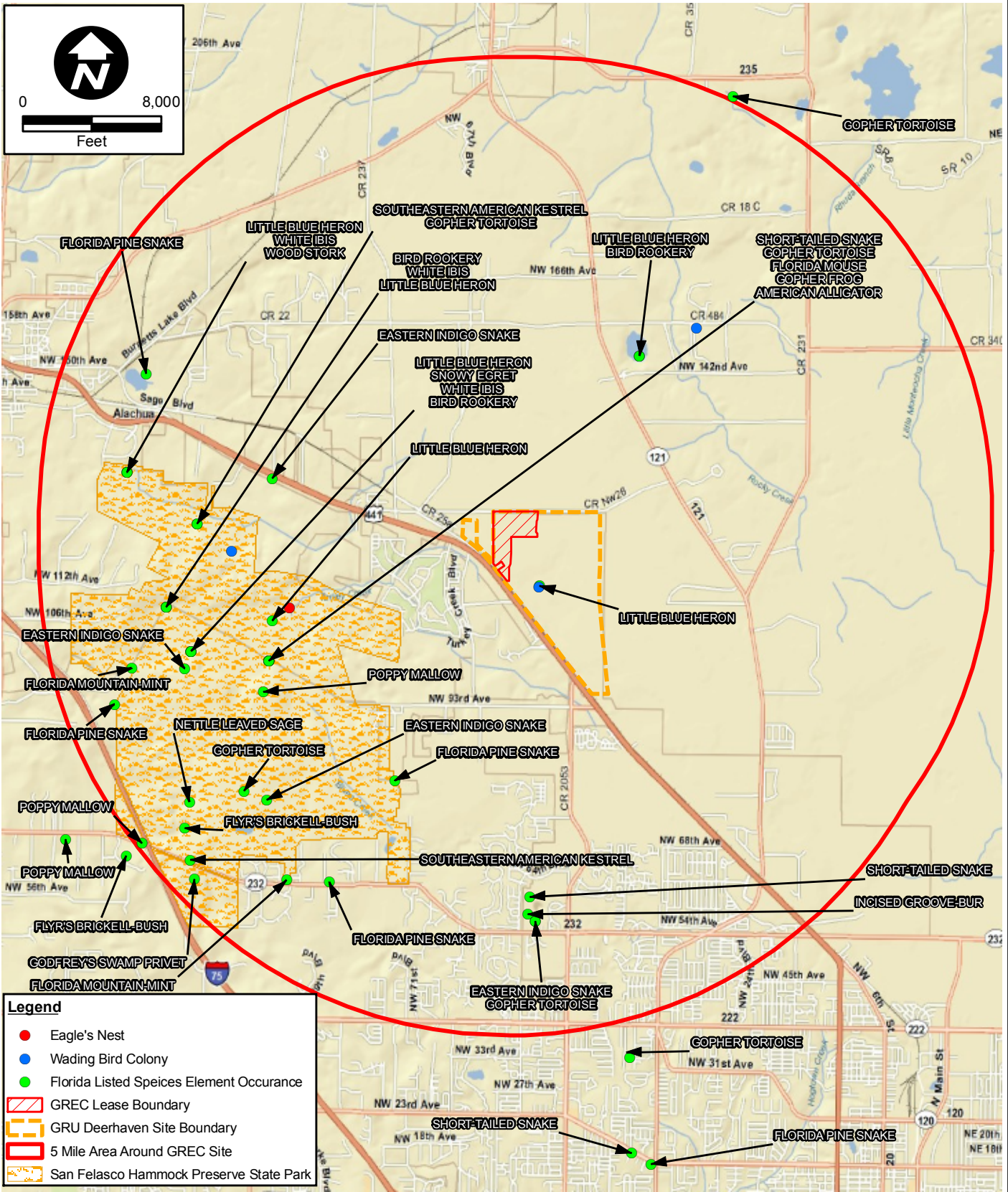


FIGURE 3.3.6-1.
FLORIDA LISTED SPECIES WITHIN
5-MILE BUFFER OF GREC SITE

Source: NRCS, 2007; FNAI, 2009; FFWCC, 2009; GREC, 2009; ECT, 2009.

Threatened and Endangered Species—Fauna

Listed wildlife species are those listed as endangered (E), threatened (T), or species of special concern (SSC) by FWC or endangered or threatened by USFWS. Table 3.3.6-3 depicts the listed wildlife species potentially occurring on the Site based on habitats present, known ranges of the species, and former documented occurrences by FWC, FNAI, or ACEPD. Figure 3.3.6-1, previously referenced, shows listed wildlife species that have been documented within 5 miles of the GREC Site.

Methodology for researching their potential for occurrence included review of databases of FWC, USFWS, FNAI, and ACEPD, as well as review of habitat types in the vicinity based on aerial photography, existing St. Johns River Water Management District (SJRWMD) FLUCFCS maps, National Wetlands Inventory (NWI) maps, and previous surveys of the Site and vicinity. Based on the field surveys of the Site conducted in May 2009, five listed species were observed either onsite or in the immediate vicinity. These species as well as others potentially occurring onsite are described in the following paragraphs.

Amphibians

Flatwoods Salamander (*Ambystoma cingulatum*)—This species is identified as threatened by USFWS due in large part to the destruction of its preferred habitat, pine flatwoods, and the degradation and/or loss of its wetlands breeding grounds. It is also listed as being of special concern in Florida (and Georgia), where the concentration of pine flatwoods habitat and consequently flatwoods salamander populations are to be found. This salamander occurs only in isolated populations, and the likelihood of its occurrence is considered unlikely within the GREC Site.

Gopher Frog (*Rana capito*)—The gopher frog is a species of special concern as identified by FWC. This amphibian is typically considered a commensal species to the gopher tortoise; therefore, the habitat requirements tend to be the xeric upland habitats that also support gopher tortoise populations. Within the area of the Site, there is a low likelihood that this species may be present due to a general lack of suitable habitat for gopher tortoises.

Table 3.3.6-3. Listed Wildlife Species Potentially Occurring in the GREC Site Area

Common Name	Scientific Name	Federal Status	State Status	Preferred Habitats	Likelihood of Occurrence
<u>Amphibians</u>					
Flatwoods salamander	<i>Ambystoma cingulatum</i>	T	SC	Flatwoods dominated by longleaf pine or slash pine and wire grass	L
Gopher frog	<i>Rana capito</i>		SC	Pinelands, scrub and freshwater marshes	L
<u>Reptiles</u>					
American alligator	<i>Alligator mississippiensis</i>		SC	Ponds, lakes, rivers and interior of swamps and freshwater marshes	P
Eastern indigo snake	<i>Drymarchon couperi</i>	T	T	Hardwood swamps, pine flatwoods and sandhill communities	M
Gopher tortoise	<i>Gopherus polyphemus</i>		T	Pinelands, sand pine scrub, xeric oak and sandhill communities	L
Alligator snapping turtle	<i>Macrolemys temminckii</i>		SC	Deep rivers typically contain muddy or sandy bottoms	U
Florida pine snake	<i>Pituophis melanoceus mugitus</i>		SC	Longleaf pine/turkey oak and sandhill communities	L
Suwannee cooter	<i>Pseudemys concinna suwanniensis</i>		SC	Rivers, springs, backwaters	U
Short-tailed snake	<i>Stilosoma extenuatum</i>		T	Dry, high pineland and upland hammocks	L
<u>Birds</u>					
Florida scrub jay	<i>Aphelocoma coerulescens</i>	T	T	Sand pine scrub and pine/xeric oak communities	U
Limpkin	<i>Aramus guarauna</i>		SC	Slow-moving freshwater rivers and streams, marshes and lakeshores	L
Florida burrowing owl	<i>Athene cunicularia floridana</i>		SC	Open, dry grasslands and deserts	U
Little blue heron	<i>Egretta caerulea</i>		SC	Shallow marshes, edges of swamps or ponds, flooded ditches and stream banks	P
Snowy egret	<i>Egretta thula</i>		SC	Shallow marshes, edges of swamps or ponds, flooded ditches and stream banks	P
Tricolored heron	<i>Egretta tricolor</i>		SC	Shallow marshes, edges of swamps or ponds, flooded ditches and stream banks	M

Table 3.3.6-3. Listed Wildlife Species Potentially Occurring in the GREC Site Area (Continued, Page 2 of 2)

Common Name	Scientific Name	Federal Status	State Status	Preferred Habitats	Likelihood of Occurrence
White ibis	<i>Eudocimus albus</i>		SC	Lakes, marshes and waterways	P
Southeastern American kestrel	<i>Falco sparverius paulus</i>		T	Open pine forest and clearings with dead trees, open edges and river bottoms	M
Florida sandhill crane	<i>Grus canadensis pratensis</i>		T	Wet prairies, marshy lake margins, sparsely vegetated marshes and shallow flooded open areas	L
Wood stork	<i>Mycteria americana</i>	E	E	Freshwater and brackish wetlands	P
Red-cockaded woodpecker	<i>Picoides borealis</i>	E	SC	Pine flatwoods, longleaf pine/oaks, and mixed hardwood and pine	U
<u>Mammals</u>					
Florida mouse	<i>Peromyscus floridanus</i>		SC	Sand pine scrub, longleaf pine/turkey oak, south Florida slash pine/turkey oak and scrubby flatwoods	L
Sherman's fox squirrel	<i>Sciurus niger shermani</i>		SC	Mature longleaf pine/turkey oak and temperate forests	L
Florida black bear	<i>Ursus americanus floridanus</i>		T *	Hardwood swamp. Cypress swamp, hardwood hammock and pine flatwoods	U

Federal Status (Source: USFWS, 2009.)

E = Listed as endangered.
T = Listed as threatened.

Florida Status (Source: FWC, 2009.)

E = Listed as endangered.
T = Listed as threatened.
T* = Listed as threatened only in selected areas.
SC = Listed as species of special concern.

Likelihood of Occurrence

U = Unlikely; habitat not present on project site.
L = Low; range and habitats are marginal to lacking.
M = Moderate; either range or habitat is marginal.
H = High; documented for the county.
P = Present; observed onsite.

Reptiles

American Alligator (*Alligator mississippiensis*)—The alligator is listed by FWC as a species of special concern. Found in most permanent bodies of fresh water, including marshes, swamps, lakes, and rivers throughout Florida, this reptile has been observed just offsite in a retention basin, and its presence is likely in other suitable habitats within the area.

Eastern Indigo Snake (*Drymarchon corais couperi*)—This distinctive large, bluish-black snake is listed as threatened by both USFWS and FWC and has a wide range of habitat preferences and prey species. Often considered a gopher tortoise commensal, it can be found in xeric habitats but also uses more mesic habitats as well. There is moderate likelihood of this snake occurring on the Site.

Gopher Tortoise (*Gopherus polyphemus*)—This medium-sized tortoise has a statewide range excluding the Everglades and the Keys. It is state-listed as a threatened species due to habitat loss and population decline. Found in dry upland habitats, including sandhill, scrub, xeric oak hammock, and dry pine flatwoods, it has low likelihood of occurrence on the Site, although an abandoned burrow was observed onsite.

Alligator Snapping Turtle (*Macrolemys temminckii*)—These freshwater turtles are listed as a species of special concern by FWC. Preferring rivers with muddy or sandy bottoms, and found also in backwater swamps, overflow lakes, and impoundments, the alligator snapping turtle is considered unlikely to be found within the GREC Site area.

Florida Pine Snake (*Pituophis melanoleucus mugitus*)—This state-listed species of special concern prefers the well-drained sandy soils associated with upland pine areas. Its likelihood of occurrence within the Site area is considered low due to the lack of suitable habitat.

Suwannee Cooter (*Pseudemys concinna suwanniensis*)—FWC has listed this freshwater turtle as a species of special concern whose populations are in decline. The preferred ha-

bitat includes rivers and large streams, including alluvial, blackwater, and spring-run streams, often with dense aquatic vegetation upon which this species feeds. Occurrence is unlikely within the Site.

Short-Tailed Snake (*Stilosoma extenuatum*)—This slender snake is a state-listed threatened species whose decline is directly related to loss and conversion of habitat from citrus, mining, silviculture, and development. The short-tailed snake is restricted in range to Florida only and prefers dry upland habitats, principally sandhill, xeric hammock, and sand pine scrub; therefore, the likelihood of occurrence in the Project area is low.

Birds

Florida Scrub Jay (*Aphelocoma coerulescens*)—This species, whose range is restricted to peninsular Florida, is listed as threatened both by USFWS and FWC. This jay inhabits the fire-dominated, low-growing, oak scrub habitat found on well-drained sandy soils. Florida scrub jays are diminishing in population due to loss, fragmentation, and degradation of suitable xeric habitat to sustain them. Occurrence within the Site is unlikely.

Limpkin (*Aramus guarauna*)—This elusive wading bird is state-listed as being of special concern. Although found in suitable habitats throughout the state, it prefers large slow-moving freshwater rivers and streams, marshes, and lakeshores and, for this reason, is considered to have a low likelihood of occurrence within the GREC Site.

Florida Burrowing Owl (*Athene cunicularia floridana*)—This species is listed by FWC as being of special concern. Most common in central Florida and preferring high, sparsely vegetated, sandy ground, this small ground-dwelling owl uses natural habitats including dry prairie and sandhill and is considered unlikely to occur in the Project area due to lack of habitat.

Little Blue Heron (*Egretta caerulea*)—The little blue heron is a state-listed species of special concern and is found in suitable wetlands throughout Florida. This wading bird prefers freshwater habitats for foraging and was observed on the DGS property just off-site of the GREC Site.

Snowy Egret (*Egretta thula*)—This medium-sized wading bird is state-listed as a species of special concern due primarily to wetland habitat loss. This bird is widely distributed in Florida in both fresh- and saltwater systems and prefers shallow marshes, edges of swamps or ponds, flooded ditches, and stream banks. It was observed on the DGS property near the Site.

Tricolored Heron (*Egretta tricolor*)—The tricolored heron (formerly known as the Louisiana heron) is a species of special concern as listed by FWC. This medium-sized wading bird prefers estuarine habitats but can be found foraging in almost any wetland system. There is suitable habitat to be found in the GREC Site area, and there is moderate likelihood for occurrence.

White Ibis (*Eudocimus albus*)—Found throughout Florida, this wading bird is state-listed as a species of concern due to statewide population decline. White ibis is found in a wide variety of habitats, including freshwater and brackish marshes, salt flats and salt marsh meadows, many types of forested wetlands, wet prairies, swales, seasonally inundated fields, and manmade ditches. This species was observed just off the Site.

Southeastern American Kestrel (*Falco sparverius paulus*)—The kestrel, the smallest of the falcons in the United States, is a state-listed threatened species. Found in open pine habitats, woodland edges, prairies, and pastures throughout much of Florida with sandhill habitats being preferred. The kestrel is considered to have a moderate likelihood for occurrence on the Site.

Florida Sandhill Crane (*Grus canadensis pratensis*)—This state-listed threatened species inhabits prairies, freshwater marshes, and pasture lands. Favoring wetlands dominated by pickerelweed and maidencane, it has a moderate likelihood of occurrence within the Site vicinity due to open areas with suitable open, shallow wetlands. The current population is estimated at 4,000 birds.

Wood Stork (*Mycteria americana*)—This large wading bird is a federal- and state-listed endangered species. Its habitat preference includes freshwater and brackish wetlands and cypress swamps for nesting, which are present in the GREC Site. Wood storks were observed roosting on the GRU DGS property just off the Site.

Red-Cockaded Woodpecker (*Picoides borealis*)—This small woodpecker is federally endangered and state-listed for special concern due to an increasingly fragmented population and lack of old-age pine stands. This species prefers mature pine woodlands and occupies longleaf pine flatwoods in north and central Florida. Due to the lack of preferred habitat on the Site, it is considered unlikely this nonmigratory species would occur.

Mammals

Florida Mouse (*Podomys floridanus*)—This state-listed species of special concern has a low likelihood of occurring on the Site due to its habitat preference, xeric upland communities with sandy soils including scrub and sandhill communities, not being present. It is also considered a gopher tortoise commensal, and gopher tortoises are lacking onsite.

Sherman's Fox Squirrel (*Sciurus niger shermani*)—This large tree squirrel has been listed as a species of special concern by FWC. Preferring mature longleaf pine/turkey oak and temperate forests, the Sherman's fox squirrel has been eliminated from much of its former habitat as a result of conversion to pine plantation, row crops, or development. Given the lack of mature longleaf pine and sandhill communities in immediate area, the likelihood of their presence on the Site is low.

Florida Black Bear (*Ursus americanus floridanus*)—The Florida black bear is currently listed as threatened by FWC except in Baker and Columbia Counties and in Apalachicola National Forest. Much of the historical habitat, large hardwood and cypress swamps, pine flatwoods, and dense thickets, has been lost to land clearing and alteration by man. It is considered unlikely given its habitat preference that the Florida black bear would be present on the Site.

3.3.6.2 Preexisting Stresses

Flora

There are several preexisting stresses to the vegetation communities onsite. With exception for the cypress wetlands (621) and the mixed forested wetland (630) in the southern part of the Site, the remaining portions of the Site have been subject to long-term silviculture activities, including bedding, furrowing, clearing, burning, cutting, planting, and debris piling. In addition, numerous roads and drainage swales bisect the GREC Site. The silviculture activities have eliminated the natural communities onsite (likely to have been a combination of pine flatwoods, mesic hammock, and mixed hardwood conifer) and significantly altered the species composition. Disturbance activities increase the opportunity for the introduction of weedy or nuisance species. Also, the roads and swales fragment the contiguous nature of vegetation associations and introduce gaps in the canopy, which can allow for invasion of weedy or nuisance species. Several populations of the invasive species including cogon grass, torpedo grass, and Chinese tallow were observed onsite in areas of disturbance.

The cypress wetland and adjacent mixed forested wetland delineated as Wetland B (see Figure 3.3.5-1) is significantly stressed as evidenced by a number of dead cypress trees, large gaps in the canopy, and a prevalence of weedy and undesirable species. According to GRU, the dead cypress trees are likely due to prolonged drought conditions. Death of the cypress introduced gaps in the canopy that allowed for overgrowth of duckweed. The eastern part of this wetland was logged and is overgrown with species and vines as compared to the other examples of this cover type onsite that have a more desirable species composition.

The swales onsite are relatively shallow and most convey water only during periods of heavy rains. There is no apparent hydrologic stress to the onsite wetlands as a result of these swales.

The offsite construction laydown areas are highly impacted lands that have been cleared, graded, and sodded. They are drained via manmade swales and mowed on a routine basis

to keep grass heights at lawn level. They contain little native vegetation species and support no significant flora communities.

Fauna

The preexisting stresses to the GREC Site are dominated by the presence and operation of DGS and all related facilities, such as buildings, equipment storage areas, stormwater basins, ash disposal areas, coal storage areas, substation and transmission line facilities, and a series of roads and manmade drainages. DGS operation also produces attendant noise, human presence, and operation of equipment and vehicles near the GREC Site. Numerous unimproved roads and trails cross the Site, probably as a result of past logging operations. However the presence of nearby stormwater basins does attract a large variety of wetland and water-dependent wildlife, that otherwise may not occur near the Site due to lack of such habitats.

3.3.6.3 Measurement Programs

Terrestrial ecological resources were evaluated through site reconnaissance, previous studies, and literature and Web site reviews. Vegetative communities, wildlife utilization, and potential for endangered and threatened plants and wildlife was evaluated during the field reconnaissance surveys conducted in May and June 2009.

The terrestrial ecology surveys conducted for GREC were specifically designed to obtain the baseline information necessary to characterize the Site's ecological resources as required by specific regulatory requirements and for the impact assessment. The required information includes:

- Identification of important flora and fauna on and in the vicinity of the Site, including state- and federal-listed species.
- Their habitats, abundance, and distribution.
- The relationship between species and their environment.
- The identification of the extent, distribution, type, successional status, preexisting stresses, condition, species composition and diversity, and function of vegetation communities on the Site.

Prior to field surveys, a literature search was conducted to review available written information, maps and aerial photographs, current listings and records of endangered and threatened species, and any available published material dealing with regional biota, preexisting environmental stresses, and effects of power plant construction and operation on plant and animal species.

Vegetation surveys were conducted in July 2008 and May through June 2009. All vegetation communities and associations thereof on the Site were identified and characterized by species composition and habitat structure. All discrete plant communities or associations thereof were classified using the FLUCFCS published by FDOT in 1999. Semi-quantitative estimates of percent cover and species dominance in each vegetative stratum and detailed qualitative information was compiled for all wetland communities proposed to be impacted by GREC, as well as for many of those wetlands in portions of the GREC Site that will not be directly impacted by proposed Project activities. Uplands were detailed qualitatively. Wetland jurisdictional boundaries were set according to current FDEP and USACE requirements, and the functional values of existing wetland communities were described and quantified utilizing the Uniform Mitigation Assessment Methodology (UMAM). The data gathered from the field surveys and the results of the UMAM evaluations are provided in the ERP application in Appendix 10.4.1.

Fauna at the Site was evaluated by conducting detailed wildlife surveys over the entire property in May through June 2009. The locations of any listed wildlife observed at the Site were recorded and mapped.

No aquatic ecological studies were conducted and are not considered necessary for the purposes of evaluating impacts to aquatic systems from the GREC facilities, since aquatic habitats are not present onsite.

3.3.7 METEOROLOGY AND AMBIENT AIR QUALITY

3.3.7.1 Meteorology and Climatology

The climate of north-central Florida is characterized as subtropical. Located approximately midway between the Gulf of Mexico and Atlantic Ocean, maritime influences have

less of an effect on the area than what is experienced along the coastlines. Gainesville is surrounded by several lakes located mostly to the south and east. Summers are humid, warm to hot, and long. Winters are typically mild with cold fronts occurring, which in some instances produce brief freezing conditions. Table 3.3.7-1 provides a summary of average monthly temperature and daily extremes data recorded at GRA, which is approximately 9 miles southeast of the site. Table 3.3.7-2 summarizes relative humidity data from GRA.

Generally, winter temperatures are temperate and range from approximately 30 to 75°F. Relative humidity is fairly constant year-round due to the inland conditions, surrounding lakes, and relative proximity to the Gulf of Mexico. Typical relative humidity values range from 88 to 93 percent in the early morning hours, and from 48 to 62 percent in the early afternoon. Typical monthly summertime temperatures range from 70 to 95°F and are mostly dependent on cloud formation and rain showers.

Based on data collected at GRA between 1971 and 2000, average daily maximum and minimum temperatures occurring during the summer months are 90 and 70°F, respectively. Average daily maximum and minimum temperatures occurring during the winter months are 68 and 44°F, respectively. The mild winter climate can be attributed to the southern latitude and the flat to rolling terrain found in the Gainesville area.

The normal annual precipitation recorded for Gainesville is approximately 48.4 inches, with most of this precipitation occurring during the summer months (see Subsection 3.3.3.1). The average rainfall during the period of 1971 to 2000 for June and August is 6.8 and 6.6 inches, respectively. The highest monthly rainfall during this same time period for June and August is 12.9 and 15.8 inches, respectively. The winter months are much drier with an average monthly rainfall of 2 to 3 inches. The large amount of summer rainfall is attributed to strong afternoon thunderstorms that can become extremely intense at times. These thunderstorms are a result of the moisture and heat introduced into the atmosphere during the hot summer days. Rainfall during the winter months results from frontal systems moving through the Gainesville area.

Table 3.3.7-1. Temperature Data for Gainesville, Florida

Month	Temperature (°F)		
	Mean*	Extreme Lowest Daily†	Extreme Highest Daily†
January	54.3	10	83‡
February	57.0	18	88
March	62.5	28‡	90
April	67.6	32	95
May	74.3	42	98‡
June	79.2	50	102
July	80.9	62‡	108
August	80.4	62	99‡
September	77.8	48	97
October	70.1	33	92‡
November	62.8	25	88‡
December	56.3	13	85
Annual	68.6	10	108

*Years 1971 through 2000.

†Years 1960 through 2001.

‡Occurred on more than one date.

Source: National Climatic Data Center (NCDC), 2004.

Table 3.3.7-2. Normal Relative Humidity Data for Gainesville, Florida

Month	Average Relative Humidity (%) Hour (Local Time)—1984 to 2008	
	0700	1300
January	89	58
February	88	55
March	89	51
April	88	48
May	88	48
June	87	56
July	88	59
August	90	60
September	93	62
October	91	59
November	91	58
December	90	59
Annual	90	56

Source: NCDC, 2008.

Wind data from GRA have been collected since 1960. GRA is located approximately 9 miles southeast of the GREC Site and provides representative wind data for GREC. A wind rose generated from the airport data for the period of 2001 to 2005 is shown in Figure 3.3.7-1. The predominant winds are from the northeast and west-southwest, and the average wind speed is 2.6 meters per second (m/s). Over the 5-year period, calm winds occurred 26 percent of the time.

Figures 3.3.7-2 through 3.3.7-5 show wind roses for the winter, spring, summer, and fall seasons, respectively, generated from the 2001 to 2005 GRA data. The wind direction varies significantly with the seasons. However, the average wind speed remains fairly constant throughout most of the year with the summer season experiencing more calm winds. The winter winds are predominantly from the northwest and westerly directions, with winds also occurring from the northeast. The average winter wind speed is 2.7 m/s. Winds during the spring are predominately from the west-southwest and easterly directions. The average spring wind speed is 2.9 m/s. Winds during the summer are evenly distributed among the southerly directions, with winds from the north rarely occurring. The average summer wind speed is 2.0 m/s, with calm winds occurring 33.2 percent of the time. Winds during the fall are predominantly from the northeast having an average wind speed of 2.6 m/s.

A distribution of atmospheric stability classes, given for annual average and seasonally, is presented in Table 3.3.7-3. Neutral to moderately stable atmospheric conditions predominate the Gainesville area with unstable conditions occurring only 26.5 percent of the time.

Typically, Alachua County does not have many serious climatological events associated with hurricanes and/or tropical storms. However, in 2004, Alachua County suffered severe damages from Hurricane Frances and Tropical Storm Jeanne. Alachua County estimated the cost of the damage from Frances alone to be \$9 million, also contributing to three deaths within the county (Arndofer, 2004). Most of the damage occurred from fallen or uprooted large trees in combination with flooding. Normally tropical systems are either substantially reduced in strength or change direction and avoid impacting the

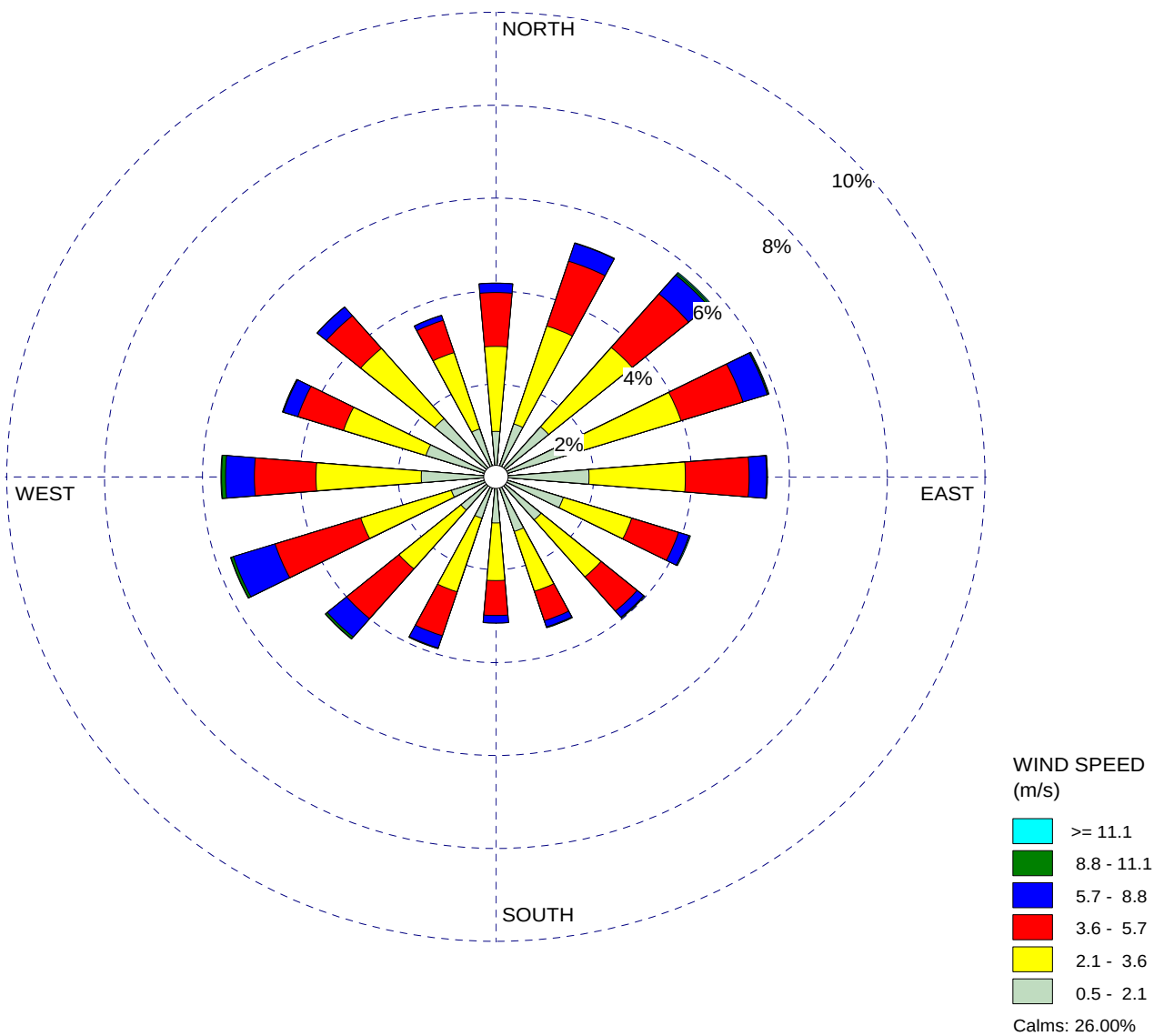


FIGURE 3.3.7-1.

5-YEAR WIND ROSE FOR GAINESVILLE REGIONAL
AIRPORT—2001 THROUGH 2005

Source: NCDC, 2006.

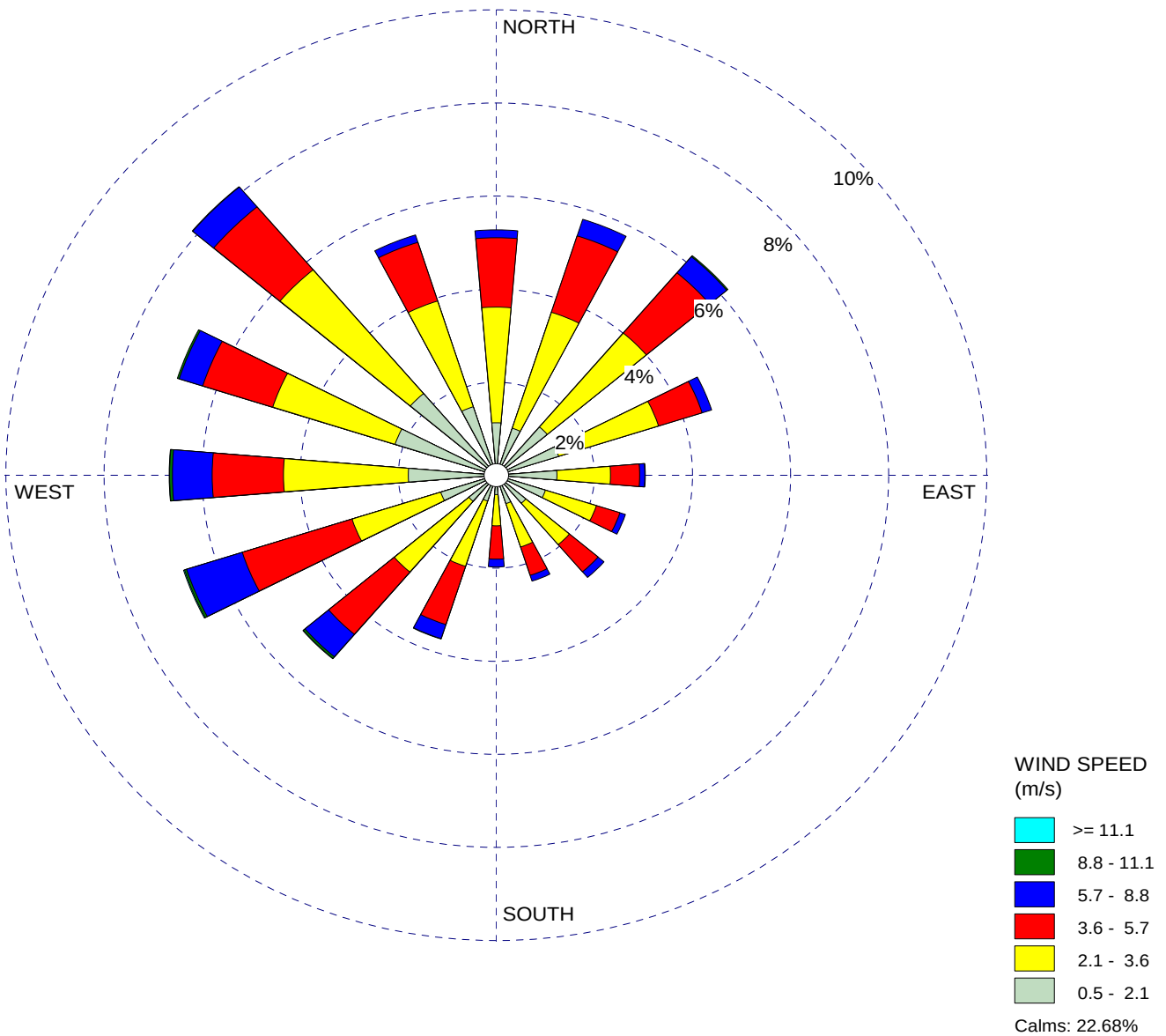


FIGURE 3.3.7-2.

5-YEAR WINTER WIND ROSE FOR GAINESVILLE
REGIONAL AIRPORT—2001 THROUGH 2005

Source: NCDC, 2006.

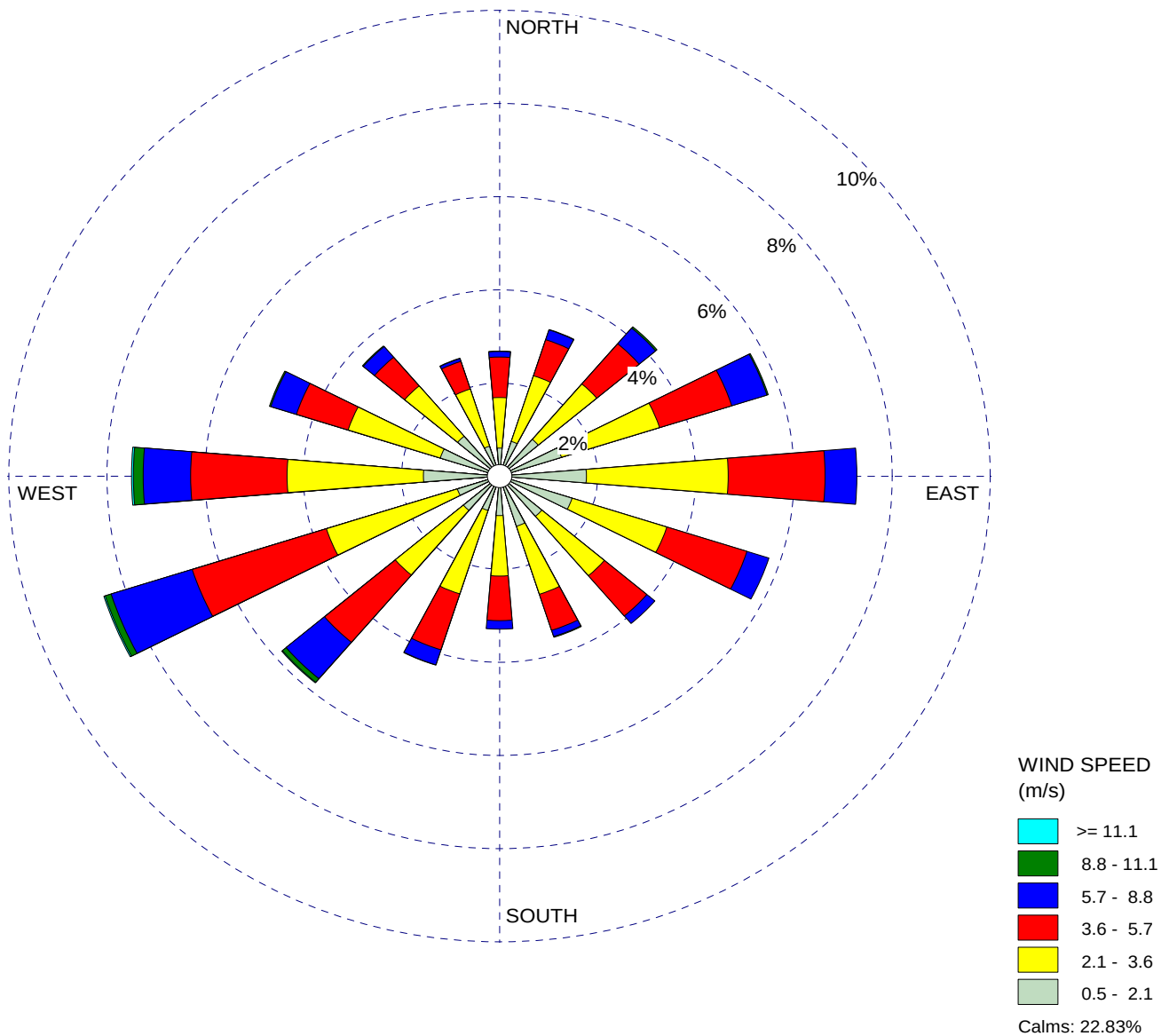


FIGURE 3.3.7-3.

5-YEAR SPRING WIND ROSE FOR GAINESVILLE
REGIONAL AIRPORT—2001 THROUGH 2005

Source: NCDC, 2006.

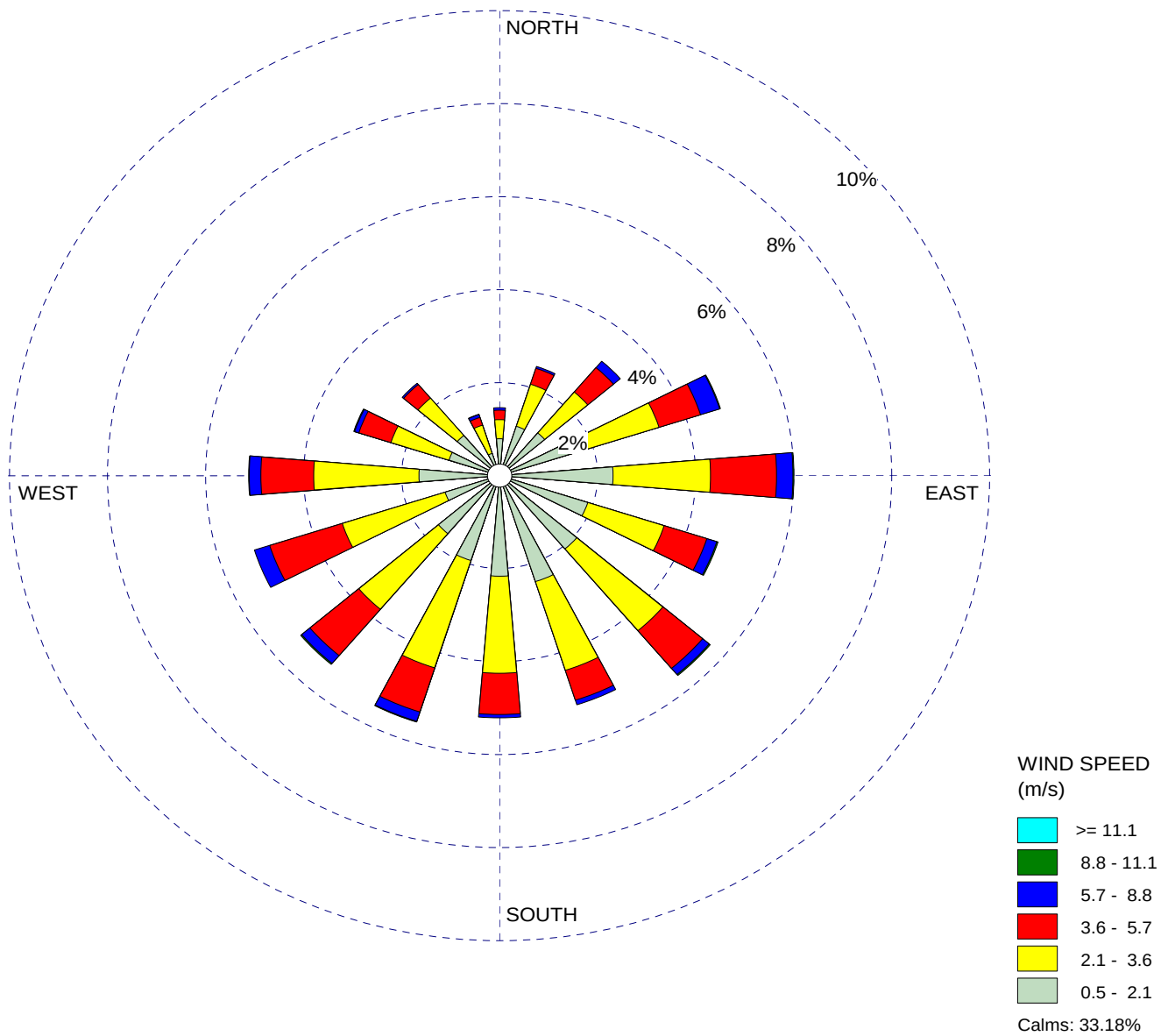


FIGURE 3.3.7-4.

5-YEAR SUMMER WIND ROSE FOR GAINESVILLE
REGIONAL AIRPORT—2001 THROUGH 2005

Source: NCDC, 2006.

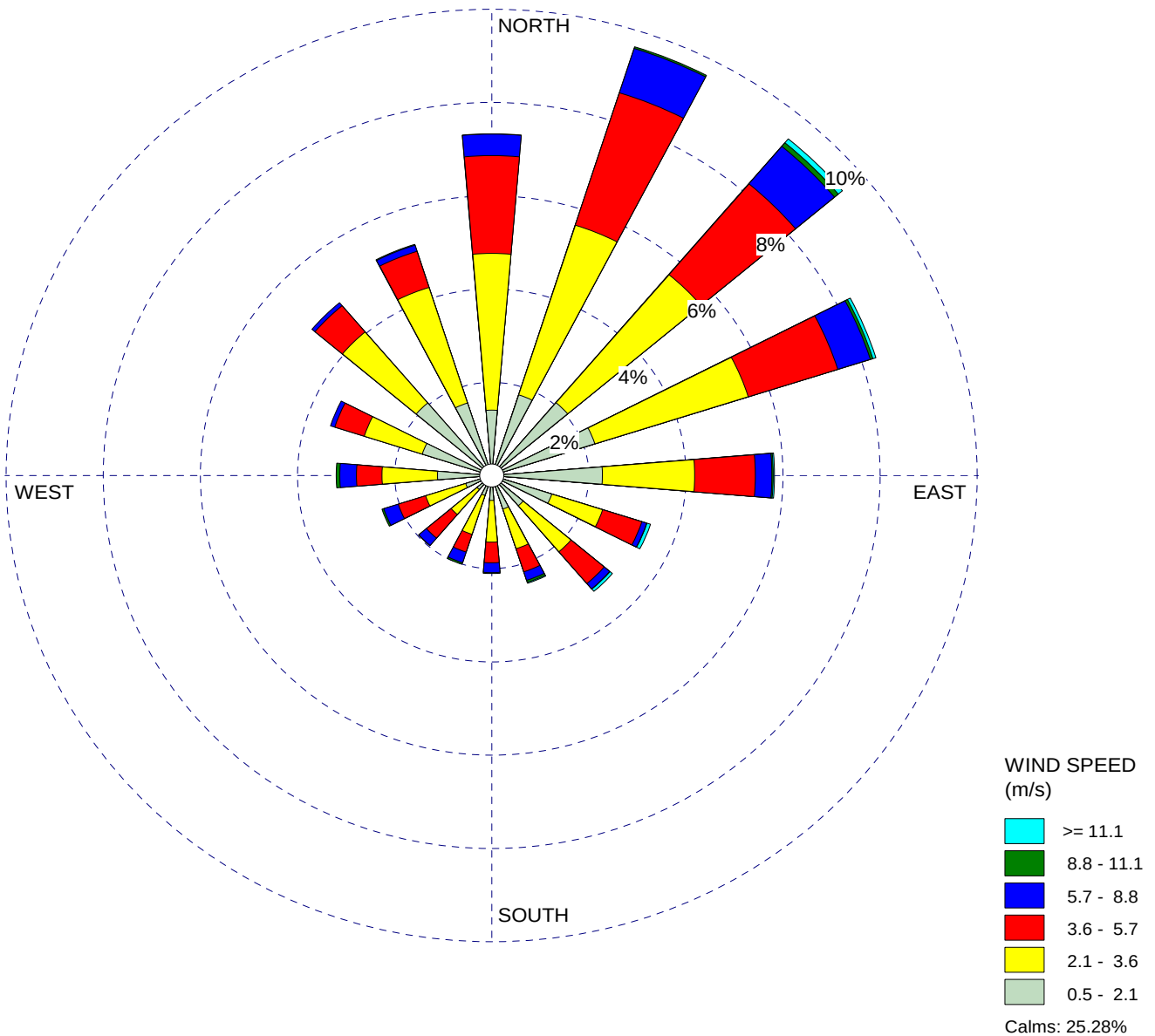


FIGURE 3.3.7-5.

5-YEAR FALL WIND ROSE FOR GAINESVILLE
REGIONAL AIRPORT—2001 THROUGH 2005

Source: NCDC, 2006.

Table 3.3.7-3. Annual and Seasonal Average Distribution of Atmospheric Stability Classes for Gainesville, Florida (2001 through 2005)

Season	Occurrence (%) of Stability Class					
	Very Unstable	Moderately Unstable	Slightly Unstable	Neutral	Slightly Stable	Moderately Stable
Winter	0.2	4.2	12.5	35.8	14.8	32.4
Spring	2.6	10.4	15.6	25.7	14.0	31.7
Summer	5.4	15.1	17.5	16.2	10.9	34.9
Fall	0.7	7.7	14.7	28.2	13.7	35.0
Annual	2.2	9.3	15.0	26.8	16.2	33.3

Sources: NCDC, 2006.
FDEP, 2009.
ECT, 2009.

Gainesville area. Gainesville is located approximately 55 miles from the Gulf of Mexico and 70 miles from the Atlantic Ocean, which is enough land mass to reduce or deter most tropical systems. Based on data from 1900 through 2008, the area of north-central Florida within approximately 25 miles of GREC experienced 10 tropical storms and 2 hurricanes (NOAA, 2009).

3.3.7.2 Ambient Air Quality

Ambient air quality is affected by meteorology, atmospheric chemistry, and pollutant emissions. The type, amount, and location of emission points can affect ambient air quality. Meteorology controls the distribution, dilution, and removal (e.g., deposition) of pollutants. Atmospheric chemistry governs the reactions that transform primary pollutants into other chemical compounds referred to as secondary pollutants. Maximum ground level concentrations of pollutants normally occur during periods of low wind speeds. During the summer months, the intensity of sunlight is at its highest. The combination of high pollutant concentrations and an abundance of ultraviolet light causes the production of photochemical smog, which contains pollutants such as ozone. Relative humidity is important to chemical transformation because of the interaction between pollutants and water molecules.

Air pollutants are characterized as either primary or secondary pollutants. Primary pollutants are generated directly from the emission source (i.e., NO_x, sulfur oxides [SO_x], carbon monoxide [CO], and particulates). Secondary pollutants are formed when primary pollutants react with atmospheric compounds (e.g., water, organics, and oxygen) under various atmospheric conditions, including temperature, humidity, and solar light intensity. An example of a secondary pollutant is ozone, which is formed when NO_x and volatile organic compounds (VOCs) react in the presence of sunlight.

The U.S. Environmental Protection Agency (EPA) has established national ambient air quality standards (NAAQS) for six pollutants: sulfur dioxide (SO₂), nitrogen dioxide (NO₂), CO, PM, lead, and ozone. These six pollutants are referred to as *criteria* pollutants. Primary NAAQS are health-based, with the principle objective being to protect

human health. Secondary NAAQS were developed to protect the environment and physical property.

PM is separated into two size categories. The NAAQS for particulate matter less than or equal to 10 micrometers (PM_{10}) and particulate matter less than or equal to 2.5 micrometers ($PM_{2.5}$) were revised effective October 17, 2006.

An 8-hour ozone NAAQS replacing the existing 1-hour standard was promulgated in July 1997. In March 2008, EPA lowered the 8-hour ozone NAAQS from 0.08 to 0.075 part per million (ppm). Although the Florida rules currently include a 1-hour ozone AAQS, on the federal level, EPA revoked this standard in Florida effective June 15, 2005. FDEP is in the process of adopting both the 8-hour ozone and $PM_{2.5}$ NAAQS and removing the current 1-hour ozone NAAQS.

Table 3.3.7-4 shows the primary and secondary NAAQS developed for different averaging times dependent on the characteristics of the pollutant. The states have the right to establish more stringent ambient air quality standards (AAQS). Table 3.3.7-4 also shows the AAQS developed for the state of Florida. Florida has adopted the federal limits for all pollutants except for the annual and 24-hour standards for SO_2 , which, in Florida, are more stringent.

Alachua County and the entire state of Florida are designated as attainment for all AAQS. On April 30, 2004, EPA issued final designations for the 1997 8-hour ozone NAAQS. For Florida, Chapter 40, Part 81.310, Code of Federal Regulations (CFR), was revised to designate all areas of the state, including Alachua County, as unclassifiable/attainment for the 1997 8-hour ozone NAAQS. In December 2008, EPA designated Alachua County attainment with respect to the revised 2006 $PM_{2.5}$ NAAQS. In its March 2009 submittal to EPA, Florida recommended that Alachua County be designated attainment with respect to the revised 2008 8-hour ozone NAAQS. EPA plans to designate geographic areas as attaining or not attaining the 2008 ozone NAAQS by March 12, 2010.

Table 3.3.7-4. NAAQS and Florida AAQS
(micrograms per cubic meter [$\mu\text{g}/\text{m}^3$] unless otherwise stated)

Pollutant (units)	Averaging Periods	National Standards		Florida Standards
		Primary	Secondary	
SO ₂	3-hour*		1,300	1,300
	24-hour*	365		260
	Annual†	80		60
PM ₁₀	24-hour‡	150	150	150
	Annual§			50
PM _{2.5}	24-hour**	35	35	
	Annual††	15	15	
CO	1-hour*	40,000		40,000
	8-hour*	10,000		10,000
Ozone (ppmv)	1-hour‡‡			0.12
	8-hour§§	0.075	0.075	
NO ₂	Annual†	100	100	100
Lead	Calendar quarter†	1.5	1.5	1.5
	Rolling 3-month	0.15	0.15	

*Not to be exceeded more than once per calendar year.

†Arithmetic mean.

‡The standards are attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu\text{g}/\text{m}^3$, as determined in accordance with 40 CFR 50, Appendix K, is equal to or less than one.

§The standards are attained when the expected annual arithmetic mean concentration, as determined in accordance with 40 CFR 50, Appendix K, is less than or equal to 50 $\mu\text{g}/\text{m}^3$.

**98th percentile concentration, as determined in accordance with 40 CFR 50, Appendix N.

††Arithmetic mean concentration, as determined in accordance with 40 CFR 50, Appendix N.

‡‡Standard attained when the expected number of calendar days per calendar year with maximum hourly average concentrations above the standard is equal to or less than 1, as determined by 40 CFR 50, Appendix H.

§§Standard attained when the average of the annual 4th highest daily maximum 8-hour average concentrations over a 3-year period are less than or equal to the standard.

Sources: 40 CFR 50.

Section 62-204.240, F.A.C.

Ambient air quality monitors collect data used to determine attainment status. Figure 3.3.7-6 shows the locations of the ambient monitors in the Alachua County area. Table 3.3.7-5 (for PM₁₀, PM_{2.5}, SO₂, NO₂, CO, and lead) and Table 3.3.7-6 (for ozone) show the most recent 5 years of ambient air quality monitoring data and compares these data to the most stringent AAQS for the respective averaging periods.

As shown in Table 3.3.7-5, PM₁₀ and PM_{2.5} values were elevated for all the Alachua area monitors during 2007. Further investigation found elevated PM₁₀ and PM_{2.5} values for monitors located throughout northeast Florida during the time period of late February through June of 2007. FDEP attributes these elevated values to the Bugaboo Fire that burned much of the Okefenokee National Wildlife Refuge (NWR) during this same time period (FDEP, 2009). The Okefenokee NWR is located approximately 70 miles north of Gainesville. FDEP sent documentation to EPA in December of 2007 to have this data excluded for purposes of attainment/maintenance analysis. In correspondence to FDEP dated June 12, 2009, EPA agreed to exclude monitoring data that would have resulted in an exceedance of the PM₁₀ or PM_{2.5} NAAQS. Accordingly, Alachua County remains a designated attainment area with respect to the PM₁₀ or PM_{2.5} NAAQS.

EPA has developed a descriptor of air quality that is used to characterize the air quality. This descriptor is called the air quality index (AQI). Air quality is described over a range from *good* to *hazardous* based on a calculated numerical value, as follows:

AQI Values	Levels of Health Concern	Colors
<i>When the AQI is in this range:</i>	<i>...air quality conditions are:</i>	<i>...as symbolized by this color:</i>
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for sensitive groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very unhealthy	Purple
301 to 500	Hazardous	Maroon

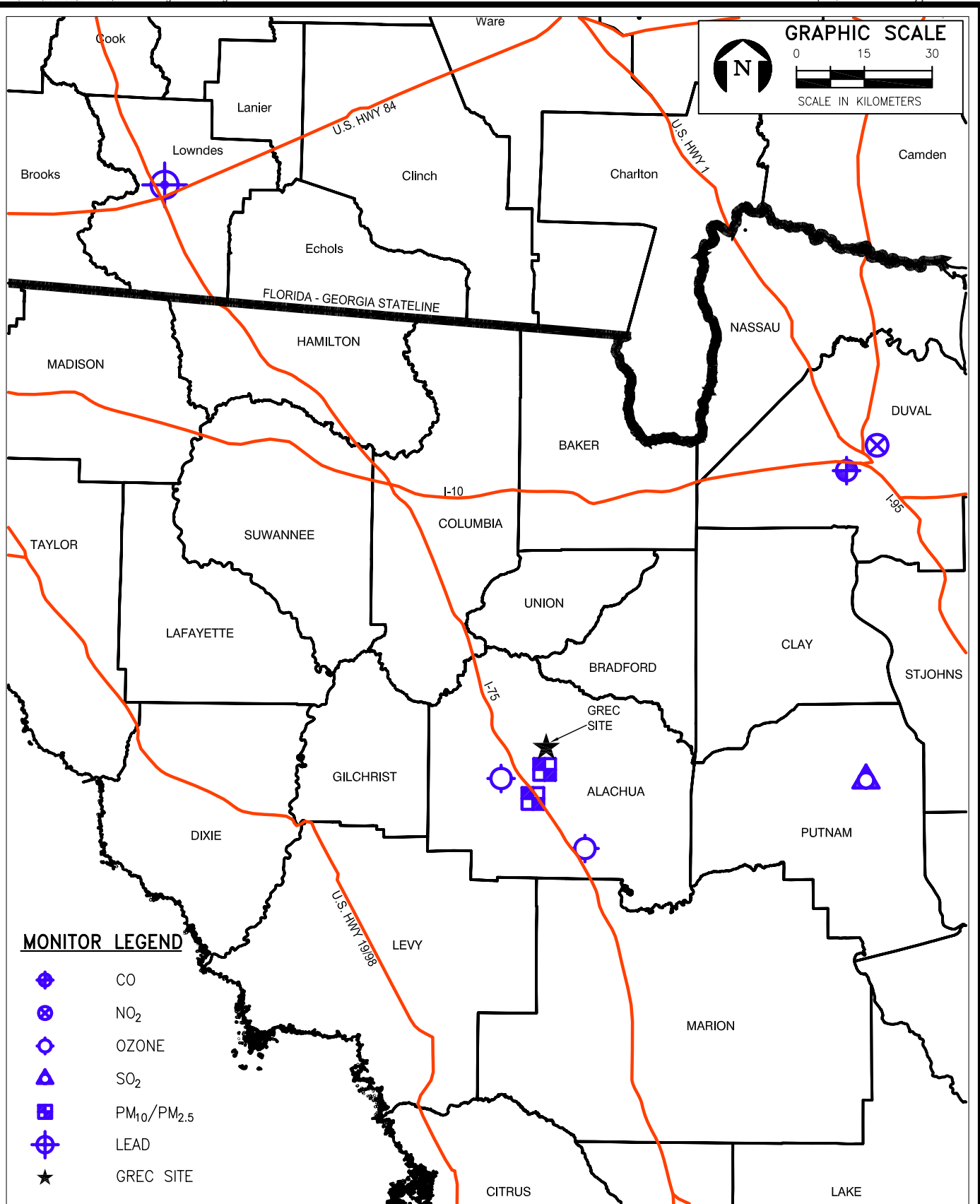


FIGURE 3.3.7-6.

LOCATION OF AMBIENT AIR QUALITY MONITORS NEAR
GREC SITE

Sources: FDEP, 2007; ECT, 2009.

Table 3.3.7-5. Gainesville Area Ambient Air Quality Data—2004 through 2008

(Page 1 of 2)

Pollutant	Site Location		Site Name	Site Number	Distance From Site (km)	Direction From Site (Vector °)	Year	Averaging Period	Number of Observations	Ambient Concentration (ug/m ³)				
	County	City								1 st High	2 nd High	Arithmetic Mean	Standard*	Percent of Standard
PM ₁₀	Alachua	Gainesville	Northwest 53 rd Avenue and Northwest 43 rd Street	120010023	7	175	2004	24-Hour	343	63	48		150†	32.0
							2005	24-Hour	307	61	61		150†	40.7
							2006	24-Hour	353	54	39		150†	26.0
							2007	24-Hour	354	163‡	77‡		150†	51.3
							2008	24-Hour	273	53	51		150†	34.0
							2004	Annual	362			18	50§	36.0
							2005	Annual	355			19	50§	38.0
							2006	Annual	347			18	50§	36.0
							2007	Annual	355			20‡	50§	40.0
							2008	Annual	348			18	50§	36.0
							2004	Annual	115			9.18	15§	61.2
							2005	Annual	120			9.28	15§	61.9
PM _{2.5}	Alachua	Gainesville	Northwest 53 rd Avenue and Northwest 43 rd Street	120010023	7	175	2004	24-Hour	115	22.4	21.4		65†	32.9
							2005	24-Hour	120	39.5	25.3		65†	38.9
							2006	24-Hour	113	21.1	20.9		65†	32.2
							2007	24-Hour	118	60.9‡	50.9‡		65†	78.3
							2008	24-Hour	89	17.7	15.7		65†	24.2
							2004	Annual	115			9.18	15§	61.2
							2005	Annual	120			9.28	15§	61.9
							2006	Annual	113			9.09	15§	60.6
							2007	Annual	118			38.1‡	15§	254.0
							2008	Annual	89			15.7	15§	104.7
PM _{2.5}	Alachua	Gainesville	Southwest 8 th Avenue	120010024	14	188	2004	24-Hour	115	39.1	23.2		65†	0.0
							2005	24-Hour	110	34.5	24.6		65†	0.0
							2006	24-Hour	117	21.2	20.0		65†	0.0
							2007	24-Hour	117	50.0‡	44.8‡		65†	68.9
							2008	24-Hour	91	18.0	16.0		65†	0.0
							2004	Annual				9.45	15§	63.0
							2005	Annual				9.74	15§	64.9
							2006	Annual				9.34	15§	62.3
							2007	Annual				9.85	15§	65.7
							2008	Annual				8.08	15§	53.9
SO ₂	Putnam	Palatka	Comfort and Port Roads	121071008	72	98	2004	3-Hour	8,706	99	94		1,300†	7.2
							2005	3-Hour	8,686	133	128		1,300†	9.8
							2006	3-Hour	8,657	196	128		1,300†	9.8
							2007	3-Hour	8,533	65	63		1,300†	4.8
							2008	3-Hour	6,469	269	71		1,300†	5.4
							2004	24-Hour	8,706	34	26		260†	10.0
							2005	24-Hour	8,686	34	34		260†	13.1
							2006	24-Hour	8,657	37	37		260†	14.1
							2007	24-Hour	8,533	21	18		260†	7.0
							2008	24-Hour	6,469	39	18		260†	7.0

Table 3.3.7-5. Gainesville Area Ambient Air Quality Data—2004 through 2008

(Page 2 of 2)

Pollutant	Site Location		Site Name	Site Number	Distance From Site (km)	Direction From Site (Vector °)	Year	Averaging Period	Number of Observations	Ambient Concentration (ug/m ³)				
	County	City								1 st High	2 nd High	Arithmetic Mean	Standard*	Percent of Standard
SO ₂ (Continued)	Putnam	Palatka	Comfort and Port Roads	121071008	72	98	2004	Annual	8,706			5.2	60§	8.7
							2005	Annual	8,686			5.2	60§	8.7
							2006	Annual	8,657			5.2	60§	8.7
							2007	Annual	8,533			5.2	60§	8.7
							2008	Annual	6,469			5.2	60§	8.7
NO ₂	Duval	Jacksonville	2900 Bennett Street	120310032	98	49	2004	Annual	7,451			26.3	100§	26.3
							2005	Annual	7,890			24.4	100§	24.4
							2006	Annual	8,086			22.5	100§	22.5
							2007	Annual	7,990			18.8	100§	18.8
							2008	Annual	6,032			16.9	100§	16.9
CO	Duval	Jacksonville	1184 South McDuff Avenue	120310083	89	49	2004	1-Hour	7,963	4,300	3,500		40,000†	8.8
							2005	1-Hour	7,862	3,800	3,300		40,000†	8.3
							2006	1-Hour	8,467	3,900	3,900		40,000†	9.8
							2007	1-Hour	8,576	3,000	2,900		40,000†	7.3
							2008	1-Hour	6,318	2,900	2,400		40,000†	6.0
							2004	8-Hour	7,963	3,000	2,600		10,000†	26.0
							2005	8-Hour	7,862	2,300	2,200		10,000†	22.0
							2006	8-Hour	8,467	2,600	1,800		10,000†	18.0
							2007	8-Hour	8,576	2,100	1,700		10,000†	17.0
							2008	8-Hour	6,318	1,600	1,400		10,000†	14.0
							2004	24-Hour	24	0.01	0.01		0.15⊗	6.7
							2005	24-Hour	27	0.01	0.00		0.15⊗	6.7
							2006	24-Hour	31	0.01	0.01		0.15⊗	6.7
Lead	Lowndes	Valdosta, GA	Valdosta_S.L. Mason	131850003	148	326	2007	24-Hour	27	0.00	0.00		0.15⊗	0.0
							2008	24-Hour	23	0.00	0.00		0.15⊗	0.0
							2004	Max quarterly	24	0.00			1.5§	0.0
							2005	Max quarterly	27	0.00			1.5§	0.0
							2006	Max quarterly	31	0.00			1.5§	0.0
							2007	Max quarterly	27	0.00			1.5§	0.0
							2008	Max quarterly	23	0.00			1.5§	0.0
							2004	Max quarterly	24	0.00			1.5§	0.0
							2005	Max quarterly	27	0.00			1.5§	0.0
							2006	Max quarterly	31	0.00			1.5§	0.0

*See Table 3.3.7-4 for the complete conditions associated with each standard.

†Not to be exceeded more than once per year.

‡FDEP suggests interference from a fire. EPA is currently reviewing the exclusion of this data.

§Arithmetic mean.

⊗Rolling 3-month average.

Sources: FDEP, 2009.
 EPA, 2009.
 ECT, 2009.

Table 3.3.7-6. Gainesville Area Ozone Ambient Air Quality Data—2002 through 2008

Site Location		Site Name	Site Number	Distance From Site (km)	Direction From Site (Vector °)	Year	Averaging Period	Number of Days	Ambient Ozone Concentration ($\mu\text{g}/\text{m}^3$)					Percent of Standard*
County	City								1 st High	2 nd High	3 rd high	4 th high	Standard	
Alachua	Gainesville	200 Savannah Boulevard	120013011	27	159	2002	1-Hour	243	176	167	157	157	235†	N/C
						2003	1-Hour	238	174	170	159	157	235†	N/C
						2004	1-Hour	232	186	178	167	161	235†	74.2
						2005	1-Hour	146	168	165	165	163	235†	72.5
						2006	1-Hour	244	174	168	167	167	235†	71.7
						2007	1-Hour	245	188	182	178	178	235†	75.9
						2008	1-Hour	209	165	149	147	147	235†	62.5
						2002	8-Hour	240	149	141	139	139	157‡	N/C
						2003	8-Hour	236	159	147	143	139	157‡	N/C
						2004	8-Hour	231	161	155	153	147	157‡	90.3
						2005	8-Hour	146	153	147	143	143	157‡	91.1
						2006	8-Hour	244	153	151	147	147	157‡	92.8
						2007	8-Hour	245	161	159	155	153	157‡	94.0
						2008	8-Hour	207	149	139	137	135	157‡	92.3
Alachua	Gainesville	2821 Northwest 143 rd Street	120010025	13	223	2002	1-Hour	N/A	N/A	N/A	N/A	N/A	235†	N/A
						2003	1-Hour	234	174	168	161	155	235†	N/C
						2004	1-Hour	219	182	161	159	155	235†	N/C
						2005	1-Hour	243	165	165	165	165	235†	70.0
						2006	1-Hour	N/A	N/A	N/A	N/A	N/A	235†	N/A
						2007	1-Hour	N/A	N/A	N/A	N/A	N/A	235†	N/A
						2008	1-Hour	N/A	N/A	N/A	N/A	N/A	235†	N/A
						2002	8-Hour	N/A	N/A	N/A	N/A	N/A	157‡	N/A
						2003	8-Hour	234	165	153	151	143	157‡	N/C
						2004	8-Hour	216	165	147	143	143	157‡	N/C
						2005	8-Hour	242	151	151	143	141	157‡	90.7
						2006	8-Hour	N/A	N/A	N/A	N/A	N/A	157‡	N/A
						2007	8-Hour	N/A	N/A	N/A	N/A	N/A	157‡	N/A
						2008	8-Hour	N/A	N/A	N/A	N/A	N/A	157‡	N/A

Note: N/A = not available.
N/C = not calculated.

*Percent of standard for 1-hour values is based on 1-hour design values (4th highest daily 1-hour maximum over a 3-year period).

†Average number of expected exceedances above the standard per year, over a 3-year period, is less than or equal to one.

‡4th highest daily 8-hour concentration averaged over a 3-year period.

Sources: FDEP, 2009.
EPA, 2009.
ECT, 2009.

Each category corresponds to a different level of health concern. The following describes the six levels of health concern and what they mean:

- **Good**—The AQI value for your community is between 0 and 50. Air quality is considered satisfactory, and air pollution poses little or no risk.
- **Moderate**—The AQI for your community is between 51 and 100. Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people. For example, people who are unusually sensitive to ozone may experience respiratory symptoms.
- **Unhealthy for Sensitive Groups**—When AQI values are between 101 and 150, members of sensitive groups may experience health effects. This means they are likely to be affected at lower levels than the general public. For example, people with lung disease are at greater risk from exposure to ozone, while people with either lung disease or heart disease are at greater risk from exposure to particle pollution. The general public is not likely to be affected when the AQI is in this range.
- **Unhealthy**—Everyone may begin to experience health effects when AQI values are between 151 and 200. Members of sensitive groups may experience more serious health effects.
- **Very Unhealthy**—AQI values between 201 and 300 trigger a health alert, meaning everyone may experience more serious health effects.
- **Hazardous**—AQI values over 300 trigger health warnings of emergency conditions. The entire population is more likely to be affected.

The higher the AQI value, the greater the level of air pollution and greater the health concern. For example, an AQI value of 50 represents good air quality with little potential to affect public health, while an AQI value more than 300 represents hazardous air quality.

An AQI value of 100 generally corresponds to the NAAQS for the pollutant, which is the level EPA has set to protect public health. AQI values below 100 are generally thought of as satisfactory. As AQI values go above 100, air quality is considered to be unhealthy—at first for certain sensitive groups of people, then for everyone as AQI values get higher.

Figure 3.3.7-7 provides AQI charts for Alachua County for 2007 and 2008. In 2007, Alachua County experienced 315 *good* air quality days, 44 *moderate* days, and 6 *unhealthy for sensitive groups* days. In 2008, there were 258 *good* days, 15 *moderate*, and 1 *unhealthy for sensitive groups* days. Overall, based on these charts, air quality in Alachua County is generally satisfactory or *good*. The pollutant primarily affecting air quality in Alachua County is ozone, which is a regional pollutant formed in the atmosphere in the summer. As shown in Figure 3.3.7-7, days having the highest AQI values are mostly caused by elevated concentrations of ozone in the spring and early summer months. In 2007, PM₁₀ and PM_{2.5} had a significant effect on air quality during the months of April and May. As previously mentioned, the emissions of PM from the Bugaboo Fire is responsible for these episodes.

Air quality is influenced by the emissions of pollutants into the air. Emissions come from a variety of sources, including the combustion of fuel by stationary sources (e.g., power plants, factories, home furnaces fired by natural gas), automobiles, manufacturing processes, and natural processes (fires, swamps). Figure 3.3.7-8 (SO₂, NO_x, VOC, and CO) and Figure 3.3.7-9 (PM_{2.5} and PM₁₀) summarize data on emissions of five criteria pollutants in Alachua County for the year 2002 (the latest year for which such data are readily available). Most emissions of PM₁₀ were attributed to fugitive dust. SO₂ emissions from stationary fuel combustion result in the greatest amounts of SO₂ emissions in the county, but are still low when compared to more urbanized counties. Vehicles emit most of the combined VOC and CO, which are products of incomplete combustion. Vehicles emit the greatest percentage of NO_x because of the overall low NO_x emissions from other sources within Alachua County. “Other” emissions denoted in the VOC emission category is mostly attributed to Metal Container Corporation and Hunter Marine Corporation. There are no AAQS for VOC; rather, VOC emissions contribute to the formation of ozone, for which ambient standards have been set.

In addition to the six criteria pollutants, EPA categorizes 188 other compounds as *noncriteria* air pollutants, or hazardous air pollutants (HAPs). HAPs are those pollutants known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. Examples of HAPs include benzene,

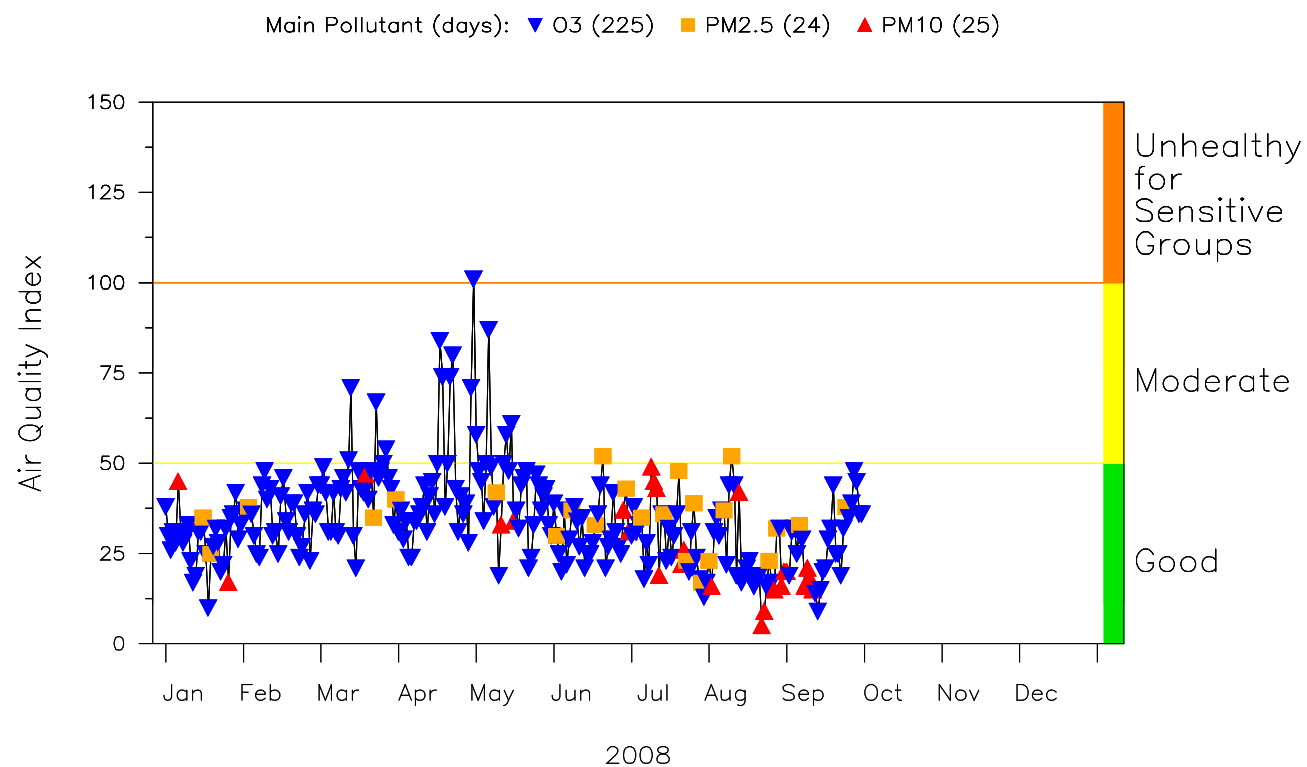
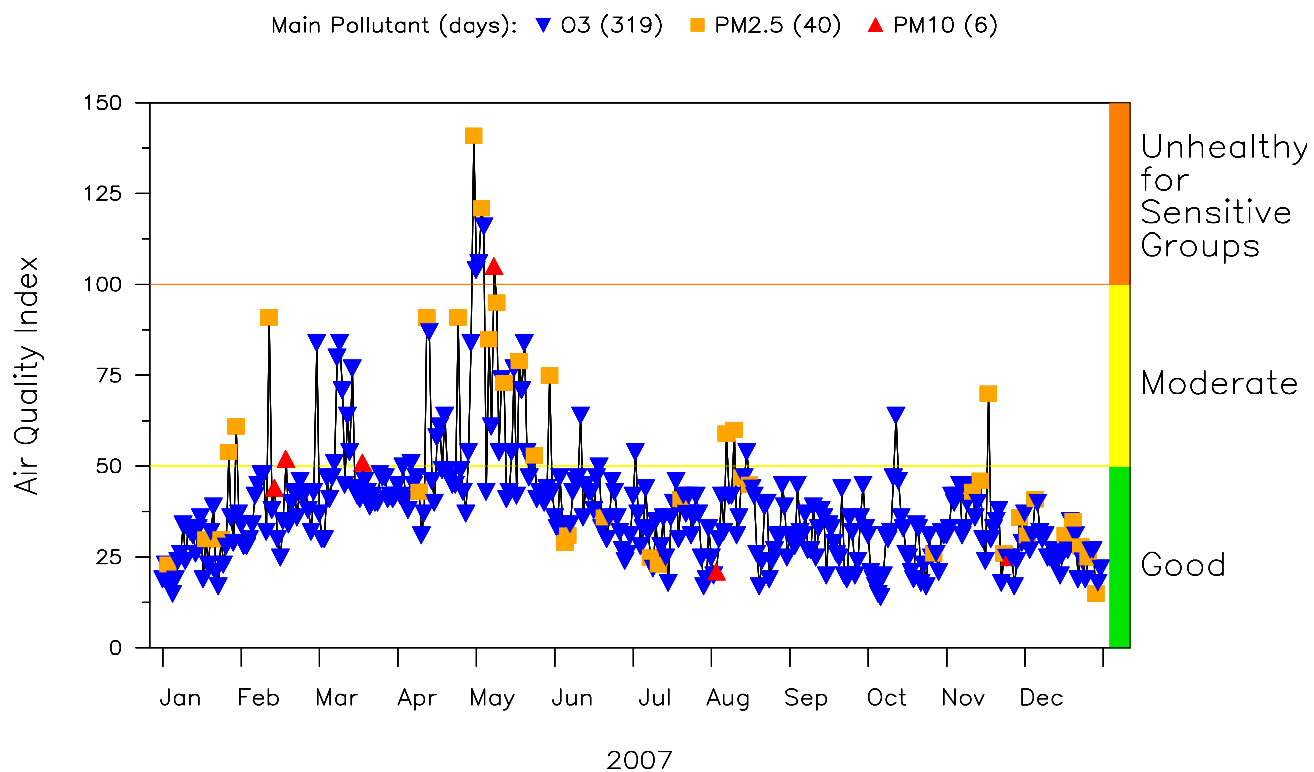


FIGURE 3.3.7-7.

AQI CHARTS FOR ALACHUA COUNTY, FLORIDA— 2007 AND 2008

Sources: EPA AirData, 2009. ECT, 2009.

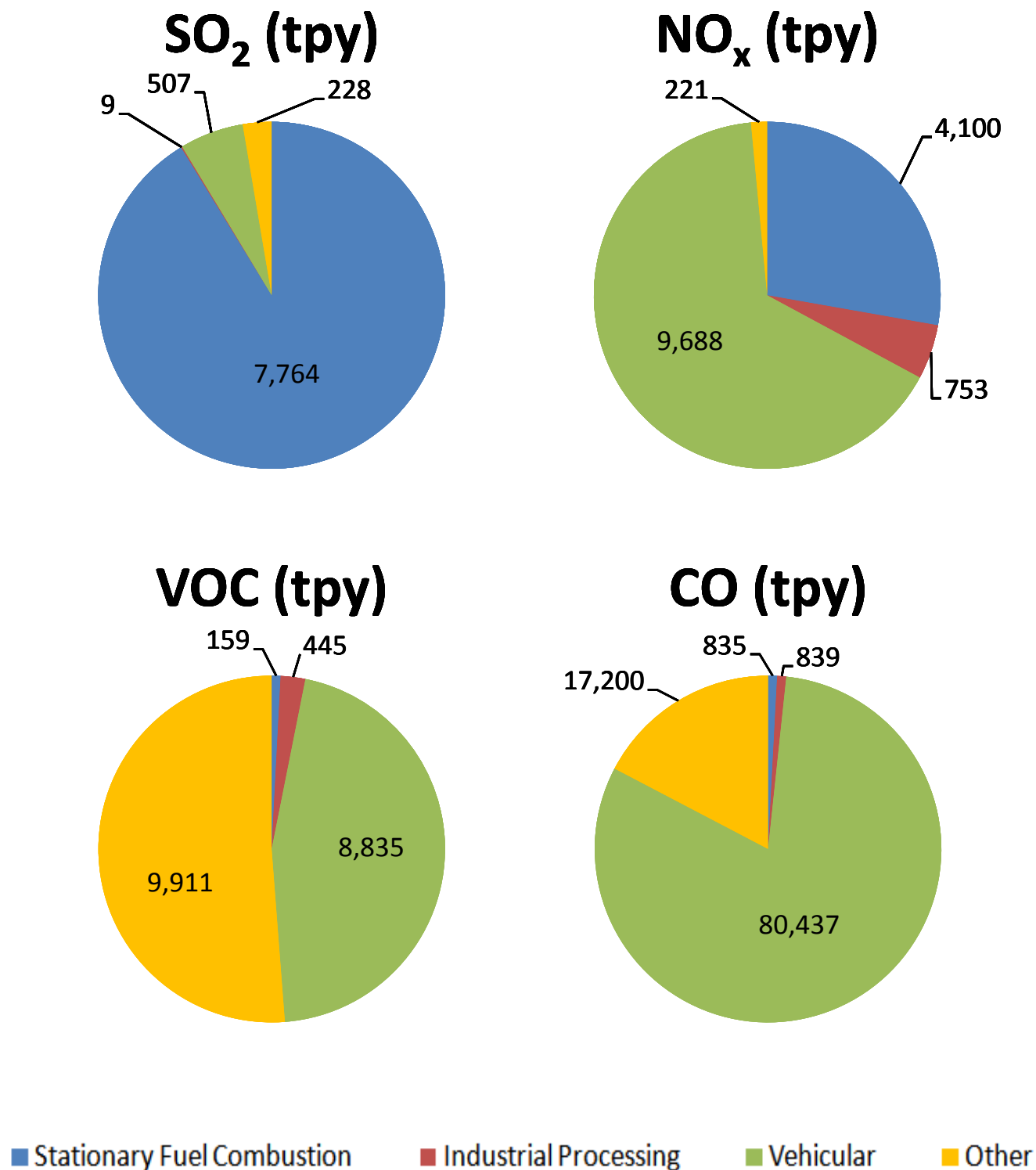
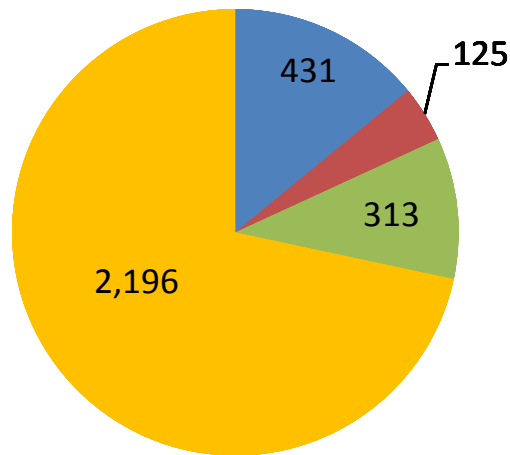


FIGURE 3.3.7-8.

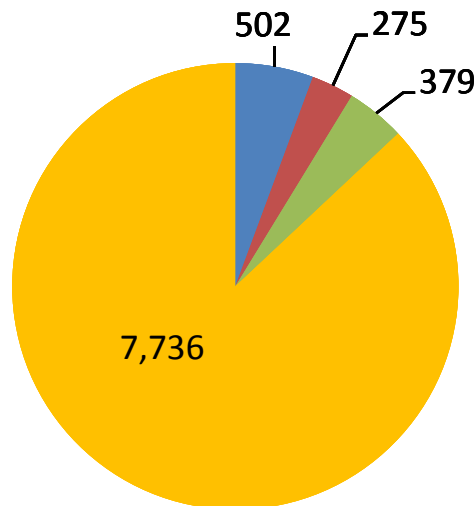
EXISTING ALACHUA COUNTY SO₂, NO_x, VOC, AND CO EMISSIONS FOR 2002

Sources: EPA AirData, 2009. ECT, 2009.

PM_{2.5} (tpy)



PM₁₀ (tpy)



■ Stationary Fuel Combustion

■ Industrial Processing

■ Vehicular

■ Other

FIGURE 3.3.7-9.

EXISTING ALACHUA COUNTY PM EMISSIONS
FOR 2002

Sources: EPA AirData, 2009. ECT, 2009.

which is found in gasoline; perchlorethylene, which is emitted from some dry cleaning facilities; and methylene chloride, which is used as a solvent and paint stripper by a number of industries. Examples of other listed air toxics include dioxin, asbestos, toluene, and metals such as cadmium, mercury, chromium, and lead compounds.

Besides the five criteria pollutants addressed in Figures 3.3.7-8 and 3.3.7-9, EPA has tabulated 2002 emissions data for lead and noncriteria pollutants (no AAQS have been established for noncriteria pollutants). Table 3.3.7-7 presents emissions data for Alachua County and provides a comparison to those Florida counties having the greatest emissions total for each pollutant.

Large point-sources of emissions may contribute to air quality in a given area at a given time, depending on wind direction and other meteorological variables. Figure 3.3.7-10 shows the locations of major sources of air emissions within 40 km of the GREC Site.

3.3.7.3 Measurement Programs

Measurements of ambient air quality are currently recorded by an existing network of ambient air monitors. Existing data presented in the previous section are more than adequate to describe current meteorological and air quality conditions. Therefore, no additional ambient air quality measurements are proposed.

3.3.8 NOISE

Gainesville's noise standard is contained in Gainesville City Municipal Code, Chapter 15, Noise, and contains standards for noise generated across real property lines. This noise standard states that no person shall create, operate, or cause to be operated in such a manner as to create a continuous airborne sound that exceeds the limits set forth for the source land use category as defined in Table 3.3.8-1 when measured at a distance of 200 ft or more from the real property line of the source of the sound. Since commercial land use is defined as all areas not designated residential, GREC will be considered commercial and subject to the associated sound levels.

Table 3.3.7-7. Lead and Noncriteria Pollutant Emissions, 2002

Pollutant	Alachua County (lb/yr)	County with Highest Emissions	
		County	Emissions (lb/yr)
Lead compounds*	1,443	Duval	11,332
Acetaldehyde*	102,054	Miami-Dade	493,050
Acrolein*	46,491	Baker	235,488
Antimony compounds	25.9	Manatee	2,198
Arsenic compounds*	244	Citrus	2,301
Benzene*	705,038	Miami-Dade	4,051,380
Beryllium compounds*	90.7	Putnam	2,083
1,3-Butadiene*	95,600	Miami-Dade	440,309
Cadmium compounds*	534	Duval	6,009
Carbon disulfide	566	Hillsborough	5,704
Chromium compounds*	80.1	Duval	26,908
Cobalt compounds	80.3	Duval	2,936
Ethylbenzene	290,920	Miami-Dade	1,689,431
Formaldehyde*	399,669	Baker	1,449,780
Manganese compounds*	282	Highlands	74,646
Mercury compounds*	220	Citrus	593
Naphthalene	12,567	Palm Beach	2,112,594
Nickel compounds*	1,163	Manatee	36,775
Propylene oxide	286	Broward	3,828
Selenium compounds	675	Citrus	7,240
Toluene	1,759,299	Miami-Dade	10,965,491
Xylenes	1,248,866	Miami-Dade	6,954,478
Sum of <i>urban HAPs</i>	1,370,181	Miami-Dade	6,815,193

*One of the 33 *urban HAPs*, defined by EPA as “the 33 air toxics that present the greatest threat to public health in the largest number of urban areas.” All of the urban HAPs listed in this table generally have most of their emissions contributed from area (small but numerous, such as gas stations and dry cleaners) and mobile (vehicular) sources. In Alachua County, 86 percent of the urban HAPs emissions in 1999 were attributed to area and mobile sources.

Sources: EPA AirData, 2009.
ECT, 2009.

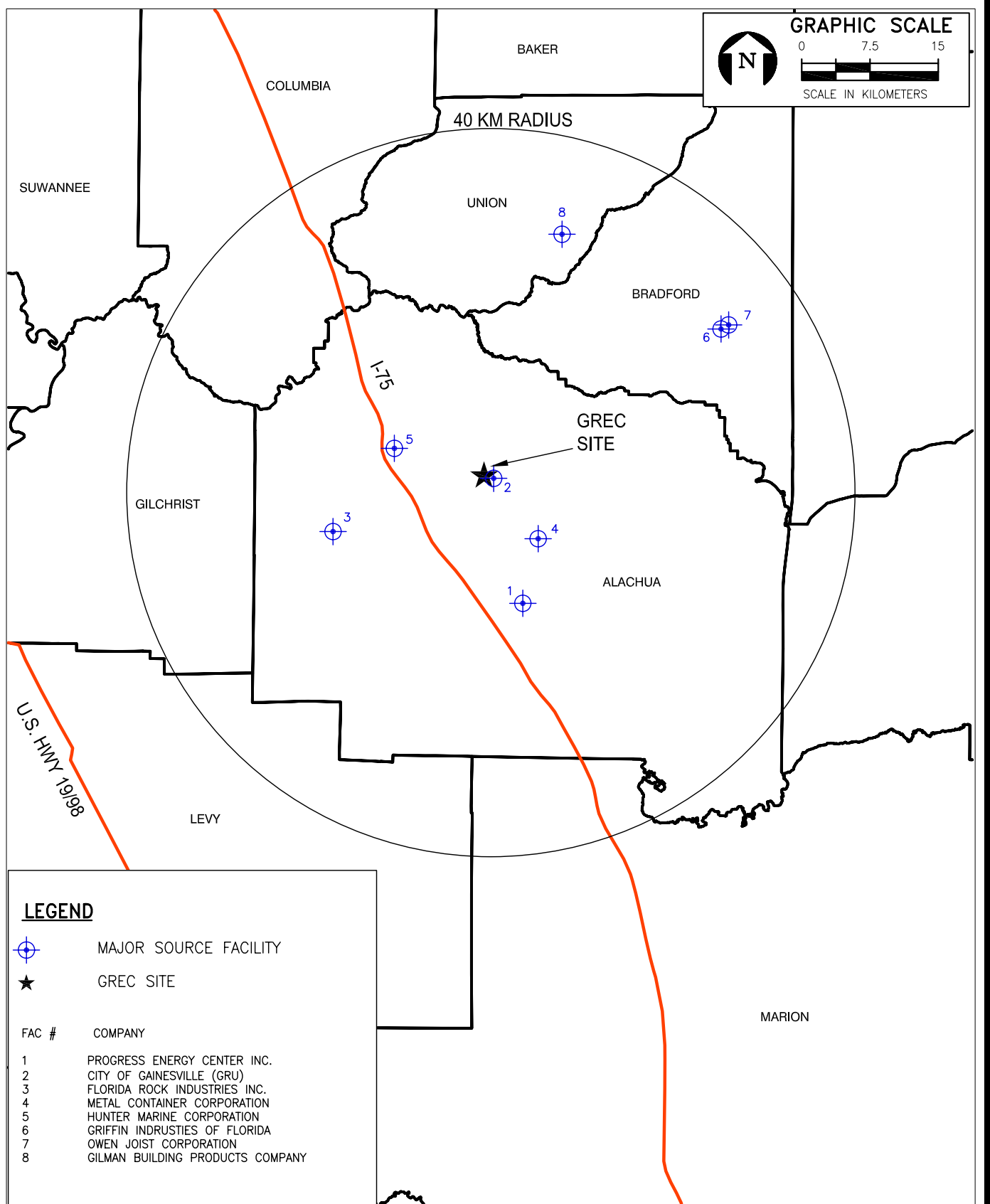


FIGURE 3.3.7-10.

LOCATION OF MAJOR SOURCES OF AIR EMISSIONS WITHIN 40 KM OF GREC

Sources: EPA, 2009; ECT, 2009.

Table 3.3.8-1. Maximum Sound Levels for Source Land Uses

Source Land Use Category	Sound Level Limit (dBA)*	
	Daytime	Nighttime
Residential	61	55
Commercial	66	60

*For the purposes of this chapter, daytime is defined as the hours between 8 a.m. and 10 p.m. of the same day. Nighttime is defined as the hours between 10 p.m. of one day and 8 a.m. of the next day.

Source: City of Gainesville, 2009b.

Sound level is defined as the weighted sound pressure level as measured in A-weighted decibels (dBA) by a sound level meter and as specified in the American National Standards Institute (ANSI) specifications for sound level meters (ANSI S1.4-1971 [R1976]).

An ambient noise survey was conducted to establish background or baseline ambient noise levels at various locations at the GREC property line. Baseline ambient noise levels should be taken into account when assessing noise impacts from a new source such as GREC.

The area surrounding the GREC Site is generally developed. Anthropogenic (manmade) noise sources in the area include traffic on U.S. 441 on the southern boundary, an Alachua County Public Works operation on the western boundary, and GRU's DGS on the eastern boundary.

Four separate monitoring sites located along the plant boundary were selected for conducting the ambient noise monitoring. These monitoring sites are described in the following and are shown graphically in Figure 3.3.8-1:

<u>Monitoring Site</u>	<u>General Location</u>
1	Eastern portion of the property adjacent to the proposed GREC power block
2	Northern portion of the property adjacent to the proposed GREC power block
3	Western portion of the property adjacent to the proposed GREC power block
4	Southern portion of the property adjacent to U.S. 441

These monitoring site locations were selected to provide a representative sample of ambient noise levels at the GREC property line. Monitoring site Nos. 1, 2, and 3 were selected along the eastern, northern, and western property boundaries in the general vicinity of the proposed power block location. Monitoring site No. 4 was selected along the southern property boundary, which is adjacent to U.S. 441. Each monitoring site location is further described in Figures 3.3.8-2 through 3.3.8-5.

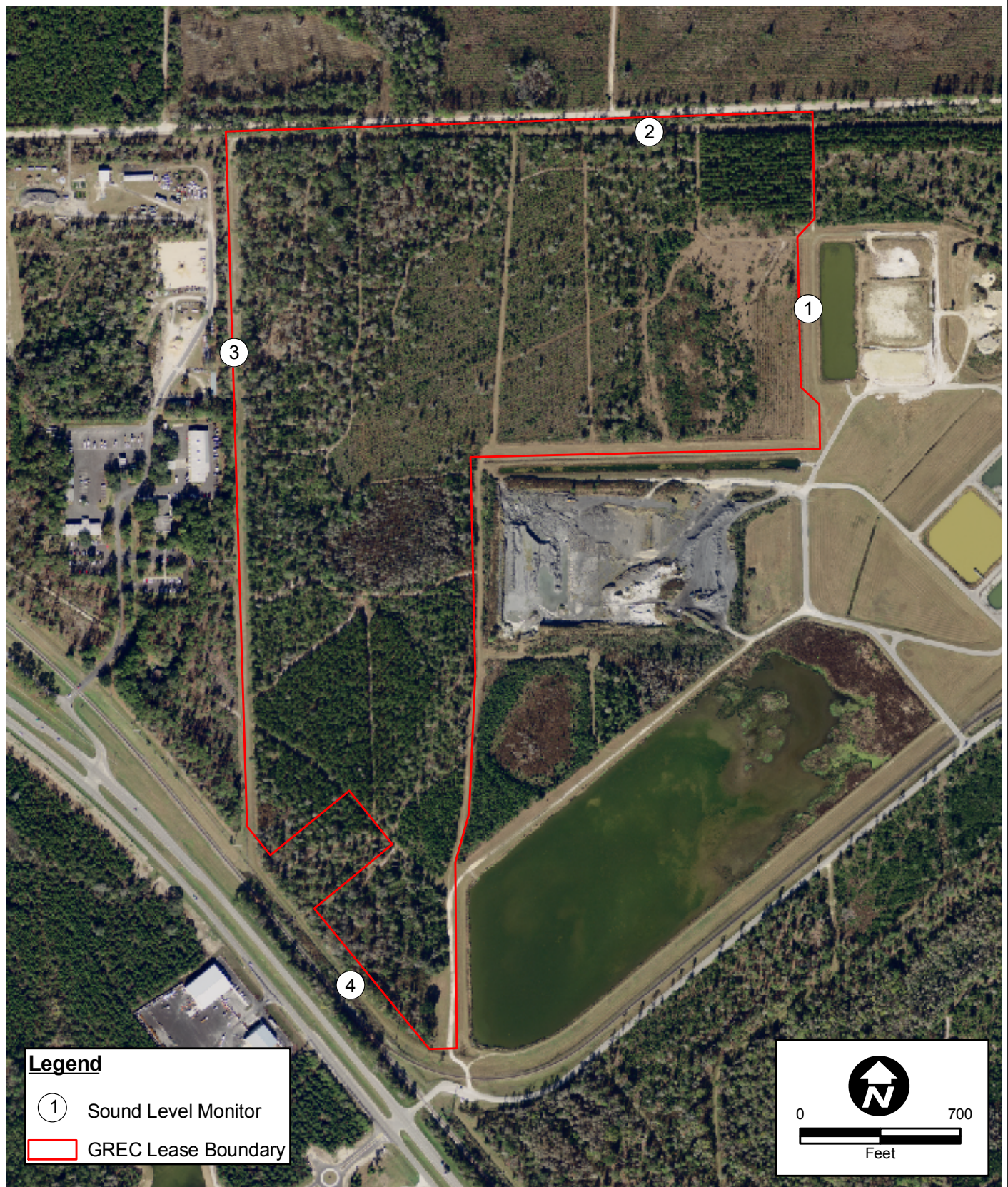


FIGURE 3.3.8-1.
AMBIENT NOISE MONITORING LOCATIONS

Sources: FDOT, 2008, ECT; 2009.

ECT
Environmental Consulting & Technology, Inc.



Sound Level Meter:	Larson Davis Model 831 Serial No. 1711
Preamplifier:	Larson Davis Model PRM831 Serial No. 12516
Microphone:	Larson Davis Model 377B02 Serial No. 109598
GPS Coordinates:	N 29.7681 W 082.3954

Meter No. 1 was located along the eastern property boundary adjacent to the proposed power block. This meter represented the closest monitoring location to the GRU Deerhaven plant, which is shown in the background in the photograph.

FIGURE 3.3.8-2.

METER No. 1—EASTERN PROPERTY BOUNDARY

Source: ECT, 2009.



Sound Level Meter:	Larson Davis Model 831 Serial No. 1736
Preamplifier:	Larson Davis Model PRM831 Serial No. 12537
Microphone:	Larson Davis Model 377B02 Serial No. 109597
GPS Coordinates:	N 29.7702 W 082.3976

Meter No. 2 was located along the northern property boundary adjacent to the proposed power block. There are no residences or businesses along the property boundary.

FIGURE 3.3.8-3.

METER No. 2—NORTHERN PROPERTY BOUNDARY

Source: ECT, 2009.



Sound Level Meter:	Larson Davis Model 831 Serial No. 1740
Preamplifier:	Larson Davis Model PRM831 Serial No. 12156
Microphone:	Larson Davis Model 377B02 Serial No. 109601
GPS Coordinates:	N 29.7677 W 082.4033

Meter No. 3 was located along the western property boundary adjacent to the proposed power block. An Alachua County Public Works Facility was located just beyond the property line.

FIGURE 3.3.8-4.

METER No. 3—WESTERN PROPERTY BOUNDARY

Source: ECT, 2009.



Sound Level Meter:	Larson Davis Model 831 Serial No. 1739
Preamplifier:	Larson Davis Model PRM831 Serial No. 12157
Microphone:	Larson Davis Model 377B02 Serial No. 109599
GPS Coordinates:	N 29.7600 W 082.4019

Meter No. 4 was located along the southern property boundary adjacent to U.S. 441. This meter would record noise from vehicles traveling on U.S. 441 as well as construction activity during the day. Some residential communities are located on the other side of U.S. 441.

FIGURE 3.3.8-5.

METER No. 4—SOUTHERN PROPERTY BOUNDARY

Source: ECT, 2009.

Each sound level meter was programmed to measure and record at each monitoring site for a 24-hour period beginning on Wednesday, July 1, 2009, at 11 a.m. and ending on Thursday, July 2, 2009, at 11 a.m. Continuous measurements of the sound levels were conducted at the monitoring sites using Larson-Davis Model 831 sound level meters and octave band analyzers. Each meter was set for a slow response using the linear integration method. Each sound level meter was provided with a free field microphone. A microphone correction was programmed to provide each sound level meter with a random incidence response. These measurements were then recorded in 1-minute intervals for the entire 24-hour period. The weather conditions were clear with temperatures in the low to mid-90s during the day and in the mid-70s at night. The wind was estimated to be less than 5 miles per hour (mph), and there was no precipitation during the entire 24-hour period.

The instruments were equipped with circuitry and microphones to meet the requirements of ANSI S1.4-1983 for Type I precision sound level meters. The microphones were positioned at a height of approximately 7 ft above the ground. Foam windscreens were used to reduce but not eliminate wind-generated noise. The calibration levels of the instruments were checked before and after the 24-hour monitoring period using a Larson-Davis CAL200 sound level calibrator.

The monitoring instruments were programmed to measure and record the equivalent continuous sound level (L_{eq}) in dBA, C-weighted decibels (dBC), and flat-frequency weighting (dBZ) for each minute and each hour of the monitoring period. Sound levels were also measured and recorded in frequencies corresponding to each octave band and one-third octave bands. At the end of the 24-hour monitoring period, the data were downloaded directly into a computer for storage and further data analysis, including computation of the 24-hour equivalent sound level ($L_{eq}[24]$), the 1-hour equivalent sound level ($L_{eq}[1]$), the maximum sound level (L_{max}), and the minimum sound level (L_{min}). While measurements were recorded in decibels on the A-scale, C-scale, and Z-scale (flat weighting), all figures presented will be in decibels on the A-scale.

The L_{eq} is a sound energy level averaged over a specified time period and represents, in a single constant numerical value, the amount of actual time-varying sound energy received during the time interval. The strength of the L_{eq} lies in the ability to assess the total time-varying effects of noise on sensitive receptors. L_{eq} represents the L_{eq} measured in decibels on the A-scale.

Results of the ambient noise survey are summarized in Tables 3.3.8-2 and 3.3.8-3 for the four monitoring sites. Table 3.3.8-2 presents the $L_{eq}(24)$, L_{max} , and L_{min} for all four monitoring locations. $L_{eq}(24)$ represents the average sound pressure level over a 24-hour period and can be used to compare overall sound levels between locations during the entire 24-hour period. L_{max} represents the maximum 1-minute sound pressure reading over the 24-hour period, and L_{min} represents the minimum 1-minute sound pressure reading over the 24-hour period.

One-hour L_{eq} values are presented in Table 3.3.8-3 and represent the average overall sound levels measured during each hour.

3.3.9 OTHER ENVIRONMENTAL FEATURES

The preceding subsections present relevant environmental information regarding the GREC Site and environs. No additional information has been determined to be necessary to describe the environmental characteristics of the Site.

Table 3.3.8-2. 24-Hour Ambient Sound Level Summary

Monitoring Location	No. 1	No. 2	No. 3	No. 4
$L_{eq}(24)$, dBA	49.9	49.8	53.2	60.9
L_{max} , dBA (time of occurrence)	70.1 (1:35 a.m.)	71.3 (5:58 p.m.)	77.5 (7:31 a.m.)	96.6 (12:34 p.m.)
L_{min} , dBA (time of occurrence)	35.9 (12:13 p.m.)	34.4 (12:12 p.m.)	38.1 (12:13 p.m.)	43.4 (4:35 a.m.)

Source: ECT, 2009.

Table 3.3.8-3. GREC Ambient Noise Measurements

1 Hour Commencing	L _{eq} (1) Summary (dBA)			
	Location 1	Location 2	Location 3	Location 4
11 a.m.	41.8	47.3	48.5	59.0
12 p.m.	47.6	48.9	52.8	70.2
1 p.m.	42.6	48.4	46.9	58.8
2 p.m.	45.3	50.7	51.4	58.8
3 p.m.	47.7	51.1	53.3	59.5
4 p.m.	51.2	51.8	51.7	60.2
5 p.m.	50.2	51.9	53.0	61.9
6 p.m.	49.0	46.6	50.8	59.9
7 p.m.	48.8	46.5	52.1	65.7
8 p.m.	47.9	57.8	59.1	58.7
9 p.m.	53.1	52.4	58.3	59.8
10 p.m.	50.7	51.5	56.0	58.1
11 p.m.	49.9	45.6	54.1	57.6
12 a.m.	46.3	44.9	53.4	55.1
1 a.m.	58.3	50.0	52.6	53.8
2 a.m.	53.2	42.8	52.5	53.6
3 a.m.	51.2	45.3	51.4	52.2
4 a.m.	44.0	41.5	46.9	50.4
5 a.m.	44.1	43.1	49.2	54.4
6 a.m.	46.3	49.5	52.4	57.7
7 a.m.	46.8	46.5	52.9	59.6
8 a.m.	45.8	45.8	51.4	59.3
9 a.m.	44.1	45.8	50.6	58.8
10 a.m.	44.2	48.4	51.6	59.2

Source: ECT, 2009.

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