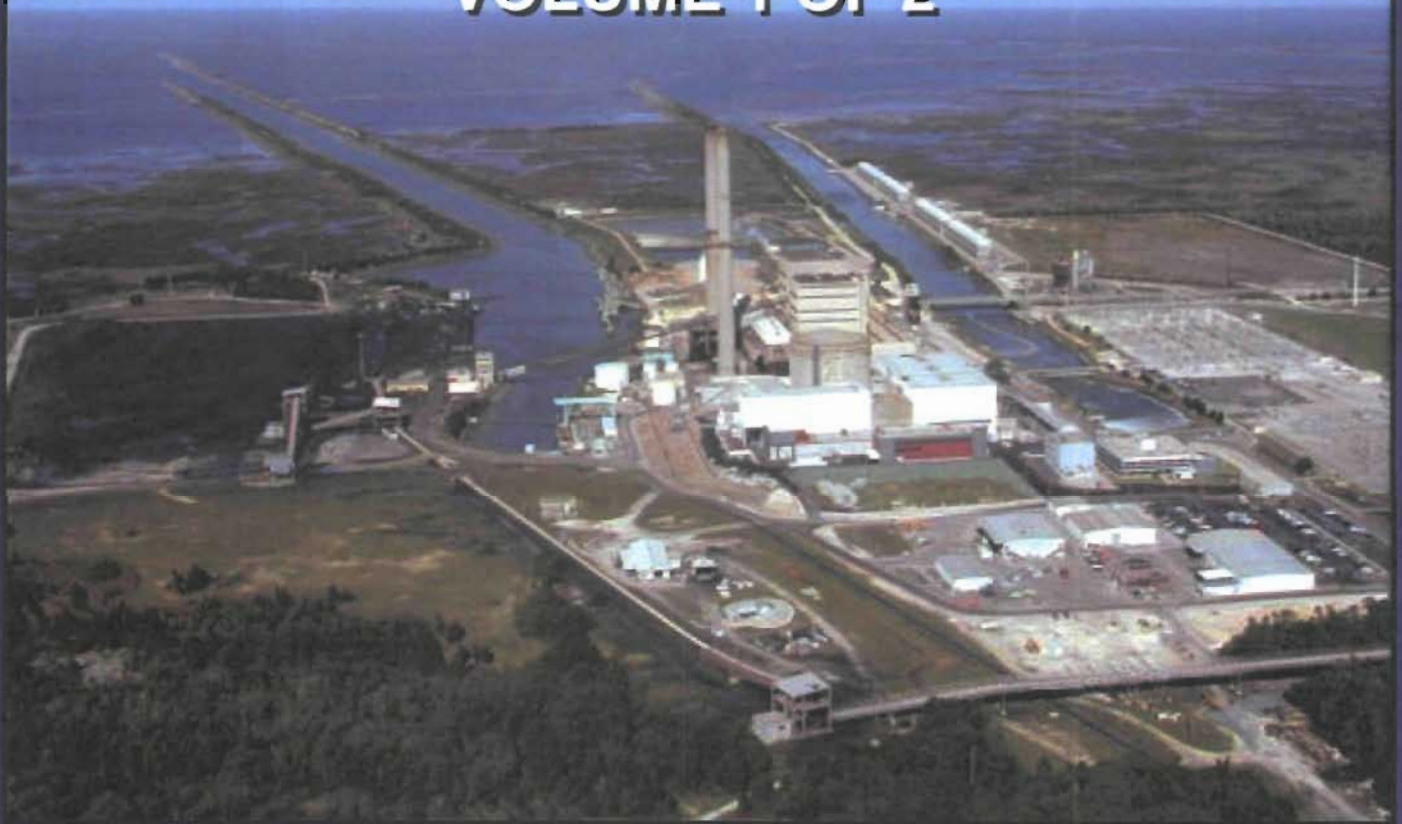




# Progress Energy

## **SITE CERTIFICATION APPLICATION FOR CRYSTAL RIVER UNIT 3 UPRATE PROJECT VOLUME 1 OF 2**



June 2007

07389531

FACILITY ID: 0170004

PROJECT #: 018

PERMIT TYPE: AC

PSD-FL- 39a

PATS #: \_\_\_\_\_

DOCUMENT TYPE(S)/DATE:  
☒ Application/ 6-11-07

☐ Correspondence/ \_\_\_\_\_

☐ Intent/ \_\_\_\_\_

☐ Permit/ \_\_\_\_\_

☐ OGC/ \_\_\_\_\_

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**Progress Energy**

**Dale E. Young**  
Vice President  
Crystal River Nuclear Plant  
Progress Energy Florida, Inc.

June 6, 2007  
CRVP07-0011

Florida Department of Environmental Protection  
Siting Coordination Office  
2600 Blair Stone Road MS-48  
Tallahassee, Florida 32399-2400

Attention: Mr. Mike Halpin

**RE: SITE CERTIFICATION APPLICATION FOR  
PROGRESS ENERGY FLORIDA  
CRYSTAL RIVER UNIT 3 UPRATE PROJECT**

**RECEIVED**

**JUN 11 2007**

**BUREAU OF AIR REGULATION**

Dear Mr. Halpin:

Progress Energy Florida is pleased to provide you four electronic and four hard copies of the Progress Energy Florida – Site Certification Application (SCA) for the Crystal River Unit 3 (CR3) Uprate Project.

PEF plans to add 180 MW (megawatts) of nuclear-fueled electrical generation resources to its system in order to continue to provide reliable, safe, and cost-effective service to its customers. The CR3 Uprate Project will occur over two phases; the first phase will occur during a 2009 planned refueling CR3 outage which will result in an additional 40 MW of electric generation. Phase II will take place during the 2011 planned refueling outage of CR3 and will result in an additional 140 MW of electric generation. These upgrades increase the existing CR3 steam electric output, and thus trigger the need for this SCA.

Check #166818, payable to the Department in the amount of \$200,000 for the certification of CR3 to operate at an increased capacity of 180 MW, for a total unit capacity of approximately 1,080 MW, based on Rule 62-17.293(1)(b), is enclosed. The PSD/Air Construction permit application for this project is located in Appendix 10.1.5. Four copies of the PSD/Air Construction permit application have been submitted directly to the Department's Division of Air Resource Management.

Copies of the SCA are being distributed to the individuals and agencies shown on the attached distribution list. Delivery is scheduled for June 11, 2007.

We look forward to working with you, the Department, and other agencies in the certification process. Should you, your staff, or any other agency representatives have questions regarding this application, please contact Mr. Michael Shrader at (727) 820-5588.

Sincerely,

Dale E. Young, Vice President  
Crystal River Nuclear Plant

DEY/krw  
Attachments

15760 W. Power Line Street  
NA2C  
Crystal River, FL 34428

T > 352.563.4331

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1	1	Citrus County Attorney 110 N. Apopka Avenue Inverness, Florida 34450 (352)341-6560 – Office	Robert B. Battista, Esq.
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1	1	City of Crystal River City Hall 123 NW Highway 19 Crystal River, FL 34428	Mayor Ronald E. Kitchen, Jr.

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**SITE CERTIFICATION APPLICATION  
CRYSTAL RIVER UNIT 3 POWER UPRATE PROJECT  
CRYSTAL RIVER, FLORIDA**

**VOLUME 1 OF II**

**SUBMITTED BY:**

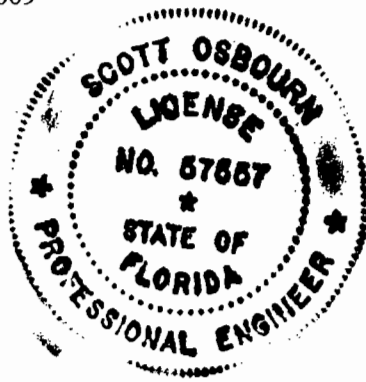
**PROGRESS ENERGY FLORIDA, INC.  
299 1<sup>ST</sup> AVENUE NORTH  
ST. PETERSBURG, FLORIDA 33701**



Scott Osbourn, P.E.  
Professional Registered Engineer No. 57557

Golder Associates Inc.  
5100 West Lemon Street, Suite 114  
Tampa, Florida 33609

June 2007



## APPLICANT INFORMATION

Please supply the following information:

Applicant's Official Name **Florida Power Corporation, dba Progress Energy Florida, Inc.**

Address **299 1<sup>st</sup> Avenue North, PEF – 903, St. Petersburg, FL 33701**

Address of Official Headquarters **P. O. Box 1551, Raleigh, NC, 27602**

Business Entity (corporation, partnership, co-operative) **Corporation**

Names, owners, etc. **Progress Energy Florida**

Name and Title of Chief Executive Officer **Mr. Robert McGehee**

Name, Address, and Phone Number of Official Representative responsible for obtaining certification:

**Mr. Michael Shrader, (727) 820-5588**

Site Location (county) **Citrus County**

Nearest Incorporated City **Crystal River, Florida**

Latitude and Longitude **Latitude 28/57/34; Longitude 82/42/01**

UTM's Northerly (km) **3204.5**

Easterly (km) **334.3**

Section, Township, Range **Section 33, Township 17, Range 16**

Location of any directly associated transmission facilities (counties) **Not Applicable**

Name Plate Generating Capacity **838 MW( electrical)**

Capacity of Proposed Additions and Ultimate Site Capacity (where applicable)

**Addition of 180 MW**

Remarks (additional information that will help identify the applicant): **Addition of 180 MW to Crystal River Unit 3, an existing nuclear generating unit located within the Crystal River Energy Complex.**

## **EXECUTIVE SUMMARY**

Progress Energy Florida (PEF), a subsidiary of Progress Energy, provides electricity and related services to more than 1.6 million customers in the state of Florida. Progress Energy's retail service area in Florida spans about 20,000 square miles in central Florida. In Florida, the company maintains more than 43,600 miles of distribution and transmission lines in serving 1.6 million customers and a population of more than five million people.

### **Project Description**

PEF plans to add 180 MW (megawatts) of electrical generation resources to its system in order to continue to provide reliable, safe, and cost-effective service to its customers. This additional electrical generation will occur through modifications to PEF's existing nuclear-fueled Crystal River Unit 3. That existing unit has been in operation since 1977. That unit has not been previously certified under the PPSA.

The CR3 Uprate Project will occur over two phases. The first phase (Phase I) will occur during a 2009 planned refueling outage and scheduled steam generator replacement also will result in an additional 40 MW of power. Phase II will take place during the 2011 planned refueling outage of CR3. The second phase will result in an additional 140 MW of power and will require a large number of smaller yet substantial modifications to assure long term reliability of all plant systems at the conditions necessary to support this higher licensed power level.

The power level upgrades scheduled for 2009 through 2011 trigger the need for this Site Certification Application (SCA). Net environmental impacts associated with the CR3 Uprate Project are expected to be minimal and can be summarized as follows:

### **Land Use**

CR3 has a future land use and zoning designation of Transportation, Communication, and Utilities (TCU). According to both the Citrus County Comprehensive Plan and the Land Development Code, the TCU designation allows for those uses directly related to transportation, communication, and utilities. Power generation facilities are a specified use under the TCU designation. No new lands will be required for the project.

**Air**

The CR3 Uprate Project will increase the electrical output from CR3 and the associated circulating intake water flow rate. The types and sources of air emissions associated with the CR3 Upgrade Project will consist of drift emissions from a potential new mechanical draft cooling tower to be designated the South Cooling Towers (SCT). The air emission impacts of the SCT associated with increased intake water flow (i.e., increased flow through additional new cooling towers) will trigger PSD for particulate matter (PM), but not for PM less than 10 microns (PM<sub>10</sub>). Other regulated air emissions (e.g., NO<sub>x</sub> and SO<sub>2</sub>) will not be affected, as there will be no additional fuel combustion sources (e.g., additional diesel generator capacity) that may trigger PSD for these pollutants.

**Traffic**

Construction of the CR3 Uprate Project is anticipated to commence in 2009 and conclude in the 2012. The majority of construction workers are expected to commute to the CR3 site from within a distance of up to 75 miles. Peak construction employment of 650 is estimated to increase the total of onsite employees to approximately 2,950 workers in late 2009. Traffic generated during the construction activities is considered a temporary condition. No increase in operations personnel will occur beyond the conclusion of the construction activities in 2011. During the full build-out year, traffic on both West Powerline Street and U.S. Highway 19/98 are expected to increase by less than one percent and not cause unacceptable traffic conditions on area roadways.

**Ecology**

Due to the existing nature of the CR3 site, and limited amount of disturbance associated with the proposed uprate project, no impacts to threatened or endangered species are anticipated as a result of the CR3 Uprate Project.

**Water**

The CR3 Uprate Project will result in increased cooling water flow rates and a larger pumping capacity than what currently exists within the water flow system which supply the CR3 steam generators. Overall, the uprate project will result in an additional 180 MW of power and include alterations that will elevate the thermal unit's discharge.

A conceptual and conservative design plan for a new South Cooling Tower has been proposed both to offset the increased circulating water rejected heat and to replace the existing modular Helper Cooling Towers. A small portion of the increased flow associated with the uprate project will be evaporated in the recirculating portion of the new SCT, which will be used to dissipate the increase in rejected heat. The new SCT has also been designed to avoid any increase in flow into the intake canal from Crystal Bay/Gulf of Mexico, and to avoid any increase in heat load or temperature rise leaving the discharge canal to Crystal Bay/Gulf of Mexico. PEF intends to request modification of the NPDES permit to authorize the operation of the new SCT and an increase in circulating water flow at CR3. Detailed design will be addressed as part of the NPDES renewal process in 2009.

Overall, the proposed CR3 Uprate Project will not increase flow to the intake canal from Crystal Bay and there will be no net increase in the thermal discharge at the NPDES POD. The CR3 Uprate Project will not have a negative impact to fisheries or the aquatic environment.



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- Appendix 10.5-1 Calibration Certificates for Noise Monitoring Equipment

**Appendix 10.6 Traffic Study**

**LIST OF ACRONYMS**

µg	micrograms
µm	micrometers
AAQS	Ambient Air Quality Standards
ANSI	American National Standard Institute
bgs	below ground surface
BACT	Best Available Control Technology
BMP	Best Management Practices
Btu	British thermal units
CAA	Clean Air Act
CDS	Comprehensive Demonstration Study
CFB	circulating fluidized bed
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	carbon monoxide
CO <sub>2</sub>	carbon dioxide
CR3	Crystal River Unit 3
CREC	Crystal River Energy Complex
db	decibel
dba	A-weighted decibel
DMR	Discharge Monitoring Report
EMS	Emergency Medical Services
EPA	U.S. Environmental Protection Agency
ERP	Environmental Resource Permit
ESP	electrostatic precipitator
°F	Degree Fahrenheit
FAA	Federal Aviation Authority
F.A.C.	Florida Administrative Code
FAS	Florida Aquifer System
FDACS	Florida Department of Agriculture and Consumer Affairs
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Association
FEPPSA	Florida Electric Power Plant Siting Act
FES	Final Environment Statement
FGD	Flue gas desulfurization
FLUCFCS	Florida Land Use, Cover and Forms Classification System
FNAI	Florida Natural Areas Inventory
fps	feet per second
FR	Federal Register
ft	feet
FWC	Florida Fish and Wildlife Conservation Commission
gpd	gallons per day
gpm	gallons per minute
HAPs	Hazardous air pollutants
HCT	Helper Cooling Tower
HRSG	Heat Recovery Steam Generator
Hz	Hertz
IAS	Intermediate Aquifer System



kg	kilograms
kV	kilovolt
L <sub>10</sub>	sound pressure level which is exceeded ten percent of the time
L <sub>eq</sub>	equivalent sound pressure level
L <sub>n</sub>	sound pressure level which is exceeded n percent of the time
lb/MMBtu	pounds per million British thermal unit
lb/MW-hr	pounds per megawatt hour
LFA	Lower Floridan Aquifer
LNB	low-NO <sub>x</sub> burners
MAF	minimum absolute flow
MGD	million gallons per day
m <sup>3</sup>	cubic meter
mm	millimeter
msl	mean sea level
MW	megawatt
MWh	Megawatt hour
MWe	Megawatt electrical
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NGVD	national geodetic vertical datum
NO <sub>x</sub>	Nitrous oxide
NO <sub>2</sub>	Nitrogen dioxide
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NSPS	New Source Performance Standards
NWA	National Wilderness Area
NWS	National Weather Service
O <sub>3</sub>	ozone
OFW	Outstanding Florida Waterway
Pb	lead
PD&E	Project Development and Environment
PEF	Progress Energy Florida
POD	Point of Discharge
PPSA	Power Plant Siting Act
ppt	parts per thousand
PM	particulate matter
PM <sub>10</sub>	Particulate matter less than 10 microns
PM <sub>2.5</sub>	Particulate matter less than 2.5 microns
ppm	parts per million
PSC	Florida Public Service Commission
PSD	Prevention of significant deterioration
PUD	Planned Unit Development
RFP	Request for Proposal
SCA	Site Certification Application
SCR	Selective catalytic reduction
SER	significant emissions rates
SGRP	Steam Generator Replacement Project
SPCC	Spill Prevention and Countermeasure Plan
SPL	sound pressure level
SO <sub>2</sub>	sulfur dioxide

SO <sub>3</sub>	sulfur trioxide
SWFWMD	Southwest Florida Water Management District
TCU	Transportation, Communities and Utilities
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
TPY	tons per year
TV	Title V
UFA	Upper Florida Aquifer
U.S.	United States
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	Volatile organic compounds

## **1.0 NEED FOR POWER AND THE PROPOSED FACILITIES**

### **1.1 Introduction**

This section of the Site Certification Application (SCA) provides an introduction to the applicant, Florida Power Corporation, dba Progress Energy Florida, Inc. (PEF), discusses the proposed Crystal River Unit 3 Uprate Project and the need to uprate the Crystal River Nuclear Unit 3 (CR3).

Progress Energy Florida, a subsidiary of Progress Energy, provides electricity and related services to more than 1.6 million customers in the state of Florida. Progress Energy's retail service area in Florida spans about 20,000 square miles in central Florida. In Florida, the company maintains more than 43,600 miles of distribution and transmission lines in serving 1.6 million customers and a population of more than five million people. In 2005, the company also received the prestigious J.D. Power and Associates Founder's Award for dedication, commitment and sustained improvement in customer service.

### **1.2 The Project**

PEF plans to add 180 MW (megawatts) of electrical generation resources to its system in order to continue to provide reliable, safe, and cost-effective service to its customers.

Following PEF's request, the Florida Public Service Commission (PSC) has determined that a power uprate is an economical option to add capacity and power output to the existing nuclear unit, CR3. The CR3 Uprate Project will result in economic benefits to customers and the community by providing additional clean energy at lower cost to consumers. An increase in the plant's gross output from 900 MW to 1,080 MW can serve the equivalent of an additional 110,700 homes. Studies have demonstrated that in order to reduce PEF's total fuel cost, increased efficiencies can be realized from technological advancements and system modifications to increase generation capacity from the company's lowest cost fuel source. The need for the project is based on an economic need to provide fuel savings for consumers. The CR3 Uprate Project is expected to save customers more than \$2.6 billion in gross fuel costs through 2036.

The CR3 Uprate Project will occur over two phases. The first phase (Phase I) will occur during a 2009 planned refueling outage and scheduled steam generator replacement. The improvement to the

turbine center line components will increase the efficiency of power production resulting in decreasing consumer costs. The existing steam turbines were designed in the 1960s and are less efficient than current technology. Main feed-water heat exchangers and main steam re-heaters will also be modified or replaced. The low pressure turbines and electrical generator will be replaced. The net impact of these modifications is a substantially more efficient secondary plant. Thus, while the Nuclear Regulatory Commission (NRC) licensed power level will remain constant; the net generation increase from current levels through Phase I is expected to be approximately 40 MW.

Phase II will take place during the 2011 planned refueling outage of CR3. The second phase will result in an additional 140 MW of power and will require a large number of smaller yet substantial modifications to assure long term reliability of all plant systems at the conditions necessary to support this higher licensed power level.

Leading up to 2011, CR3 will obtain modification to the NRC license to allow operation at the increased output. The higher licensed power level is currently anticipated to result in an increase in the NRC licensed net electrical generation capability of 180 MW or more above current levels.

No alternative generation option exists that can supply the benefits of additional, reliable, base load, nuclear generation at a net savings to PEF customers. The CR3 Uprate Project will also increase the level of nuclear production in the fuel supply mix of PEF's system, resulting in increased fuel diversity for PEF and the state of Florida. The total cost for the uprate is estimated to be \$427 million.

CR3 began operations in 1977. The Power Plant Siting Act (PPSA) SCA was promulgated in 1973. At that time, existing facilities or ones already in construction were not required to seek certification under the PPSA and to file an SCA. Since the uprate project will increase the electrical generating capacity of CR3, an SCA is now required. The SCA will address the layout, history, and associated facilities relevant to the current operation of CR3 as well as the impacts associated with the construction and operation of the CR3 Uprate Project.

CR3 is currently licensed by the NRC. No NRC approvals are required for Phase I of the CR3 Uprate Project. PEF plans to submit a licensed power change to the NRC for Phase II of the CR3 Uprate Project in 2009 and NRC approval for Phase II is expected in 2011. PEF also intends to file to

relicense the plant for an additional 20 years in 2009. It is anticipated that the license now set to expire in 2016 will be extended to 2036.

CR3 provides power into an existing 500 kilovolt (kV) transmission system connected to the site and uses an existing 230 kV system for onsite backup power. No transmission upgrades are required for the project.

### **1.3 Need for the Project**

PEF's petition for a determination of need for the CR3 Uprate Project has been approved by the PSC in accordance with Section 403.519(3) (Attachment 1).

H:\PROJECTS\2007proj\073-89531 CR 3 Nuclear Uprate (SCA)\Chapter 1\Revised Chapter 1.doc

## **ATTACHMENT 1**

BEFORE THE PUBLIC SERVICE COMMISSION

In re: Petition for determination of need for expansion of Crystal River 3 nuclear power plant, for exemption from Bid Rule 25-22.082, F.A.C., and for cost recovery through fuel clause, by Progress Energy Florida, Inc.

DOCKET NO. 060642-EI  
ORDER NO. PSC-07-0119-FOF-EI  
ISSUED: February 8, 2007

The following Commissioners participated in the disposition of this matter:

LISA POLAK EDGAR, Chairman  
MATTHEW M. CARTER II  
KATRINA J. TEW

APPEARANCES:

R. ALEXANDER GLENN, ESQUIRE, Progress Energy Service Company, LLC, 100 Central Avenue, Suite 1D, St. Petersburg, Florida 33701, and JAMES MICHAEL WALLS, and DIANNE M. TRIPLETT, ESQUIRES, Carlton Fields, P. A., Post Office Box 3239, Tampa, Florida 33601-3239  
On behalf of Progress Energy Florida, Inc. (PEF).

JOHN W. MCWHIRTER, JR., ESQUIRE, McWhirter, Reeves & Davidson, P. A., 400 North Tampa Street, Suite 2450, Tampa, Florida 33601-3350  
On behalf on the Florida Industrial Power Users Group (FIPUG).

ROBERT SCHEFFEL WRIGHT and JOHN R. LAVIA, III, ESQUIRES, Young van Assenderp, P. A., 225 South Adams Street, Suite 200, Tallahassee, Florida 32301  
On behalf of the Florida Retail Federation (FRF).

PATRICIA A. CHRISTENSEN, and JOSEPH A. MCGLOTHLIN, ESQUIRES, Office of Public Counsel, c/o The Florida Legislature, 111 West Madison Street, Room 812, Tallahassee, Florida 32399-1400  
On behalf of the Citizens of the State of Florida (OPC).

LISA C. BENNETT, and LORENA A. HOLLEY, ESQUIRES, Florida Public Service Commission, 2540 Shumard Oak Boulevard, Tallahassee, Florida 32399-0850  
On behalf of the Florida Public Service Commission (Staff).

DOCUMENT NUMBER-DATE

01327 FEB-85

FPSC-COMMISSION CLERK

FINAL ORDER GRANTING PETITION FOR DETERMINATION OF NEED  
FOR PROPOSED EXPANSION OF  
CRYSTAL RIVER UNIT 3 NUCLEAR POWER PLANT

BY THE COMMISSION PANEL:

Background

On September 22, 2006, Progress Energy Florida, Inc. (PEF) filed a Petition (petition) for Determination of Need for Expansion of its Crystal River 3 Nuclear Power Plant (CR3) located in Citrus County, Florida. The proposed expansion is an uprate that when completed will increase the power output at CR3 by approximately 180 megawatts ("MWs"). The proposed uprate or expansion will be completed in two phases. The first phase will be accomplished during the planned 2009 refueling outage and the second phase will be completed during the 2011 planned refueling outage. Phase one will be completed during a scheduled steam generator replacement and will include modifications to the turbine line components to take advantage of greater steam efficiencies, with an expected additional 40 MW of power following work completed in phase one. Phase two consists of changes that will allow for use of more highly enriched uranium in the reactor core and will result in an anticipated additional 140 MW of power.

Included in PEF's petition was a request for exemption from Rule 25-22.082, Florida Administrative Code, and a request that PEF be permitted to recover the costs of the expansion through the fuel clause. On December 22, 2006, by Order No. PSC-06-1059-PCO-EI, the Prehearing Officer bifurcated the cost recovery issue from the need determination. A formal administrative hearing was held on January 18, 2007 to hear the issues related to the need determination and the requested exemption from Rule 25-22.082, Florida Administrative Code. Intervention was granted to the Office of Public Counsel (OPC), the Florida Industrial Power Users Group (FIPUG), the Florida Retail Federation (FRF), and AARP. AARP has subsequently been excused from this proceeding.

We approve the settlement between the parties and grant PEF's petition for determination of need. This Order reflects that decision and serves as our report under the Power Plant Siting Act, as required by section 403.507(4), Florida Statutes.

Section 403.519(3), Florida Statutes, sets forth those matters that we must consider in a proceeding to determine the need for a proposed expansion of an existing nuclear power plant:

In making its determination, the commission shall take into account the need for electric system reliability and integrity, the need for adequate electricity at a reasonable cost, the need for fuel diversity and supply reliability, and whether the proposed plant is the most cost-effective alternative available. The commission shall also expressly consider the conservation measures taken by or reasonably available to the applicant or its members which might mitigate the need for the proposed plant and other matters within its jurisdiction which it deems relevant.



*Exemption from Requirements of Rule 25-22.082, Florida Administrative Code*

We find that the CR3 Uprate satisfies all criteria for exemption from the Bid Rule, pursuant to Rule 25-22.082(18), Florida Administrative Code (F.A.C.). PEF has shown that the CR3 Uprate will likely result in a lower cost supply of electricity to its general body of ratepayers and will also serve the public welfare. Because the CR3 Uprate provides customers additional generation at a net savings, not a net cost, from a more environmentally beneficial source that enhances fuel diversity, no request for proposal is needed. No generation alternative can supply 180 MW of additional power at a net savings to customers comparable to the economic, environmental, and fuel diversity benefits provided by the CR3 Uprate. Other available supply-side generation alternatives will likely have higher fuel costs and, therefore, increase the net cost to customers.

In making our decision whether to grant a determination of need, we have necessarily relied on the representations of the proposed power plant's cost effectiveness made by PEF. This reliance is especially critical where, as in PEF's petition before us in this case, there are no request for proposal results or other market-based checks on the utility's representations. Accordingly, while we grant PEF's requested exemption, PEF is on notice that we will closely scrutinize the reasonableness and prudence of any capital cost greater than those represented by PEF through its testimony and exhibits.

*Need for Electric System Reliability and Integrity*

In determining the need for the CR3 Uprate, we have taken into account the need for electric system reliability and integrity. The need for the CR3 Uprate is an economic need, not reliability need. The CR3 Uprate will displace higher cost fossil fuel and purchased power generation with low cost nuclear generation, resulting in substantial fuel savings that provide a net benefit to customers. The CR3 Uprate's substantial economic benefits satisfy the statutory need requirements under our prior precedent and Rule 25-22.081(3), F.A.C., recognizing an economic or socio-economic need for new generation.

*Need for Adequate Electricity at a Reasonable Cost*

We find that the CR3 Uprate will displace higher cost fossil fuel and purchased power generation with low cost nuclear generation, resulting in substantial fuel savings that provide a net benefit to customers. Nuclear energy is the lowest cost energy available on PEF's system. Producing additional nuclear energy from the CR3 Uprate, therefore, will produce energy at the lowest possible generation fuel cost.

*Need for Fuel Diversity and Supply Reliability*

We find that the proposed CR3 Uprate will displace fossil fuel and purchased power generation with nuclear generation, resulting in increased fuel diversity and supply reliability. The CR3 Uprate provides a stable source of additional base load power. Nuclear generation is

not subject to the same supply interruptions or changes in price volatility that can affect generation with fossil fuels. Rather, the supply of nuclear fuel is relatively plentiful and stable in price. PEF's customers, and the State, thus, will benefit from increased price stability, enhanced fuel diversity, and decreased reliance on foreign fuel sources resulting from the addition of nuclear capacity to PEF's system.

*No Mitigating Conservation Measures*

We find that expanding conservation programs cannot displace the CR3 Uprate. PEF is currently exceeding its Commission-approved numeric conservation goals. Further, PEF has recently expanded its demand side management program offerings, resulting in a projected additional 388 MW of summer demand savings. The CR3 Uprate will produce more incremental energy into the system than an equivalent amount of conservation can save. If the comparison were to be done on equivalent energy alone, it would take more MWs of conservation to save an amount of energy equivalent to the energy produced by the CR3 upgrade, which would result in higher costs to customers.

*Most Cost-Effective Alternative Available*

We find that the CR3 Uprate displaces higher cost generation on PEF's system, yielding substantial fuel savings to the net benefit of PEF's customers. PEF's customers will receive additional generation at a net savings of approximately \$327 million on a cumulative net present value basis. This means that no entity offering a supply-side generation alternative can likely propose a lower cost alternative for the same amount of power, and certainly not from relatively clean nuclear power. The CR3 Uprate, because of the net fuel savings benefits driving the project, is the lowest cost supply of electricity for PEF's customers.

Conclusion

Based on the foregoing, we grant PEF's petition for a determination of need for the proposed expansion of the Crystal River Unit 3 Nuclear Power Plant because it fills an economic need. It will provide adequate electricity at a reasonable cost to customers. CR3 will displace higher cost fossil fuel and purchased power generation with low cost nuclear generation, resulting in substantial fuel savings that provide a net benefit to customers. Although it is not needed for reliability it does meet the need for fuel diversity and supply reliability. The proposed CR3 Uprate will displace fossil fuel and purchased power generation with nuclear generation, resulting in increased fuel diversity and supply reliability. PEF's customers, and the State, thus, will benefit from increased price stability, enhanced fuel diversity, and decreased reliance on foreign fuel sources resulting from the addition of nuclear capacity to PEF's system. There are no cost-effective demand-side management measures available to offset the need. Because the CR3 uprate displaces higher cost generation on PEF's system, yielding fuel savings to the net benefit of PEF's customer, there can be no less costly supply-side generation alternative available.

ORDER NO. PSC-07-0119-FOF-EI  
DOCKET NO. 060642-EI  
PAGE 5

Upon further consideration, we exempt PEF from the requirements of Rule 25-22.082, (F.A.C.), as it applies to CR3 uprate. In granting the exemption, we do so upon the considerations listed above.

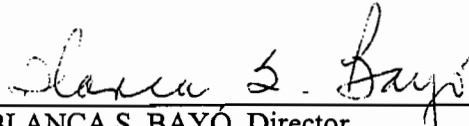
Based on the foregoing, it is

ORDERED by the Florida Public Service Commission that Progress Energy Florida's petition for determination of need for its proposed expansion of Crystal River Unit 3 nuclear power plant is granted. It is further

ORDERED that Progress Energy Florida is exempted from the requirements of Rule 25-22.082, Florida Administrative Code. It is further

ORDERED that this docket shall be closed.

By ORDER of the Florida Public Service Commission this 8th day of February, 2007.

  
\_\_\_\_\_  
BLANCA S. BAYO, Director  
Division of the Commission Clerk  
and Administrative Services

(SEAL)

LCB

NOTICE OF FURTHER PROCEEDINGS OR JUDICIAL REVIEW

The Florida Public Service Commission is required by Section 120.569(1), Florida Statutes, to notify parties of any administrative hearing or judicial review of Commission orders that is available under Sections 120.57 or 120.68, Florida Statutes, as well as the procedures and time limits that apply. This notice should not be construed to mean all requests for an administrative hearing or judicial review will be granted or result in the relief sought.

Any party adversely affected by the Commission's final action in this matter may request:

- 1) reconsideration of the decision by filing a motion for reconsideration with the Director, Division of the Commission Clerk and Administrative Services, 2540 Shumard Oak Boulevard, Tallahassee, Florida 32399-0850, within five (5) days of the issuance of this order in the form prescribed by Rule 25-22.060, Florida Administrative Code; or
- 2) judicial review by the Florida Supreme Court in the case of an electric, gas or telephone utility or the First District Court of Appeal in the case of a water and/or wastewater utility by filing a notice of appeal with the Director, Division of the Commission Clerk and Administrative Services and filing a copy of the notice of appeal and the filing fee with the appropriate court. This filing must be completed within thirty (30) days after the issuance of this order, pursuant to Rule 9.110, Florida Rules of Appellate Procedure. The notice of appeal must be in the form specified in Rule 9.900(a), Florida Rules of Appellate Procedure.

## 2.0 SITE AND VICINITY CHARACTERISTICS

### 2.1 Site and Associated Facilities Delineation

#### 2.1.1 Site Location

Progress Energy Florida's CR3 is part of the larger Crystal River Energy Complex (CREC) located in Citrus County, Florida. The CREC is comprised of 4,738 acres and includes a single nuclear unit (CR3) and four coal-fired units, CR 1, 2, 4, and 5. CR3 and the four coal-fired units lie in the developed area of the site.

CR3 is in the southern (and center) part of CREC and comprises approximately 26.86 acres. This 26.86 acre site and certain related facilities are the subject of this application. These CR3 facilities are shown on Figure 2.1.2-2. CR 1 and 2 are located along the southern boundary of the CREC in between the intake and discharge canals. CR 4 and 5 are located approximately 0.5 mile north of CR3. CR 1, 2, 4 and 5 are not affected by this application.

The CREC is located in all or portions of Sections 31, 32, 33, 34, and 35, Township 17, Range 16. CR3 is located in Section 33, Township 17, Range 16 (Figure 2.1.1-1). CR 1 and 2 are located in Section 33, Township 17, Range 16, and CR 4 and 5 are located in or portions of Sections 28 and 33, Township 17, Range 16.

#### 2.1.2 Existing CREC Site Uses

CR3 is an 838 MW pressured water reactor which began commercial operation in 1977. CR3 is not currently certified under the PPSA. CR 1 and 2 were built in the 1960s and produce 379 and 486 MW, respectively. CR 4 and 5 were built in the early 1980s and produce 717 and 720 MW, respectively. CR 4 and 5 were certified under the PPSA in 1980. The CREC also contains office buildings, warehouses, coal storage areas, ash storage, transmission, and substation facilities which support the various units (Figure 2.1.2-1).

Cooling water for CR 1, 2, and 3 is withdrawn from an intake canal which connects to Crystal Bay and the Gulf of Mexico (Figure 2.1.2-2). Florida Department of Environmental Protection (FDEP) National Pollution Discharge Elimination System (NPDES) permit FL0000159 (Appendix 10.1.2)

limits the combined condenser flow from CR 1, 2, and 3 to 1,898 million gallons per day (MGD) during the period of May 1 through October 31, and 1,613.2 MGD during the remainder of the year.

### CR 1 and 2

The cooling water intake structures for CR 1 and 2 are located on the north bank of the intake canal. The design intake flow for CR 1 and 2 is 638,000 gallons per minutes (gpm); or 919 MGD.

### CR3

The cooling water intake structure for CR3 is located approximately 400 ft east of the intake for CR 1 and 2. A chain link fence extends across the entire width of the intake canal upstream of the intakes for CR 1 and 2. The fence restricts access to CR3 and collects floating or partially submerged debris. CR3 has four pump bays and seven traveling screen bays separated from the pump bays by a common plenum. An eighth traveling screen bay provides service water. Similar to CR 1 and 2, the traveling screen trays are three meters wide and have 9.5 millimeter (mm) (3/8 inch) mesh. They are operated once every eight hours and cleaned by a front spray wash system. The screenwash trough slopes to the west where material is collected in a sump prior to discharge to the intake canal. The trough receives combined wash water from all screens.

CR3 operates with four circulating water pumps, each rated 170,000 gpm. The design intake flow for CR3 is 680,000 gpm or 979 MGD. The three units have a maximum permitted flow of 1,898 MGD and a total nameplate rating of 1,854.8 MW. Additionally, CR3 has a low flow nuclear services water pumping capacity of 10,000 to 20,000 gpm, depending on system demand.

Cooling water for CR 1, 2, and 3 is withdrawn by a common intake canal south of the units that extends into the Gulf of Mexico. The 14-mile-long intake canal is dredged to a depth of approximately 20 feet (ft) to also accommodate coal barges which unload and dock on the south side of the canal, just west of the intakes for CR 1 and 2 (Figure 2.1.2-2). The intake canal is defined by northern and southern dikes. The northern dike continues along the channel for another 5.3 miles. There are openings in the dikes at irregular intervals to allow north-south boat traffic in the area of CREC. Movement of water into the canal is tidally influenced; at the mouth of the canal, current velocities ranged from 0.6 to 2.6 feet per second (fps) when last measured in 1983-1984 (Golder 2005).

The head of the common discharge canal for all units is located just north of the discharge from CR3. The canal extends west for approximately 1.6 mile to the point of discharge, where it opens into a bay. The dredged channel, bordered to the south by a spoil bank, continues for another 1.2 miles. Water in the discharge canal is maintained by dredging to a depth of approximately 10 ft.

Helper cooling towers currently line the northern bank of the discharge canal and receive a portion of the circulating water flow from CR 1, 2, and 3 including cooling tower blowdown from CR 4 and 5. The helper cooling towers are operated as necessary to ensure that the discharge temperature does not exceed 96.5°F (as a three-hour rolling average) at the point of discharge into the Gulf of Mexico. In February 2006, PEF received approval from the state of Florida to install modular cooling towers which CR 1 and 2 operate during the warmest times of the year. CR 4 and 5 are closed-cycle units that withdraw water for cooling tower makeup from the discharge canal, downstream of CR 1, 2, and 3 and discharge cooling tower blowdown to the discharge canal (Figure 2.1.2-2).

CR 1, 2, and 3 are authorized to operate via several common environmental permits issued by the FDEP and other agencies (Appendices 10.1.2 and 10.4). Figure 2.1.2-1 depicts the site layout and Figure 2.1.2-2 is an aerial photograph of CR3.

### 2.1.3 Adjacent Properties

CR3 is located within the CREC and is adjacent to CR 1 and 2. The intake canal is located south of CR3 and the discharge canal is located north of CR3. PEF operates a mariculture center approximately one mile east of CR3. The Crystal River Mariculture Center is a multi-species marine hatchery originally established in the early 1990s to mitigate fisheries impacts related to the once-through cooling water system at Crystal River Units 1, 2, and 3. The Mariculture Center operations focus on the successful husbandry, culture, grow-out, harvest, and release into local waters of those selected species. Land use surrounding the CREC is predominantly undeveloped land. Active mines are located to the north and east of CREC.

The Central Florida Barge Canal is located approximately 3.2 miles north of CR3. There is relatively low-density residential housing north of the Central Florida Barge Canal and east of U.S. Highway 19

## Uses within the Project Area

Figure 2.1.2-1 provides the site layout for the facilities that support the operation of CR3 (identified within the red boundary) and the facilities that are located adjacent to CR3. The existing CR3 facilities and their approximate land areas are shown in Figure 2.1.2-1.

### 2.1.4 100-Year Flood Zone

According to the Federal Emergency Management Agency (FEMA) and the FDEP, CR3 and CREC are located within Zone VE. VE is an area inundated by 100-year flooding with velocity hazard (wave action) in which base flood elevations have been determined (Figure 2.1.5-1). The main CR3 power block is located on a concrete berm with wave steps to mitigate flood and wave impacts.

## 2.2 **Socio-Political Environment**

### 2.2.1 Governmental Jurisdictions

CR3 is located in unincorporated northwest Citrus County, Florida. Yankeetown, Inglis, and the city of Crystal River are municipalities located within five miles of CR3. Yankeetown is located approximately four and a half miles northwest of CR3 in Levy County and Inglis is located approximately five miles northeast of CR3 in Levy County. The city of Crystal River is located approximately four miles southeast of CR3 in Citrus County (Figure 2.2.1-1).

There are three state parks (Crystal River Preserve State Park, Crystal River Archeological State Park, and Felbrun Park Trailhead/Withlacoochee Bay Trail), one aquatic preserve (St. Martin's Marsh Aquatic Preserve), and two outstanding Florida waters (Crystal River and Withlacoochee River System) within five miles of CR3 (Figures 2.2.1-2, 2.2.1-3, and 2.2.1-4). There are no national parks within five miles of CR3. The mouth of Crystal River is located within two miles of CR3 (Figure 2.2.1-3). These properties are discussed further in Section 2.2.5.

### 2.2.2 Zoning and Land Use Plans

#### 2.2.2.1 *Zoning*

The Citrus County Land Development Code (Code) has been adopted to implement the policies and objectives of the Citrus County Comprehensive Plan and to regulate land development within the



unincorporated portions of Citrus County. The Code incorporates a zoning map that depicts the zoning categories of lands lying within unincorporated Citrus County. CR3 and CREC are zoned as a Transportation, Communication, and Utilities (TCU) (Figure 2.2.2-2) (Appendix 10.2).

The TCU category is described in the Code Chapter 4 (4634) as follows:

*This category allows for those uses directly related to transportation, communications, and utilities. It also accommodates service, repair, maintenance, and storage related facilities necessary to support such uses.*

Electrical power plants are an allowed use in this zoning district.

#### 2.2.2.2 Future Land Use

CR3 is located in unincorporated Citrus County, Florida. The county has adopted a comprehensive plan, which is updated on a periodic basis. The county comprehensive plan incorporates a future land use map that depicts the future land use categories of all property falling within the unincorporated portions of the county.

CR3 and CREC Future Land Use category is designated as TCU according to the Citrus County Future Land Use Map (Figure 2.2.2-1). The TCU category is described in the Citrus County Comprehensive Plan Future Land Use Element (II)(3)(d) as follows (Appendix 10.3):

*This land use category comprises three types of uses: Transportation, Communication, and Utilities (TCU). Transportation land uses include airports, railroad lines, and major shipping channels. Communication land uses include telephone, radio, and television facilities, including transmission towers. Public utilities include major utility transmission rights-of-way (230 KV or greater), water supply plants, sewage treatment plants, and electrical power facilities. There are 5,416 acres designated as TCU in Citrus County. This land use category comprises 1.42 percent of the County land area. The majority of this allocation consists of Florida Power's Crystal River Power Plant, the major transmission lines, the Crystal River Airport, and the Inverness Airport.*

CR3 is an allowed use under this land use designation.

### 2.2.3 Demography and Ongoing Land Use

CR3 and CREC are located in a rural unincorporated area of Citrus County. Yankeetown, Inglis, and the city of Crystal River are incorporated municipalities located within five miles of the CR3 (Figure 2.2.1-1).

According to the University of Florida's 2006 Florida Statistical Abstract, Citrus County was estimated to have 132,635 residents in 2005, a 12.32 percent increase from 2000. The medium population projections for all of Citrus County depict continued growth, with an estimated population of 184,600 in 2025. Census counts and population estimates for the three municipalities within five miles of CR3 are listed below:

<b>Municipality</b>	<b>Census 2000</b>	<b>Estimates 2005</b>	<b>Percentage Change</b>
Crystal River	3,485	3,710	6.46
Yankeetown	629	743	18.2
Inglis	1,491	1,676	12.41

University of Florida's 2006 Statistical Abstract Table 1.25

Existing land use patterns near CR3 are depicted on Figure 2.2.3-1. The predominant existing land uses within the vicinity of CR3 are undeveloped and industrial. This pattern of land use is anticipated to remain the same for the current planning period as reflected in the county's Future Land Use Map. Policy 17.3.24 of the Citrus County Comprehensive Plan Future Land Use Element discourages new residential development in the vicinity of the CREC and no increase in residential density shall be approved within five miles of the nuclear power plant facility. The code shows a five mile overlay zone around the nuclear power plant in which further residential density increases are prohibited. Scattered residential clusters are located north of the Central Florida Barge Canal and east of U.S. Highway 19.

### 2.2.4 Easements, Title, Agency Works

No easements, titles, or agency works are required for the CR3 Uprate Project.

### 2.2.5 Regional Scenic, Cultural and Natural Landmarks

Crystal River Preserve State Park is approximately one and a half miles southeast of CR3 and adjacent to CREC's southern boundary. The park borders 20 miles of the northern Gulf Coast between the two cities of Yankeetown and Homosassa. Crystal River Preserve State Park offers hiking, bicycling, kayaking, and canoeing. The park is located west of U.S. Highway 19 in the city of Crystal River.

The Crystal River Archaeological State Park is approximately five miles southeast of CR3. The park is a 61-acre pre-Columbian and Native American National Historic Landmark. The park has burial mounds, temple/platform mounds, a plaza area, and a substantial midden. The six-mound complex is one of the longest continuously occupied site in Florida. The park is also a part of the Great American Birding Trail and offers boat tours of Crystal River.

The Feldburn Park Trailhead (Withlacoochee Bay Trail) is managed as a unit of the 90,000 acre Marjorie Harris Carr Cross Florida Greenway located approximately 4.32 miles northeast of CR3. Felburn Park was formerly a approximately 140-acre limerock mine. Remnants of the mining activity include the 40-acre Phil's Lake that was formed as a result of the mining activity intersecting the water table. The Withlacoochee Bay Trail traverses five miles west from the Felburn Park Trailhead to the Gulf of Mexico along the southern side of the former Cross Florida Barge Canal. The trail offers hiking, biking, rollerblading, horseback riding, bird watching, and fishing. The park is a part of the FDEP Greenways and Trails program.

The St. Martin's Marsh Aquatic Preserve is approximately four miles south of CR3. The aquatic preserve covers open water areas from Crystal River to the Homosassa River in coastal Citrus County. Adjacent roads to the preserve include U.S. Highway 19, State Route 44, and County Route 488. The St. Martin's Marsh Aquatic Preserve is composed of open water, several inlet bays, tidal rivers and creeks, salt marshes, and adjoins upland hammock islands. Species found in the preserve include amphibians, fish, birds, mammals, plants, and reptiles. The preserve is also a protected area for many commercially, recreationally, and important species.

The Crystal River and Withlacoochee River System are designated as Outstanding Florida Waters (OFW). They are waters designated worthy of special protection because of their natural attributes. This special designation is applied to certain waters and is intended to protect existing, good, water quality, and is managed by state or federal governments. Crystal River is located approximately two

miles south of CR3. The Withlacoochee River System is located approximately four miles northwest of CR3. CREC does not interact directly or indirectly with these OFWs.

The CR3 Uprate Project will not directly or indirectly impact these regional scenic, cultural, and natural landmarks.

#### 2.2.6 Archaeological and Historic Sites

In December 2006, New South Associates conducted a background search on behalf of Tetra Tech NUS to support the license renewal for CR3 (Appendix 10.3-1). A review of the relevant data was conducted in order to provide a synthesis of known archaeological sites within a six-mile radius of the facility. According to the report, the Florida Master Site File data indicates that there are currently 195 archaeological sites, nine structures, and three cemeteries within a six-mile radius of the 4,738-acre CREC. Of these, Citrus County contains 174 of the known sites, eight of the known structures, and two recorded cemeteries. The Levy County portion of the six-mile radius includes 21 known sites, one recorded structure, and one recorded cemetery. Only two sites are listed in the National Register of Historic Places and both are prehistoric: the Crystal River Indian Mound site complex (8CI00001) and Mullet Key (8CL00022) (New South Associates 2006). The NRC license renewal includes no plans for new construction and therefore will have no effect on the cultural resources in the identified review area.

The Crystal River Indian Mound site complex (8CI00001) is two miles northwest of the city of Crystal River on U.S. Highway 19 and is classified as prehistoric. The ceremonial center site contains two temple mounds, a conical burial mound, a shell midden ridge, and a shell midden mound. On September 29, 1970, it was added to the U.S. National Register of Historic Places. The site was excavated by C.B. Moore in 1903, 1906, and 1917; Florida State University in 1951; and Florida State Museum in 1964 (National Register Information Systems 2007).

The Mullet Key is a historic island near the city of Crystal River. It is located three miles south of the main mouth of the Crystal River, and was inhabited by Native Americans in pre-Columbian times. On July 3, 1986, it was added to the U.S. National Register of Historic Places. Mullet Key is located approximately 5.27 miles southwest of CR3.

No archaeological or historical sites are located within the CR3 project area.

## 2.2.7 Socioeconomics and Public Services

### 2.2.7.1 *Labor Force*

The total labor force in Citrus County for 2005 was 49,093 with employment of 47,136. Unemployment in 2005 was 1,957 or 4.0 percent in Citrus County. For the state of Florida, the unemployment rate was 3.8 percent and the U.S. unemployment rate was 5.1 percent (University of Florida 2006).

Average monthly private-sector employment by major industry group in Citrus County for September 2006 is depicted below:

<b>Major Industry Group</b>	<b>Employment</b>
Agriculture, Forestry, Fishing and Hunting	92
Mining	57
Utilities	Not Available
Construction	4,334
Manufacturing	934
Transportation and Warehousing	162
Wholesale Trade	594
Retail Trade	5,500
Finance and Insurance	775
Information	532
Real Estate and Rental and Leasing	551
Professional Scientific and Technical Services	1,020
Management Companies and Enterprises	35
Administration and Support and Waste Management and Remediation Services	2,043
Educational Services	125
Health Care and Social Assistance	6,405
Arts, Entertainment & Recreation	491
Accommodation and Food Services	2,796
Other Services	1,440
Unclassified	29

Source: State of Florida, Labor Market Statistics, "Quarterly Census of Employment and Wages" (ES-202), Annual NAICS files.

The health care and social assistance groups and retail trade industry provided the most employment in Citrus County with about 43 percent of the total employment between the two groups. The construction industry provided about 4,334 jobs.

Employment projections for construction and extraction trades in Florida have been estimated for the year 2013. Statewide, construction employment is estimated to increase from 546,810 in 2005 to 660,509 in 2013 (University of Florida 2006).

### 2.2.7.2 *General Income*

Citrus County had a per capita personal income of \$24,278 for 2004 compared to state of Florida and U.S. per capita personal income of \$31,469 and \$33,050, respectively (U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information 2004). This income level ranked 35 out of the 67 counties in Florida.

The median household income in Citrus County was \$31,895 in 2003. When compared to the 2000 median household income, this income level is a 1.7 percent increase. Florida had a median household income of \$38,985 in 2003, which was an increase of 0.5 percent from 2000 (University of Florida 2006). The average wage and salary earnings in Citrus County in 2004 were \$28,343, approximately 19 percent lower than the statewide average of \$34,935 (BEA 2004).

### 2.2.7.3 *Housing*

The table below identifies the total number of housing units in Citrus County by occupancy type according to the U.S. Census Bureau:

Renter Occupied	11,301
Owner Occupied	46,530
<b>Total Occupied</b>	<b>57,831</b>

The average, house purchase-price in Citrus County in 2005 was \$196,322 (University of Florida 2006).

A total of 71 licensed lodgings existed in 2006, representing 2,259 lodging units. This includes 1,001 apartment building units, nine rooming house units, 140 rental condominiums, and 117 transient apartment building units (University of Florida 2006).

## 2.2.8 Area Public Service and Utilities

### 2.2.8.1 *Education*

Primary public education in Florida is operated on a countywide basis. Each county's respective school district establishes educational policies and staffing requirements. According to the Florida Department of Education, Statistical Brief, Citrus County had a total student membership in preschool

through twelfth grade of 16,077 in the fall of 2006. Citrus County schools employed approximately 1,028 teachers in the fall of 2005.

There are seven schools located in the city of Crystal River and one school located in Yankeetown. The Academy of Environmental Science is located five miles southeast of CR3 and the Marine Science Station is located 5.1 miles southeast of CR3 (Figure 2.2.8-1). The Academy of Environmental Science is a charter school focused on environmental and natural resource education. The Marine Science Station provides marine education to students through the county and state.

#### *2.2.8.2 Transportation*

U.S. Highway 19 is the major north-south route in the western portion of the County, traveling through the city of Crystal River and Homosassa Springs, connecting Levy County to the north with Hernando County to the south. In the area of the CREC, U.S. Highway 19 is a four-lane divided arterial (Citrus County 2006).

The main entrance to the CR3 is West Powerline Street, located off U.S. Highway 19, approximately 3.7 miles west of U.S. Highway 19/U.S. Highway 98. All CREC employees use Powerline Street to enter and exit the facility (Figure 2.2.8-2). The existing peak hour traffic volumes are presented in Figure 2.2.8.3 for the a.m. and p.m. peak hours.

U.S. Highway 19/U.S. Highway 98 is a state maintained, northbound-southbound principle rural arterial. At the intersection with West Powerline Street, the U.S. Highway 19/U.S. Highway 98 northbound approach consists of one exclusive left lane, and two through lanes and the southbound approach consists of two through lanes and one dedicated right turn lane. The traffic signal control at the intersection with West Powerline Street is actuated-uncoordinated with a variable cycle length.

West Powerline Road is an eastbound-westbound local roadway and is used exclusively for access to and from the existing power plant. At U.S. Highway 19/U.S. Highway 98, the West Powerline Street eastbound approach consists of one left turn and one right lane. The traffic signal control at the intersection with U.S. Highway 19/U.S. Highway 98 is actuated-uncoordinated with a variable cycle length.

There is one railroad serving Citrus County, the Seaboard Coast Railroad, owned by CSX Transportation. A spur from this line runs just south of West Powerline Street, the CR3 access road and terminates on the CR3 property.

There are two public and six private airports within Citrus County. The CREC has its own private heliport onsite. The Crystal River Airport is the closest public airport to CR3, which is approximately 9.95 miles from CR3. J.R.'s Stolport Airport is the closest private airport to CR3, which is approximately 9.18 miles from CR3.

The Florida Department of Transportation (FDOT) is currently conducting a Project Development and Environment (PD&E) study in support of a new four-lane (toll) turnpike. The new Citrus County portion of the Suncoast Parkway turnpike will extend from U.S. Highway 98 to U.S. 19 Highway, alleviating congestion along U.S. Highway 19 and around the city of Crystal River and other towns along the west coast of Citrus County.

#### *2.2.8.3 Medical Facilities*

Citrus County has two hospitals, which contain approximately 326 licensed beds. Licensed medical practitioners in Citrus County include 200 physicians, 180 dentists, dental hygienists, and dental radiographers, 268 health practitioners, 1,929 registered and practical nurses, 23 opticians, and 96 pharmacists and pharmacist interns (University of Florida 2006).

The closest medical facility to CR3 is Seven Rivers Regional Medical Center, located approximately four miles east of CR3. Seven Rivers Regional Medical Center services include an ambulatory surgery center, cardiovascular care, the Dunnellon Diagnostic Center, emergency services, endoscopy services, imaging services, inpatient services, an intensive care/coronary care unit, laboratory services, an orthopedic center of excellence, rehabilitation services, the Seven Rivers Rehab & Wound center, a sleep disorder center, surgical services, a women's and family center, wound care and hyperbaric medicine services. If Seven Rivers Regional Medical Center is not available for emergency care, Citrus Memorial Hospital in Inverness, Florida is located approximately 23 miles southeast of CR3.

The Nature Coast Emergency Medical Services (EMS) provides emergency medical transportation within Citrus County. EMS is licensed to operate by the Office of Emergency Medical Services, Florida Department of Health and Rehabilitative Services and functions according to Chapter 401,



F.S., and Chapter 10D-66, Florida Administrative Code (F.A.C). EMS operates the county rescue units.

#### *2.2.8.4 Firefighting Facilities*

Citrus County Fire Rescue is responsible for providing fire rescue, fire prevention, hazardous materials, and technical rescue services to Citrus County. The Citrus County Fire Rescue has over 200 career and volunteer members working out of 22 fire and rescue stations.

CR3 has an onsite fire brigade that provides onsite response in the event of an emergency. Additionally, numerous response organizations and sub-organizations are available to respond to emergencies. These emergency response organizations may be drawn from local, state, federal, and private sectors.

#### *2.2.8.5 Police Protection*

The Citrus County Sheriff's Office serves a population of about 132,635 people (University of Florida, 2006). The Citrus County Sheriff's Office provides law enforcement in the vicinity of CR3. The Florida Highway Patrol provides service to U.S. Highway 19.

During an emergency at CR3 in which all available assistance is required, numerous response organizations and sub-organizations are available. These emergency response organizations may be drawn from local, state, federal, and private sectors. They are cited in Table 2.2.8-1 (RERP 2007).

#### *2.2.8.6 Emergency Response and Preparedness*

PEF has developed an integrated preparedness program to respond to potential emergencies at CR3. The plan has been developed to 1) provide reasonable assurance that appropriate measures can and will be taken to protect health and safety in the event of an emergency; 2) assure that CREC personnel are protected to the maximum extent practicable; and 3) to provide timely dissemination of accurate information to local, State and Federal authorities and to the public (Progress Energy, Radiological Emergency Response Plan, 2007).

#### *2.2.8.7 Recreation Facilities*

There are four known public recreation areas within five miles of CR3 located in Citrus and Levy Counties (Figure 2.2.8-1).

Fort Island Gulf Beach is located approximately 3.3 miles south of CR3 off west Fort Island Road. Fort Island Gulf Beach amenities include barbecue grills, beach, boat ramp, fishing pier, lighting detector, parking, picnic tables, restrooms, showers (outdoor), and swimming.

Bird Creek County Park is approximately five miles northwest of CR3 located in Yankeetown at the end of U.S. Highway 40. Bird Creek Park is a little park located where the Withlacoochee River flows into the Gulf of Mexico in Levy County, providing both freshwater and saltwater fishing. It also offers activities and facilities such as canoeing, swimming, fishing, picnic sites, and boat ramps.

Wilderness Addition Park and Masnola Park/Garden Club are local recreation facilities located in Yankeetown approximately five miles north of CR3.

#### *2.2.8.8 Electricity and Gas*

PEF and Withlacoochee River Electric Coop, Inc. provide electricity to Citrus County businesses and residents. Central Florida Gas provides natural gas service in the area.

#### *2.2.8.9 Water Supply Facilities*

The Citrus County Utilities Division is responsible for the operation of six county owned water facilities. The Division supplies potable water directly to over 5,000 customers and to the Ozello Water Association and Apache Shores through bulk water agreements. Agreements have also been made to supply potable water to the city of Crystal River and Beverly Hills/Rolling Oaks Utilities during emergency situations. The Charles A. Black II (aka Meadowcrest Water Treatment Facility) is located in the city of Crystal River, which is the closest water treatment facility to CR3.

There are seven active freshwater groundwater wells located on PEF's CREC property. Three of the seven groundwater wells supply an existing water treatment plant. CR3 receives and meters its intake supply from this existing water treatment plant. This facility is capable of serving the CR3 Uprate Project.

#### *2.2.8.10 Sewage Treatment Facilities*

The Citrus County Utilities Division is responsible for the operation of four, county-owned wastewater treatment facilities and provides wastewater treatment for over 2,000 customers.

One of the following types of wastewater facilities serves Citrus County businesses and residents: septic tanks, package plants, or regional facilities. Septic tanks provide service to individual residences or small businesses within unincorporated Citrus County. Regional facilities are large systems that serve areas of densely populated developments. The Brentwood Wastewater Treatment Facility located in Lecanto is the closest facility to CR3.

The existing CR3 is not connected to the regional wastewater system. The CR3 Uprate Project will be self-sufficient and facility-specific sanitary and process wastewater collection, treatment, and disposal needs will be met by the existing and permitted CR 1, 2, and 3 wastewater treatment plant (Appendix 10.4.2).

#### *2.2.8.11 Solid Waste Disposal*

The Citrus County Solid Waste Management Division is responsible for solid waste collection, transport, and disposal in unincorporated portions of the county. It operates the central landfill that accepts household, commercial, and industrial waste. Over 104,000 tons of material per year is buried, and approximately three million gallons of leachate is treated annually at a specialized facility on-site.

CREC currently provides for facility-specific solid waste collection and disposal. No change in solid waste management and disposal practices are anticipated.

### **2.3 Bio-Physical Environment**

#### **2.3.1 Geohydrology**

The information presented in this section draws upon previous information submitted in the CREC CR 4 and 5 SCA (March 1979) and provides a brief summary of the geohydrologic baseline information applicable to the CR3 Uprate Project.

The general geology of Citrus County was derived from the "Text to Accompany the Geologic Map of Florida" (Scott 2001). Site-specific, subsurface information was obtained by a geotechnical investigation performed within the CREC site as referenced in Dames and Moore 1995.

#### *2.3.1.1 Geologic Description of the Site Vicinity*

The generalized geology and hydrogeology for northern Florida, in the vicinity of the site, is shown in Figure 2.3.1-1. Based upon review of the U.S. Geological Survey (USGS) map for Red Level, Florida, dated 1954 and revised 1992; the area in the vicinity of the CREC has a natural ground surface elevation less than five feet (ft) above mean sea level (msl) with respect to the National Geodetic Vertical Datum (NGVD) of 1929. CREC was occupied by Ocala Limestone prior to development. Under natural conditions, the water table (i.e., absent drainage improvements) was near the ground surface. Geologic structures in the state of Florida are shown in Figure 2.3.1-2.

The primary geomorphologic feature located within the area of the site is coastal swamp (Florida Geologic Survey 1992) (Figure 2.3.1-3). Seismic activity near the site is minimal. There is 0.04 g (gravitational force) of peak ground acceleration with a two percent probability of exceedance in 50 years (Figure 2.3.1-4).

Rock units ranging in age from Paleocene to late Eocene age underlay the site. Formations and groups discussed in this report include (from oldest to youngest): the Cedar Keys Formation of Paleocene age, Avon Park Formation of middle Eocene age, and Ocala Limestone of late Eocene age (Scott et al. 2001). Figure 2.3.1-5 depicts a stratigraphic column showing lithostratigraphic units for the state of Florida. Figure 2.3.1-6 depicts a regional geologic cross section.

The Cedar Keys Formation is subdivided by lithologic character and corresponding geophysical log characteristics into six units (Winston 1994). In descending order, they are:

- Unit A, characterized by a preponderance of anhedral and cryptocrystalline dolomite, euhedral dolomite is subordinate;
- Unit B, characterized by the presence of numerous relic grain textures in chalky to microcrystalline euhedral dolomite;
- Unit C, predominately anhydrite, with subordinate chalky to very fine microcrystalline euhedral dolomite;
- Unit D, characterized by a predominance of relic grains in a chalky to very fine

microcrystalline euhedral dolomite, with few thin-bedded anhydrites; and

- Units E and F, similar in texture to Unit D, but contain fewer beds of relic grain texture.

The Avon Park Formation contains carbonate sediments of peninsular Florida. The formation consists of cream to light-brown or tan, poorly indurated to well indurated, variably fossiliferous limestone. The limestone is interbedded with dolostones (Scott 2001).

The Ocala Limestone consists of nearly pure limestone with occasional dolostones. The formation can be subdivided into two facies on the basis of lithography. The lower consists of white to cream colored, fine to medium grained, poor to medium indurated, and fossiliferous limestone. The upper facies consist of a white, poor to well indurated, poorly sorted, fossiliferous limestone. The permeable, highly transmissive carbonates of the Ocala Limestone form an important part of the Floridan Aquifer System (Scott 2001)

#### *2.3.1.2 Detailed Site Lithologic Description*

Detailed site lithology is available for the CREC Groundwater Monitoring Plan (Dames and Moore 1995). A generalized stratigraphic column for the site is shown on Figure 2.3.1-7.

Soils on and around the site are nearly level and poorly drained. The eastern portion of the site is comprised mainly of the Broward-Boca association. These are sandy soils underlain by limestone. To the west, the soils are extremely wet and classified as freshwater or saltwater swamp (FPC 1979). The property is underlain by poorly graded sand five ft below ground surface (bgs). The sand is underlain by limestone.

The site is located in the Ocala Uplift District, Big Bend Karst Division and the Chassahowitzka Coastal Strip Subdivision physiographic division (Brooks, 1981). The Ocala Uplift District is the "Lime Sink Region" of the pioneers. Early Tertiary limestones are at or near the surface in most places. Structurally, this is a broad uplift that occurred in Middle and Late Tertiary time. The most distinctive features of the Ocala Uplift District are the low-rolling limestone plains, but the landscape is varied. The Big Bend Karst Division is an erosional limestone plain with some low hills consisting of surficial sand. Beaches are rare; salt marshes give way to the open water of the Gulf of Mexico. Some mangroves occur southward of the Cedar Keys. The low coastal plain is comprised predominantly of flatwoods and swamps. The Chassahowitzka Coastal Strip Subdivision is a very low coastal strip of limestone rocklands, mostly covered by hardwoods and swamps; there are some

flatwoods. Elevations are typically 10 ft and less. Mangroves become increasingly significant along the rocky, flat coast.

#### *2.3.1.3 Bearing Strength*

The generalized profile consists of 5-10 ft of unconsolidated sediments over limestone. The overburden shows a “draped” effect in the area. There are three, broad, geotechnical layers. The first is a sand extending to approximately 5 ft bgs. The second is a very porous, limestone layer. The third is a very dense, impervious layer.

The CREC is suitable for the CR3 Uprate Project from a geotechnical standpoint. Lightly loaded structures can be supported on shallow foundations. Since the groundwater table is relatively high and upper sand is highly permeable. Major excavation will not be required for the CR3 Uprate Project.

#### *2.3.2 Subsurface Hydrology*

##### *2.3.2.1 Subsurface Hydrologic Data*

The CREC site is underlain by one principal hydrogeologic unit, the Floridan Aquifer System (FAS). In the vicinity of the site, the Floridan Aquifer is unconfined.

#### Floridan Aquifer

The FAS within the CREC site consists of the Upper Floridan Aquifer (UFA), middle confining unit, and Lower Floridan Aquifer (LFA). The UFA is approximately 10 ft bgs and 600 ft thick (FGS 1991) and consists mainly of limestone (calcium carbonate). Included at its top is Ocala Limestone, with the majority of the aquifer comprised of the Avon Park and Oldsmar Formations (FGS 1992). Groundwater storage and movement in the Floridan aquifer occurs through a complex network of fractures, solution cavities, and secondary porosity. Therefore, aquifer properties – such as hydraulic conductivity and transmissivity – are non-homogeneous and anisotropic.

Brackish groundwater is expected to be found in the coastal portion of the Floridan aquifer in the vicinity of the CREC site. The sub-Floridan confining unit occurs within the Cedar-Keys Unit.

### 2.3.2.2 *Karst Hydrogeology*

Karst terrains develop in areas underlain by carbonate rocks such as limestone. They often have drainage systems that are reflected on the surface as sinkholes, springs, disappearing streams, or even caves (<http://www.dep.state.fl.us/geology/geologictopics/sinkhole.htm>).

According to Map Series No. 110, "Sinkhole Type, Development, and Distribution in Florida," (William C. Sinclair and J. W. Stewart USGS), the site is located in Area I, where sinkholes are few, generally shallow and broad, and develop gradually. Shallow-solution sinkholes are the type of sinkholes found in this area (Figure 2.3.2-1). The FDEP's sinkhole database lists 334 sinkholes in Citrus County with the nearest one greater than three miles from the site.

### 2.3.3 Site Water Budget and Area Users

#### 2.3.3.1 *Site Water Budget*

Below is a table summarizing the USGS Estimated Use of Water in the U.S. County-Level Data for 2000 for Citrus County (<http://water.usgs.gov/wateuse/>).

<b>Water Use</b>	<b>Million Gallon per Day</b>
Public supply, ground-water withdrawals, fresh	13.97
Public supply, surface-water withdrawals, fresh	0.00
Public supply, total withdrawals, fresh	13.97
Total, ground-water withdrawals, fresh	29.99
Total, ground-water withdrawals, saline	0.00
Total, ground-water withdrawals, total	29.99
Total, surface-water withdrawals, fresh	1.30
Total, surface-water withdrawals, saline	393.90
Total, surface-water withdrawals, total	395.20
Total withdrawals, fresh	31.29
Total withdrawals, saline	393.90
<b>Total withdrawals, total</b>	<b>425.19</b>

#### 2.3.3.2 *Water Supply*

Groundwater is withdrawn regionally from the Surficial, Intermediate, and UFA for various purposes, including industrial, agricultural and potable/public supply. Water for public supplies in the vicinity of Crystal River and most of the water used by municipalities and industries in the area are obtained

from wells in the Floridan aquifer. Recharge to the groundwater table occurs as a result of approximately 55 inches of annual rainfall, most of which occurs during the summer months. At the plant site, the groundwater table is approximately 10 feet bgs and is influenced by tidal variations. Numerous springs, lakes, and ponds exist in the area of the CREC. The primary uses for these waterbodies are fresh water sport fishing and water livestock.

#### 2.3.3.3 *Area Users*

The Southwest Florida Water Management District (SWFWMD) through the issuance of water use permits and well construction permits regulates ground water use in the vicinity of the CREC (Appendix 10.4.1). CREC is authorized to withdraw brackish and fresh groundwater from the UFA via 12 production wells; nine are active and three are currently inactive (Appendix 10.4.1).

The CREC maintains nine active production groundwater wells located linearly eastward away from the complex. The closest of the fresh water production wells is approximately three miles east of the complex. These wells provide raw water to the water treatment plants which serve CR 1, 2, and 3 and CR 4 and 5. CR 1, 2, and CR3 are served by the five most western wells (PW1-A, PW1-B, SPW-3, SPW-4, and SPW-5). Wells SPW-3, SPW-4, and SPW-5 are permitted to withdraw an average of 380,000 gpd, 285,000 gpd, and 285,000 gpd, respectively. The brackish water wells, PW1-A and PW1-B are permitted to withdraw an average of 25,000 gpd. The wells are installed in the Floridan aquifer at depths ranging from 42 to 125 feet.

Figures 2.3.3-1 provides the location of the permitted water use wells within five miles of the CREC.

#### 2.3.4 Surficial Hydrology

##### 2.3.4.1 *Site Description*

The CREC is located on Crystal Bay, a shallow embayment of the Gulf of Mexico and midway between the Withlacoochee/Cross Florida Barge Canal and Crystal River, and approximately four miles from each.

As far out as Fisherman's Pass, approximately three miles west of the site, the depth of the Crystal Bay is less than 10 ft (SWEC 1985 page 3-1). Shallow inshore areas are characterized by oyster bars (or oyster "reefs") oriented parallel to shore that are visible at low tide and covered by water at high



tide. These oyster bars, composed mostly of broken shell, create numerous small basins with north-south orientation in the area of the intake and discharge canals.

The Withlacoochee River watershed covers approximately 2,100 square miles. The 157 mile long Withlacoochee River originates in the Green Swamp in Polk County and extends northward, discharging into the Gulf of Mexico near Yankeetown, Florida. In 1989, the river was designated an OFW by the Florida Department of Environmental Regulation. Connected lakes and tributaries are also included in this designation. It traverses eight counties (Polk, Lake, Sumter, Pasco, Hernando, Citrus, Marion, and Levy counties), with a watershed in six physiographic regions. Within the Green Swamp, at a location near U.S. Highway 98, the Withlacoochee River runs close to the headwaters of the Hillsborough River. A natural saddle occurs between the two rivers at an elevation of 78.5 ft. The Withlacoochee River can discharge to the Hillsborough River during high flows, but overflow seldom occurs. West of Lake Rousseau, the Withlacoochee River flows to the Gulf of Mexico where it discharges into the Withlacoochee Bay estuary. The area of the river from Inglis to the mouth has been greatly altered by the construction of the lock, dam, and bypass canal.

The Cross-Florida Barge Canal located south of the Levy/Citrus County border was originally constructed as a transportation waterway that would connect the Gulf of Mexico on the west coast to the Atlantic Ocean on the east coast. The original project was constructed and managed by the Army Corps of Engineers prior to the cancellation of the project. The Florida Board of Trustees now owns the unfinished portions of the project and the land. The 100-mile corridor is now designated as the Marjorie Harris Carr Cross-Florida Greenway. The greenway is administrated by the Board of Trustees as conservation and recreation lands.

Crystal River is located in Citrus County and runs from the city of Crystal River west seven miles toward the Gulf of Mexico. Crystal River Springs is a cluster of 30 springs and is the second largest springs group in Florida. Many of the river's springs are 20 to 30 ft deep. The tidally influenced Kings Bay is the headwater of Crystal River that forms at the northwest corner of the bay.

The CREC is served by an intake and a discharge canal, both of which were constructed with CR 1, 2, and 3. The intake canal is approximately 20 ft deep, and is diked westward on both sides for approximately 3.4 miles. The north dike extends for another 5.3 miles, but has openings for navigation. Velocities in the intake canal, assuming CR 1, 2, and 3 are all operating their cooling water systems at maximum pumping capability (1,318,000 gpm or 1897.9 MGD), are estimated to be

about 1.3 fps at low tide. The discharge canal is approximately 14 ft deep, and is diked approximately 1.6 miles west-northwest to the designated NPDES point of discharge (POD). The discharge canal was dredged for about another 1.2 miles offshore (Figure 2.3.4-1).

Velocities in the discharge canal when CR 1, 2, and 3 are all operating at maximum pumping capability are estimated to be about 2.4 feet per second at low tide. CERC performs cooling water flow monitoring as part of its NPDES permit, and reports the data as part of its Discharge Monitoring Reports (DMRs). The current permit, which was issued on May 9, 2005, limits this flow to 1,897.9 MGD during the period from May 1 through October 31 each year and to 1,613.2 MGD during the remainder of the year. Figure 2.3.4-5 shows the reported C.W. rates for CR 1, 2, and 3 during the period January 2003 through January 2007.

#### *2.3.4.2 Streamflow Data*

Monthly average streamflow for the Withlacoochee River at the Inglis Dam (USGS Station #02313230) for the period of record (1969 to 2006) ranges from 178 cubic feet per second (cfs) to 698 cfs. Daily flows for the same period of record range from 70 to 2,000 cfs. Mean annual streamflow for Withlacoochee River can be found in Table 2.3.4-1.

Streamflow data is not available for the Cross-Florida Barge Canal; however, water supply is inherently reliable and resistant to drought. Mean annual streamflow for Withlacoochee River can be found in Table 2.3.4-1.

Monthly average streamflow for Crystal River near Crystal River, Florida (USGS Station # 02310750) for the period of record (1964 to 1977) ranges from 801 cfs to 1,180 cfs. Daily flows for the same period of record range from -1,520 to 4,340 cfs. Mean annual streamflow for Crystal River can be found in Table 2.3.4-1.

#### *2.3.4.3 Water Quality*

Surface water quality standards for the state of Florida consist of designated uses for waterbodies, numerical and narrative criteria that correspond with the designated uses, and various policies, including moderating provisions.

Crystal Bay, the only designated water body affected by plant operations, is designated as a Class III Coastal Water. The corresponding uses are shellfish propagation or harvesting. Water Quality data in the vicinity of the site is available from U.S. Environmental Protection Agency's (EPA's) STORET Database (Figure 2.3.4-2). In general, the Crystal Bay has good water quality near the site. Water quality data near the intake canal and near the discharge canal from the site are listed in Table 2.3.4-2.

CREC performs Total Dissolved Solids (TDS) monitoring of the cooling water and reports the data as part of its NPDES permit. Figure 2.3.4-6 shows TDS measured in the discharge canal from October 2005 through February 2007. Values ranged between 24 and 31 parts per thousand. Because of the station's large flow rate, and the much smaller flow rates of added waste streams, the chemical concentrations in the discharge canal are not significantly different than those in the intake canal.

There are no anticipated changes in the chemical concentrations in the intake and discharge canal as a result of the CR3 Uprate Project.

#### Thermal

Based on EPA data, the average annual temperature in the Crystal Bay near the intake canal is 71.2 °F. The water temperature ranges from a minimum of 43.0 °F to a maximum of 94.6 °F in the summer.

CR 1, 2, and 3 currently withdraw condenser cooling water from the intake canal and discharge it to the discharge canal at the following rates, temperature rises, and heat loads, under design conditions:

Unit	CR1	CR2	CR3	Total
Condenser cooling water flow - gpm	310,000	328,000	680,000	1,318,000
Condenser temperature rise – degrees F.	14.9	16.9	17.5	
Condenser cooling system Heat rejection rate – Billion Btu/hour	2.28	2.74	5.88	10.91

In order to mitigate the thermal impacts to Crystal Bay, the CREC is also equipped with two types of Helper Cooling Towers (HCT), designated Permanent and Modular (Figure 2.3.4-3). These HCT are designed to allow CREC to meet NPDES permit limits on the absolute temperature of the facility

discharge of 96.5° F as a rolling three-hour average. The HCT are operated between May 1 and October 31 in order to achieve those limits.

The design characteristics of the HCT are as follows:

	<b>Permanent HCT</b>	<b>Modular HCT</b>
Design Wet Bulb Temperature – Degrees F.	81	81
Flow rate - gpm	684,600	180,000
Design Heat Dissipation Rate – Billion Btu/Hour	4.569	1.317

CREC performs temperature monitoring of the cooling water as part of its NPDES permit, and reports the data as part of its DMRs. Figure 2.3.4-7 shows the recorded intake and discharge temperatures for the period January 2003 through February 2007.

Although the dominant characteristic of the CREC discharge is once-through cooling water, there are other wastewater streams currently permitted by the CR 1, 2, and 3 NPDES Permit Number FL0000159. These waste streams are shown in the plant water use diagram (Figure 2.3.4-4).

#### *2.3.4.4 Existing CREC Effects*

##### Domestic/Sanitary Wastewater

Showers, lavatories, sinks, toilets, urinals and drinking fountains generate plant domestic/sanitary wastewater. These wastewaters are collected and treated in an on-site domestic/sanitary waste treatment facility.

FDEP Permit FLA118753-001-DW3P (Appendix 10.4.2) authorizes PEF to operate a 0.030 MGD Type III extended aeration domestic wastewater treatment plant. The wastewater treatment plant (WWTP) provides secondary treatment with basic level disinfection and consists of equalization, aeration, clarification, and sludge digestion. An associated land application system receives effluent from the WWTP. The land application system is permitted separately under FDEP Permit No. FLA016960 (Appendix 10.4.3).

### Potable Water Systems

Potable water uses at the plant include water for drinking, washing, showers, urinals, and toilets. Potable water for the plant is provided by a service water system, supplied by well water. The water treatment plant is located in the Water Treatment Building, located southwest of CR3 and southeast of CR 1 and 2 within the CR 1 and 2 facility. The existing water treatment train is comprised of natural draft aeration, cold lime softening, scale inhibitor addition, chlorination, pressure filtration, storage, and distribution. Potable water is distributed via four 300 gpm service water pumps to CR 1 and 2, CR3 and other facilities within the CREC.

### Process Wastewater Systems

The major process wastewater systems for CR3 are authorized by the CR 1, 2, and 3 NPDES (Appendix 10.1.2) and Industrial Wastewater Permits (Appendix 10.4.3) as described below (Figure 3.5.4-1):

Outfalls D-091, D-092, D-093 and D-094 are discharges produced when water from the intake canal (for outfalls D-091, D-092 and D-093) and discharge canal (for outfall D-094) is used to wash debris from the rotating debris screens protecting the intake pumps at Units 1, 2, and 3 and also the HCTs. These outfalls discharge to the intake canal at the plant intake structures (for outfalls D-091, D-092 and D-093) and discharge canal (for outfall D-094).

The nuclear services and decay heat seawater system (Outfall D-0F) associated with CR3 consist of once through cooling water and discharges from internal processes (i.e., laundry shower and sump tanks and secondary drain tanks) and the evaporator condensate storage tanks to the discharge canal.

The plant wastewater pond system (Outfall D-0C2) receives waste streams from the overflow of the plant wastewater evaporation/percolation pond system. This system receives various low volume wastes from CR 1, 2, and 3 including the discharge from the CR 1 and 2 sewage treatment plant. This area is also occasionally used as a dredge spoil dewatering area. This discharge has not been used due to the adequacy of the overall capacity of the pond system; however, the outfall should be maintained for future use as needed. This outfall discharges into the discharge canal.

### Chemical and Biocide Waste

CR 1 and 2 currently utilize a mechanical condenser cleaning system, wherein plastic cleaners are added to the once through cooling water stream and recaptured in the discharge canal for reuse. CR3 utilizes a differently designed mechanical condenser cleaning system. With this system, cleaning balls are circulated through the CR3 condensers. The balls are collected and recirculated within the circulating water system.

The nuclear services and decay heat seawater system associated with CR3 consists of once through cooling water and discharges from internal processes. This process is treated with a biocide known as Clamtrol (Spectrus CT1300) which is periodically injected into the system to control bio-fouling.

### 2.3.5 Vegetation/Land Use

The Florida Land Use, Cover, and Forms Classification System (FLUCFCS) Level III codes were utilized to describe the existing vegetative communities at the project area and the surrounding CREC. Figure 2.3.5-1 illustrates vegetative communities and land use at the project area. Each community is discussed in detail in Section 2.3.6.1

Existing land use and land cover within the project boundary includes electrical power facilities (FLUCFCS 831), open land (FLUCFCS 190), freshwater marsh (FLUCFCS 641), saltwater marsh (FLUCFCS 642), and mixed wetland hardwoods (FLUCFCS 617). Upgrades to the CREC will be conducted within areas currently used for electrical power generation. Open land and areas of freshwater marsh and mixed wetland hardwoods will be utilized for construction laydown.

The land use and vegetative communities surrounding the project area include mixed wetland hardwoods, open land, electrical power facilities, saltwater marsh, canals (FLUCFCS 510), and transmission lines (FLUCFCS 832).

### 2.3.6 Ecology

#### 2.3.6.1 *Species-Environmental Relationships*

The following subsections include descriptions of flora and fauna at the project area and areas near CR3. The CR3 area reconnaissance was conducted on April 12, 2007.

## Terrestrial Systems – Flora

### *831 - Electrical Power Facilities*

The project area is dominated by the existing electric power facilities and associated infrastructure, including CR3, warehouses, offices, and cooling water intake and discharge structures. Occasional species occurring adjacent to roadways and upon filled areas include red cedar (*Juniperus virginiana*), cabbage palm (*Sabal palmetto*), Brazilian pepper (*Schinus terebinthifolius*), lantana (*Lantana camara*), marsh elder (*Iva frutescens*), Virginia creeper (*Parthenocissus quinquefolia*), poison ivy (*Toxicodendron radicans*), peppervine (*Ampelopsis arborea*), wax myrtle (*Myrica cerifera*), groundsel tree (*Baccharis halimifolia*), and ragweed (*Ambrosia artemisiifolia*).

### *832 - Transmission Line Corridor*

Two sets of 230 kV and 500 kV transmission lines enter the CREC. The transmission line corridor crosses areas that will be used for construction laydown.

### *190 - Open Land*

There are large areas of open filled land adjacent to the project site that are covered in grasses. Grasses that dominate this habitat include Bermuda grass (*Cynodon dactylon*) and bahia grass (*Paspalum notatum*).

### *641 - Freshwater Marsh*

Several small freshwater marsh areas exist on the project site within areas designated for parking and construction laydown. Dominant species in the freshwater marsh areas include cattails (*Typha latifolia*), coastal plain willow (*Salix caroliniana*), and buttonbush (*Cephalanthus occidentalis*), while common subdominant species include arrowhead (*Sagittaria lancifolia*), sawgrass (*Cladium jamaicense*), white top sedge (*Dichromena colorata*), St. Johns wort (*Hypericum* spp), persimmon (*Diospyros virginianus*), soft rush (*Juncus effusus*), primrose willow (*Ludwigia* spp.), spadeleaf (*Centella asiatica*), marsh pennywort (*Hydrocotyle umbellata*), smartweed (*Polygonum* spp.), lizard's tail (*Saururus cernuus*), groundsel bush (*Baccharis halimifolia*), dogfennel (*Ambrosia artemisiifolia*), sedges (*Cyperus* sp.), spikerush (*Eleocharis* sp.), blue-eyed grass (*Sisyrinchium atlanticum*), American elm (*Ulmus americana*), ash (*Fraxinus* sp.), swamp bay (*Persea palustris*), mermaidweed (*Proserpinaca pectinata*), water hyssop (*Bacopa monnieri*), red maple seedlings (*Acer rubrum*), and blue flag (*Iris virginica*).

#### 642 - Saltwater Marsh

Areas of saltwater marsh are located to the west of the CREC, as well as between the intake and discharge canals. The saltwater marsh areas are dominated by black needlerush (*Juncus roemerianus*), with additional herbaceous and shrub species including marsh elder, salt grass (*Distichlis spicata*), bushy seaside oxeye (*Borrchia frutescens*), saltmarsh cordgrass (*Spartina alterniflora*), annual glasswort (*Salicornia bigelovii*), and occasional cabbage palm and red cedar trees.

#### 617- Mixed Wetland Hardwoods

An area of mixed wetland hardwoods occurs to the east of CR3; this area is designated for additional construction laydown and parking. Canopy species present in the wetland include ash, red maple, cabbage palm, American elm, swamp bay (*Persea palustris*), red cedar, dahoon holly (*Ilex cassine*), coastal plain willow, and live oak (*Quercus virginiana*). Understory species present include sawgrass, swamp lily (*Crinum americanum*), greenbriar (*Smilax* spp.), cattail, lizard's tail (*Saururus cernuus*), marsh pennywort (*Hydrocotyle umbellata*), poison ivy, and leather fern (*Acrostichum danaeifolium*). Shrub species present include coastal plain willow, buttonbush, wax myrtle, Walter's viburnum (*Viburnum obovatum*), and swamp dogwood (*Cornus foemina*).

#### Vegetative Communities Adjacent to the Project Area

The vegetative communities adjacent to the project area were classified during field reconnaissance conducted in 2006 and 2007.

#### 831 - Electrical Power Facilities

Portions of the CREC are located outside of the defined project area.

#### 832 - Transmission Lines

Two sets of 230 kV and 500 kV transmission lines enter the CREC.

#### 190 - Open Land

There are large areas of open filled land within the CREC adjacent to the project area that are covered in grasses. Grasses that dominate this habitat include Bermuda grass (*Cynodon dactylon*) and bahia grass (*Paspalum notatum*).



#### *641 - Freshwater Marsh*

Freshwater marshes are common in the area. Dominant species in these areas include torpedo grass (*Panicum repens*), maidencane (*Panicum hemitomon*), arrowhead (*Sagittaria lancifolia*), cattails, sawgrass, buttonbush, lizard's tail, bushy broomsedge (*Andropogon virginicus*), and coastal plain willow. Other species present include marsh pennywort, smartweed, blue flag iris (*Iris virginica*), and leather fern. Some freshwater marsh areas are located within the transmission line corridors and are impacted by transmission line maintenance activities.

#### *642 - Saltwater Marsh*

Saltwater marsh habitat is abundant to the west of CREC adjacent to Crystal Bay. Dominant species include black needlerush with a sparse canopy of cabbage palm and occasional red cedar, marsh elder, as described previously.

#### *630 - Wetland Forested Mixed*

These are communities in which neither hardwoods nor conifers achieve a 66 percent dominance of the crown canopy composition. Canopy species present in these areas include cabbage palm, red cedar, slash pine (*Pinus elliottii*), red maple, laurel oak, water oak (*Quercus nigra*), green ash, American elm, swamp bay, red bay (*Persea borbonia*), dahoon holly, and willow. Common understory species include wax myrtle, blueberry (*Vaccinium* sp.), Virginia creeper (*Parthenocissus quinquefolia*), greenbrier, and poison ivy.

#### *510 - Canals*

The intake and discharge canals for the CREC are located just outside of the project area. The banks of these areas are actively mowed and maintained.

#### Terrestrial Systems – Fauna

Wildlife habitat in the project area has been significantly altered by the construction and operation of the existing power facility. Only a very small amount of native habitat is present within the project area. The majority of the site contains structures related to power generation, or is cleared, grassed and periodically mowed. As a result of these extensive habitat alterations, most of the project area provides poor wildlife habitat.

Wildlife utilization of the project area is expected to be minimal. Species tolerant of urbanization and human interaction were observed during the site reconnaissance conducted on April 12, 2007, including common ground doves (*Columbina passerina*) and common grackles (*Quiscalus quiscula*). One wading bird, a snowy egret (*Egretta thula*), was observed in a forested wetland area (FLUCFCS 617). Wading birds may occasionally use wetlands within and adjacent to the project area. Common wading birds that may utilize these areas include the great blue heron (*Ardea herodias*), little blue heron (*Ardea caerulea*), great egret (*Casmerodius albus*), snowy egret (*Egretta thula*), and white ibis (*Eudocimus albus*).

Non-listed wildlife either directly observed, observed through tracks, scat, and/or burrows, or likely to occur in areas adjacent to the project area based upon habitat present include but are not limited to bobwhite quail (*Colinus virginianus*), raccoon (*Procyon lotor*), armadillo (*Dasypus novemcinctus*), white tailed deer (*Odocoileus virginianus*), grey squirrel (*Sciurus carolinensis*), eastern cottontail (*Sylvilagus floridanus*), red-shouldered hawk (*Buteo lineatus*), red-tailed hawk (*Buteo jamaicensis*), mourning dove (*Zenaidura macroura*), rufous-sided towhee (*Pipilo erythrophthalmus*), cardinal (*Cardinalis cardinalis*), barred owl (*Strix varia*), leopard frog (*Rana sphenoccephala*), water moccasin (*Agkistrodon piscivorus*), and black racer (*Coluber constrictor*).

Gopher tortoises (*Gopherus polyphemus*) are known to occur within the CREC property outside of the project area in upland areas adjacent to the existing rail line. Gopher tortoises are currently listed as a species of special concern by the Florida Fish and Wildlife Conservation Commission (FWC), but are proposed for uplisting to threatened upon approval of a management plan. Several species are known to utilize gopher tortoise burrows including the federally threatened Eastern indigo snake (*Drymarchon corais couperi*) and two state species of special concern, the gopher frog (*Rana capito*) and the Florida mouse (*Peromyscus floridanus*).

#### Aquatic Systems

The aquatic systems in the vicinity of the CREC consist of the cooling water intake and discharge canals, Crystal Bay, Crystal River, and the Withlacoochee River. The two most comprehensive sources of information on the aquatic resources of the CR3 area are the Final Environmental Statement related to the proposed CR3 (AEC 1973) and the CR 1, 2, and 3 316 (a) and (b) Demonstration (SWEC 1985). These historical documents contain useful information on the oceanography (bathymetry, currents, tides, water quality) and marine/estuarine communities of the

Crystal Bay area. PEF has supplemented this historical information with information from state and federal resource agency websites.

#### Cooling Water Intake and Discharge Canals

Water for cooling is withdrawn from a canal that leads to Crystal Bay. Heated cooling water is discharge into a separate canal that also leads to Crystal Bay.

#### Crystal Bay

Crystal Bay is a shallow embayment of the Gulf of Mexico. As far out as Fisherman's Pass, approximately three miles west of the site, the depth of the bay is less than 10 ft (SWEC 1985). Shallow inshore areas are characterized by oyster bars oriented parallel to shore that are visible at low tide and covered by water at high tide. These oyster bars, composed mostly of broken shell, create numerous small basins with north-south orientation in the area of the intake and discharge canals.

#### The Crystal and Withlacoochee Rivers

CREC is midway between the Withlacoochee and Crystal Rivers, and approximately four miles from each. The Withlacoochee River, with a watershed of 2,100 square miles, has an annual average flow of approximately 447 cfs at the Ingles Dam (USGS Station #02313230, period of record 1969-2006). Crystal River, with a much smaller watershed, has an annual average flow of approximately 975 cfs (USGS Station #02310750, period of record 1964-1977).

Salinity in the area of the plant ranges from 22 to 29 parts per thousand (ppt), depending on freshwater inflows to Crystal Bay from rivers and creeks in the area (AEC 1973). Eight to ten miles offshore, in the Gulf of Mexico, the salinity is more typical of open ocean waters; approximately 35 ppt. Water temperatures in the area are lowest in December-January and highest in late summer (July-September). Temperatures as high as 92°F were measured in the general area of the plant (Cedar Keys) prior to CR3 operation, but more typically average in the mid-to-high 80s in late summer (AEC 1973). Water temperatures in mid-winter can approach 40°F in shallow areas, but are generally in the 50s (AEC 1973).

#### *Shoreline Marshlands*

A well-developed 0.5 to 1.0 mile-wide band of marshland extends along the coast in the Crystal River area, separating the uplands to the east from the Gulf of Mexico. The marshlands are drained by

numerous small creeks and are typical of those found near this part of the Gulf Coast, with soft rushes (*Juncus* spp.) and cordgrasses (*Spartina* spp.) the dominant marshland plants. The marshlands and associated creeks provide habitat for a variety of invertebrate organisms, including oysters and crabs, and are nursery areas for finfish including mullet, spot, black drum, red drum, and croaker (AEC 1973). They also support alligators, wading birds, waterfowl, and small mammals, including river otters and raccoons.

### *Seagrasses*

Five species of seagrass were found in shallow water adjacent to CREC prior to plant startup (AEC 1973). Three species were most abundant: shoal grass (*Halodule wrightii*), widgeon grass (*Ruppia maritima*), and turtle grass (*Thalassia testudinum*). Manatee grass (*Syringodium filiforme*) and star-grass (*Halophila engelmanni*) were also present. Seagrass beds often contained dense assemblages of rooted green algae, primarily *Caulerpa* spp. Limestone outcroppings were colonized by rockweeds, such as Sargassum.

The same five seagrass species were observed by biologists conducting studies in the Crystal Bay area in support of the Crystal River Clean Water Act Section 316 Demonstration in 1983-1984 (SWEC 1985). These operational surveys confirmed what studies in the 1970s had suggested - that the heated effluent from the plant influenced seagrass abundance and distribution in the immediate area of the discharge (SWEC 1985). In 1983-1984, shoalgrass was the only seagrass species observed northwest of the plant's discharge canal, the area most affected by the plant's heated discharge (SWEC 1985). Shoal grass often colonizes areas where other more sensitive seagrasses cannot grow (FOCC 2003) and can withstand the widest range of temperatures and salinities (FKNMS 2001).

Biomass of the three dominant seagrasses (*Thalassia*, *Halodule*, and *Syringodium*) was also lower in the discharge area than the area south of the intake canal outside of the plant's thermal influence (SWEC 1985). Studies conducted in the late 1970s showed the same general trends with respect to biomass, but looked at combined biomass of all seagrass species rather than individual species.

### *Benthic Invertebrates*

Preoperational surveys of marine benthos at the CREC identified 286 species, including Atlantic Coast and West Indian species. Most of these were widely distributed forms capable of withstanding a wide variation of environmental conditions, such as fluctuating temperature and salinity. Thirty

mollusks were characterized as “common” or “abundant,” including 22 marine gastropods (snails) and 8 marine pelecypods (bivalves). The following mollusks were described as “abundant” in the vicinity of the CREC: variable bittium (*Bittium varium*), semiplicate doveshell (*Anachis semiplicata*), lunar doveshell (*Mitrella lunata*), common eastern nassa (*Nassarius vibex*), scorched mussel (*Brachidontes exustus*), lateral musculus (*Musculus lateralis*), and Eastern oyster (*Crassostrea virginica*). Other important groups found were six families of Polychaetes, four species of Isopods, and eight species of Decapods, including pink shrimp (*Farfantepenaeus duorarum*).

### *Fisheries*

The Final Environmental Statement (FES) for CR3 lists 64 finfish species and 6 shellfish species commonly found in the Crystal River area that are either commercially/recreationally important or important as “food chain species” (AEC 1973). The four finfish species collected most often in pre-operational (1969-1970) surveys were silver perch (*Bairdiella chrysoura*), spot (*Leiostomus xanthurus*), pigfish (*Orthopristis chrysoptera*), and pinfish (*Lagodon rhomboides*). American oyster (*Crassostrea virginica*), blue crab (*Callinectes sapidus*), stone crab (*Menippe spp.*), and pink shrimp were the most important shellfish. The FES contains useful information on spawning periods and food habits of important species, including species sought by recreational anglers, e.g., spot, Atlantic croaker (*Micropogonias undulatus*), spotted seatrout (*Cynoscion nebulosus*); forage species, e.g., striped mullet (*Mugil cephalus*); and commercial species, e.g., blue crab and pink shrimp.

Trawls captured 98 species of fish and 108 species of invertebrates in the general vicinity of the plant (SWEC 1985). Catch varied by season, with highest numbers in the spring and summer (April through August) and lowest numbers in January and February. Although there was considerable variability in the data, some trends were apparent. Lowest densities of fish and invertebrates were observed along the central transect, the area most affected by the plant’s heated discharge. Transects to the north and south had similar densities of fish, and were both higher than the central transect. Highest numbers of fish were collected at the northern transects in 1983 and the southern transects in 1984.

With regard to important species, spot were present year-round and were captured in highest numbers at northern transects. Pigfish were collected primarily in spring and summer, but were found in greater concentrations at southern transects. Pinfish were collected mostly in spring and summer, but were collected in substantial numbers at both northern and southern transects.

Seine collections in 1983-1984 produced 49 species of fish and 15 invertebrate species (SWEC 1985). Fish captured in significant numbers were usually juveniles of schooling species, such as spot and bay anchovy (*Anchoa mitchilli*). Highest densities were generally observed in June and July and lowest densities were normally observed in fall, winter, and spring. Large numbers of spot, clupeids (Clupeidae), and anchovies were sometimes captured during these "slow" periods as schools of these small fish moved into nearshore shallows where they were more vulnerable to capture by seiners.

Creek trawls collected 43 species of fish and 27 species of invertebrates. The largest numbers of fish were collected from January through May with the peak in March (SWEC 1985). Juveniles dominated all creek samples. Fish biomass was highest in the spring, with a secondary peak in November. Invertebrate numbers were highest from November through March. Fish and invertebrate were found in highest densities at a creek north of the discharge canal. They were found in lowest densities at a creek north of the discharge canal and a creek south of the intake canal.

#### *Commercial and Recreational Fishing in the CR3 Area*

The FES observed that the shallow waters and numerous oyster bars in the area of the CR3 site make commercial fishing infeasible (AEC 1973). It noted that the marshy shoreline and lack of marinas or landings in the area limited sport fishing opportunities to some degree, but fishing from small boats appeared to be increasing in popularity (AEC 1973). The FES listed red drum (*Sciaenops ocellatus*), spotted seatrout, sheepshead (*Archosargus probatocephalus*), black drum (*Pogonias cromis*), jack crevalle (*Caranx hippos*), and croaker as species sought by anglers in the plant's intake and discharge canals. The CWA Section 316 Demonstration for CR 1, 2, and 3 was concerned exclusively with assessing potential impacts of the plant's cooling water intake structures and thermal discharge. The authors of the report did not survey recreational anglers or fishing guides in the area, focusing instead on data that was verifiable and amenable to statistical analysis.

#### Threatened and Endangered Species – Flora and Fauna

Species in this category consist of plants and animals designated by the U.S. Fish and Wildlife Service (USFWS) as endangered, threatened, or under review for listing; animal species designated by the FWC as endangered, threatened, or species of special concern; and plant species designated by the Florida Department of Agriculture and Consumer Services (FDACS) as endangered, threatened, or commercially exploited

### *Flora*

Table 2.3.5-1 details the state and federally listed plant and animal species of Citrus County. No suitable habitat for listed plant species is located within the project area. Native vegetation was cleared during construction of the existing plant facilities. The probability of listed species occurring in the Project area is extremely low.

### *Fauna*

The project area offers very poor habitat for wildlife. However, several state and federally listed wading birds may forage in the freshwater marsh areas located within the project area. Also, the federally listed Florida manatee and several species of sea turtles are known to utilize the intake and discharge canals immediately adjacent to the project area. Those species with a moderate or high probability of occurrence in or near the project area are discussed below.

### Birds

#### *Bald eagle*

The bald eagle (*Haliaeetus leucocephalus*) is listed as threatened by the USFWS and the FWC. Bald eagles nest throughout the United States and occur in a wide variety of habitats, but proximity of their nests to water (as foraging habitat) is important (Stalmaster 1987). Preferred nesting habitat includes a high amount of water-to-land edge where their aquatic prey is concentrated. Thus, bald eagles are generally restricted to coastal areas, lakes, and rivers. They prey on fish and other aquatic prey near the surface but will eat dead fish or other carrion, as well as birds, mammals, and occasionally reptiles. Some bald eagles in the southern U.S. migrate northward in mid-summer (after the nesting season) and return in early autumn, but some bald eagles in Florida are non-migratory (Stalmaster 1987, CRC 2006).

In 1999, nearly one thousand active eagle nests were recorded in Florida (FNAI 2001). Bald eagles breed throughout most of peninsular Florida and the Keys. One bald eagle nest (nest ID CI013) has been documented on the CREC and another nest (nest ID CI004) has been confirmed slightly north of the CREC (FWC 2006). The on-site nest is in the southeast corner of the CREC, approximately 1.9 miles from CR3. The off-site nest is approximately 1.2 miles northwest of CR3. According to the FWC bald eagle nest location database, both nests were active during all years from 2001-2005 (FWC 2006). Bald eagles are occasionally observed flying and foraging along Crystal Bay and at the CREC (CRC 2006).

*Wood stork*

The wood stork (*Mycteria americana*) is listed as endangered by the USFWS and the FWC. Wood stork habitats include cypress/gum ponds, river swamps, marshes (freshwater and saltwater), and bays. The wood stork is highly gregarious in its nesting and feeding behavior. They are tactile feeders (vision seldom used to locate or catch prey) and usually forage in shallow water (6 to 20 inches). Small fish are the primary food items, but storks also consume crustaceans, salamanders, tadpoles, and insects. The distance between nesting colonies and feeding areas can range up to 60 miles or more, although the average distance is typically 12 to 15 km (7 to 9 miles) (Ogden 1996, USFWS 1997). FWC considers the "core foraging area" of wood storks to be that area within 30 km (18.6 miles) of the colony (Cox et al. 1994). There are no known stork rookeries on the CREC. It is unlikely that any rookeries exist on the site, since the gregarious behavior of this species would result in numerous sightings. Wood storks are occasionally seen foraging in the percolation ponds at the CREC and they probably forage, at least occasionally, in nearby salt marshes and in suitable wetlands in or near the transmission corridors (CRC 2006).

*Snowy egret*

The snowy egret (*Egretta thula*) is listed as a species of special concern by the FWC. The snowy egret feeds in many types of permanently and seasonally flooded wetlands, streams, lakes, and swamps, and in manmade impoundments and ditches. This species is associated with wetlands and may forage in freshwater marsh areas within the project area. One snowy egret was observed in a forested wetland area (FLUCFCS 617) during the site reconnaissance conducted on April 12, 2007.

*Tricolored heron*

The tricolored heron (*Egretta tricolor*) is listed as a species of special concern by the FWC. Tricolored herons feed in a variety of permanently and seasonally flooded wetlands, mangrove swamps, tidal creeks, ditches, and edges of ponds and lakes. This species is associated with wetlands and may forage in freshwater marsh areas within the project area.

*Little blue heron*

The little blue heron (*Egretta caerulea*) is listed as a species of special concern by the FWC. Little blue herons feed in shallow freshwater, brackish, and saltwater habitats. This species is associated with wetlands and may forage in freshwater marsh areas within the project area.



### *White ibis*

The white ibis (*Eudocimis albus*) is listed as a species of special concern by the FWC. The 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 man-made ditches. This species is associated with wetlands and may forage in freshwater marsh areas within the project area.

### Reptiles

#### *Sea Turtles*

Sea turtles are sometimes seen in the CREC's intake canal and are occasionally found on the CR3 intake bar racks. From 1994 to 1997, eight sea turtles were stranded on the CR3 intake bar racks. However, monitoring for sea turtles prior to 1997 was non-systematic, and data on species, size, and age was not always obtained.

In the spring of 1998, an unusually high number, approximately 50, of Kemp's ridley sea turtles (*Lepiochelys kempii*) were stranded on the bar racks. As a result, a Biological Opinion was issued by the National Marine Fisheries Service in 1999 which determined that the cooling water intake system was not likely to jeopardize the existence of the five sea turtle species that might be found in the area. A second Biological Opinion, issued by the National Marine Fisheries Service in 2002, stated that continued operation of CR3 would not jeopardize any of the listed sea turtle species populations (Appendix 10.4.4). This Opinion included an Incidental Take Statement allowing the live take of 75 sea turtles annually and three annual lethal takes that are causally related to plant operations (NMFS 2002). There is no limit on non-causally related dead turtles, although there is a reporting requirement if the non-causal take reaches eight individuals (NMFS 2002).

In 1998, a continuous monitoring and rescue program was initiated by Progress Energy: (then dba Florida Power Corporation) to reduce potential sea turtle strandings and mortalities at CR3. PEF implemented Sea Turtle Rescue and Handling Guidance, which provides instructions for sea turtle observation, rescue, handling, notifications, and reporting requirements (Progress Energy undated).

Five species of sea turtles have been recorded in nearshore waters of Citrus County and are discussed below. Four of these sea turtle species have been observed at or near CR3: Kemp's ridley, green (*Chelonia mydas*), loggerhead (*Caretta caretta*), and hawksbill (*Eretmochelys imbricata*).

The Kemp's ridley sea turtle is federally and state listed as endangered. It is the most seriously endangered of the sea turtles, with nesting primarily limited to two provinces in Mexico. It does not nest in Florida. This species is associated with a wide range of coastal benthic habitats, typically with sand or mud bottoms supporting crustaceans and/or other invertebrates. They primarily feed on portunid crabs (*Callinectes spp.*), but other crabs, mollusks and invertebrates are consumed as well. Nearshore waters of the northern Gulf of Mexico provide important developmental habitat for juvenile and sub-adult Kemp's ridley sea turtles (USFWS 2006). The most frequently occurring captured, killed, and rescued sea turtles in the CR3 cooling water intake areas are sub-adult Kemp's ridleys, which reflects their abundance within the nearshore waters of the northern Gulf coast.

The green sea turtle is federally and state listed as endangered. Most green turtle nesting in Florida occurs during June through September. They require open gradually sloping beaches and minimum disturbance for nesting. Critical habitats have been defined for this species, but do not include areas in Florida. Green sea turtles are herbivores, preferring to feed on marine grasses and algae in shallow bays and lagoons (USFWS 2006).

The loggerhead sea turtle is federally and state listed as threatened. In the U.S. loggerheads nest from Texas to Virginia with approximately 80 percent of the nesting occurring in southern Florida coastal counties. They nest on ocean beaches and occasionally on estuarine shorelines with suitable sand. No Critical Habitat has been defined for this species. The nearshore waters of the Gulf of Mexico are thought to provide important developmental areas for juvenile loggerheads (USFWS 2006).

The hawksbill sea turtle is federally and state listed as endangered. In contrast to other sea turtles, hawksbills tend to nest in low densities on scattered small beaches. Nesting may occur on almost any undisturbed deep-sand beach, typically from April through November. Critical Habitats have been defined for this species, but do not include areas in Florida. Hawksbills prefer coral reefs and thus are uncommon in western Gulf waters (USFWS 2006).

The leatherback sea turtle is federally and state listed as endangered. The largest and most pelagic of the sea turtles, its decline was a result of a crash of the breeding population in western Mexico due to harvest for meat and eggs. Small numbers nest in along the east coast of Florida, but none on the western Florida coast. Critical Habitats have been defined for this species, but do not include areas in Florida. They feed primarily on jellyfish and thus may come into shallow waters if there is an

abundance of jellyfish nearshore (USFWS 2006). Although leatherbacks have been observed in Citrus County waters, none have been observed at the CREC.

#### *American Alligator*

The American alligator (*Alligator mississippiensis*) is common throughout Florida. The alligator is federally listed as “threatened due to similarity in appearance” to the endangered American crocodile (*Crocodylus acutus*), and is state-listed as a species of special concern. Alligator habitat consists of swamps, marshes, ponds, lakes, and slow-moving streams and rivers. Alligators are opportunistic feeders and eat fish, turtles, birds, snakes, frogs, insects, and small mammals (Mount 1975). Alligators are occasionally seen in swampy areas at CREC and undoubtedly occur in wetlands, ponds, and streams along the transmission corridors.

#### Mammals

##### *West Indies (Florida) Manatee*

An adult Florida manatee (*Trichechus manatus latirostris*) averages about 10 ft in length and 2,200 pounds in weight. The manatee is an aquatic mammal that feeds primarily on seagrass and other aquatic vegetation. In the winter, the Florida manatee spends most of its time in and around areas of warm water, such as natural springs or the cooling water discharge of power plants. It has been reported that the warm-water refuge of power plants is becoming more important for the Florida manatee; for example, the percentage of animals using these areas on the Atlantic coast has increased by 4-6 percent per year since 1994 (Craig and Reynolds 2004). Crystal River is the northernmost natural, warm-water refuge used by manatees on the west coast of Florida (USFWS 2001).

A major threat to manatees is collisions with watercraft (USFWS 2001). Restricted recreational boat access to the Crystal River intake and discharge canal enhances this area for manatee survival by reducing the chance of boat/manatee collisions (CCCD 2006). PEF has also established a Manatee Protection Plan that has been approved by the Florida Department of Environmental Protection (FDEP 2002). The plan establishes various precautions to minimize hazards to manatees at intake and outfall areas, such as having observers on board vessels associated with in-water work, operating vessels at “no wake/idle” speeds while in the warm water refuge area, and avoiding major inwater work in the discharge canal from November 15 through March 31 unless approved by FWC’s Bureau of Protected Species Management. PEF cooperates with USFWS, FWC, Florida Fish & Wildlife Research Institute, and the U.S. Geological Service in providing access to CR3 for manatee research and monitoring by these agencies.

The Florida manatee population is divided into four sub-populations (Figure 2.3.6-1). The sub-population of northwest Florida (including Crystal River) accounts for approximately 11 percent of the total population (FWC 2006). The northwest subpopulation has grown at an annual rate of 3.7 percent over the 10 years prior to 2001 (Runge et al. 2004), possibly due to high adult survival rate of manatees in this region (FWC 2006). Synoptic aerial manatee surveys conducted in January 2001 reported preliminary data of 3300 manatees living in Florida waters, with a total of 377 manatees in the northwest region (FWC 2006).

The Florida manatee is currently listed as Endangered by the State of Florida and the U.S. Fish and Wildlife Service (USFWS 2001). They are protected not only by the Federal Endangered Species Act, but also by the Federal Marine Mammal Protection Act and the Florida Manatee Sanctuary Act. In addition, Citrus County has a federal and state approved manatee protection plan as guidance for coastal development (CCCD 2006).

In August of 2001, the Florida Fish and Wildlife Conservation Commission (FWC) was petitioned to re-evaluate the status of the Florida manatee (FMRI 2002). The 2005-2006 FWC Florida Manatee Biological Review Panel has recommended that the Florida manatee should be listed as Threatened for the State of Florida (FWC 2006). Currently, the FWC is proceeding with the final phase of re-classification and is drafting a new management plan for the species.

#### *2.3.6.2 Pre-Existing Stresses*

##### Terrestrial Systems

The greatest pre-existing stress to the terrestrial systems located within and around the site is the result of the existing electric utility facilities. The natural topography, soils, and hydrology of the Site have been altered to accommodate the existing units.

##### Aquatic Systems

The greatest pre-existing stress to the aquatic systems located within and around the Site is the result of the existing electric utility facilities. Water is withdrawn for cooling from Crystal Bay through an intake canal, causing the impingement or entrainment of aquatic organisms. Heated cooling water is discharged to Crystal Bay through a discharge channel.

### 2.3.6.3 *Measurement Programs*

#### Terrestrial Ecology

Terrestrial ecological resources were evaluated through a combination of literature review, site reconnaissance, and previous studies. Vegetative communities, wildlife utilization, and potential for threatened and endangered wildlife occurrence were addressed during the site reconnaissance conducted in April 2007.

#### Aquatic Ecology

Aquatic ecological resources were evaluated through a combination of literature review, site reconnaissance, and previous studies. The two most comprehensive sources of information on the aquatic resources of the CR3 area are the FES related to the proposed CR3 (AEC 1973) and the CR 1, 2, and 3 Clean Water Act Section 316 Demonstration (SWEC 1985). Although two and three decades old, respectively, these documents contain useful information on the oceanography (bathymetry, currents, tides, water quality) and marine/estuarine communities of the Crystal Bay area.

### 2.3.7 Meteorological and Ambient Air Quality

#### 2.3.7.1 Meteorology

Meteorological data collected at existing monitoring stations were used to describe the local and regional climatology in the vicinity of the CREC. The closest existing meteorological station to the plant with complete data is the National Weather Service (NWS) station located at the Tampa International Airport, situated approximately 110 km south of CR3. The NWS has recorded weather observations for more than 50 years at this site. These data are the most complete for, and representative of, the region surrounding the CR3. FDEP has approved the use of these meteorological data in previous air permit applications for this area and recommended that these data be used for the CR3 Uprate Project.

The climate in the plant area is subtropical with a marine influence from the Gulf of Mexico. The NWS station is located approximately 17 miles from the Gulf. The monthly and annual average temperatures for this area are presented in Table 2.3.7-1. The annual average temperature is approximately 73 °F with the average monthly daily extreme temperatures varying from a maximum of 90 °F to a minimum of 52.4 °F. Record extreme temperatures range from a low of 18 °F to a record high of 99 °F. During the summertime, temperatures rarely exceed 99 °F due to the high

relative humidities with subsequent cloud cover formation and the abundant convective-type (e.g., thunderstorms) precipitation.

The monthly and annual average precipitation data are presented in Table 2.3.7-2. Approximately 70 percent of the annual precipitation falls during the six warmest months, May through October. The average annual precipitation is approximately 45 inches, but this has varied from as little as 30 inches to 68 inches in the past 30 years. The majority of rain is in the form of short-lived convection showers (e.g., thunderstorms). Large amounts of rain are also produced during the late summer or fall when tropical storms or hurricanes may pass near the Tampa region. These events may result in heavy downpours that reach torrential proportions; 24-hour amounts of about 12 inches have been associated with hurricanes.

Monthly and annual average relative humidities, which indicate the amount of moisture in the air at a given temperature, are also presented in Table 2.3.7-2 for the morning hours of 1:00 a.m. and 7:00 a.m. and early afternoon and evening hours of 1:00 p.m. and 7:00 p.m. The highest humidities are coincident with the coolest ambient temperatures, which generally occur at 7:00 a.m., or near dawn. The lowest humidities coincide with the highest ambient temperatures.

The project area lies entirely within the trade wind belt (i.e., below 30 °N latitude), resulting in predominant winds from the east. Because of the location of the Gulf of Mexico, moderate to strong late afternoon sea breezes occur on days with strong land heating and produce localized onshore winds to offset the prevailing easterly winds. A wind rose for the five-year period from 2001 through 2005 is given in Figure 2.3.7-1. Seasonal wind roses are presented in Figures 2.3.7-2 through 2.3.7-5. A summary of the seasonal and annual average wind direction and wind speed, including calm conditions, is presented in Table 2.3.7-3. Except during the passage of tropical storms or hurricanes, wind speeds greater than 25 mph in the area are not common.

Atmospheric stability is a measure of the atmosphere's capability to disperse pollutants and potentially reduce ground-level concentrations. During the daytime with strong solar heating, the atmosphere can disperse pollutants very quickly for a relatively short period. This condition is considered unstable and generally occurs more frequently during the summer. During the nighttime, under clear skies and light wind speeds, the atmosphere is considered stable with minimal potential to disperse pollutants. During the day or night, when wind speeds are moderate to high, pollutants are dispersed at moderate rates (i.e., dispersion rates that are lesser than those during unstable conditions

but greater than those during stable conditions). This condition is considered neutral and occurs frequently throughout the year. The seasonal and annual average occurrences of atmospheric stability classes for this area for 1991 to 1995 are shown in Table 2.3.7-4.

During the summer months, unstable conditions occur about 35 percent of the time due to strong solar heating, whereas unstable conditions occurs only 16 percent of the time in the winter months. Neutral stability occurs most frequently during the winter months due to the higher wind speeds that occur in this season. The occurrence of stable conditions is nearly uniform throughout the year.

The mixing height is a parameter used to define the vertical height to which pollutants can disperse and, therefore, is used in estimating the volume of air in which pollutants are emitted and can be dispersed. In general, the higher the mixing height, the greater the potential for pollutants to be dispersed and for ground-level concentrations to be reduced.

The seasonal and annual average morning and afternoon mixing heights for the plant area for 1991 to 1995 were determined using the Holzworth method and are listed in Table 2.3.7-5. These data are obtained from the nearest upper air station closest to the site and located in Ruskin. The highest afternoon mixing heights occur in the spring and the lowest morning mixing heights occur in winter.

Thunderstorms are the most frequent of severe storms, occurring an average of 85 days per year as reported by the NWS at Tampa International Airport. These storms occur throughout the year, but about 73 percent occur from May through October.

Hurricanes and tornadoes are other types of severe weather that can occur in the project area, but the probability of a hurricane or tornado passing over the plant site is low.

Statistics compiled by the severe local storms branch of the national severe storms forecast center (Pautz 1969) show that 42 tornadoes were spotted within the 1 degree latitude by 1 degree longitude square centered just south of the Tampa area from 1955 to 1967. This averages about two tornadoes per year. The tornado recurrence interval for any specific point location within the 1 degree square was estimated by the Methodology of Thom (1963). The recurrence interval,  $r$ , is equal to  $1/p$  where  $p$  is the probability of a tornado striking within the 1 degree square area and is estimated as follows:

$$p = (2.8209 \times t)/A$$

where:  $t$  = mean annual frequency of tornadoes occurring, and

$A$  = area in square mile ( $\text{mi}^2$ )

In this analysis,  $t$  was assumed to be 1.4 based on data collected from 1953 to 1962 and  $A$  was estimated to be 4,200 square miles. Therefore, the mean recurrence interval for a tornado striking a point within this square is more than 1,000 years.

#### 2.3.7.2 *Ambient Air Quality*

##### Ambient Standards

The National and Florida Ambient Air Quality Standards (AAQS) are presented in Table 2.3.7-6. Primary National AAQS were promulgated to protect the public health, and secondary National AAQS were promulgated to protect the public welfare from any known or anticipated adverse effects associated with the presence of pollutants in the ambient air. Areas of the country in violation of AAQS are designated as nonattainment areas, and new sources to be located in or near these areas may be subject to more stringent air permitting requirements. Pollutants for which AAQS have been established are referred to as criteria pollutants. These pollutants include particulate matter (PM) with an aerodynamic particle size of 10 micrometers ( $\mu\text{m}$ ) or less ( $\text{PM}_{10}$ ), sulfur dioxide ( $\text{SO}_2$ ), carbon monoxide (CO), nitrogen dioxide ( $\text{NO}_2$ ), ozone ( $\text{O}_3$ ), and lead (Pb).

Citrus County is classified as an attainment area for all criteria pollutants (Rule 62-204.340, F.A.C.).

On July 18, 1997 the EPA promulgated revisions to the National AAQS for  $\text{O}_3$  and PM) [62 Federal Register (FR) No. 138]. The  $\text{O}_3$  standard was modified to be 0.08 parts per million (ppm) for an eight-hour average concentration. This standard is achieved when the 3-year average concentration of the forth highest value is 0.08 ppm or less. The 1-hour average AAQS will no longer apply to an area 1 year after the effective date of the designation of that area for the 8-hour  $\text{O}_3$  AAQS. The effective date for most areas is June 15, 2004 [Federal Register, April 30, 2004 (69 FR 23996)].

The FDEP has not yet adopted the revised  $\text{O}_3$  or  $\text{PM}_{2.5}$  AAQS. Based on evaluations performed by FDEP and EPA, Citrus County has been designated an attainment area for the revised  $\text{O}_3$  AAQS [Federal Register, April 30, 2004 (69 FR 23996)] as well as an attainment area for the new particulate matter less than 2.5 microns ( $\text{PM}_{2.5}$ ) AAQS [Federal Register, January 5, 2005 (70 FR 944)]. These standards must be implemented in the 2007 to 2008 timeframe with a revision to the State Implementation Plan.



On October 17, 2006, EPA finalized the AAQS for PM (71 FR 61236). The PM AAQS include two new PM<sub>2.5</sub> standards: a short-term 24-hour average standard and an annual average standard. The PM<sub>2.5</sub> standards are based on a 3-year average of the 98<sup>th</sup> percentile of 24-hour average concentrations that must not exceed 35 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) (from population-orientated monitors) and a 3-year average of annual average concentrations that must not exceed 15  $\mu\text{g}/\text{m}^3$  (from a single- or community-orientated monitor). The form of compliance for the annual standard remains in the form of an expected exceedance that must not be exceeded more than once per year averaged over three years.

In promulgating the 1977 Clean Air Act (CAA) Amendments, Congress specified that certain increases above an air quality *baseline concentration* level of SO<sub>2</sub> and PM concentrations would constitute *significant deterioration* for sources located in attainment areas. The magnitudes of the allowable increases, or prevention of significant deterioration (PSD) increments, depend on the classification of the area in which a new source (or modification) will be located or have an impact. Three PSD increment classifications were designated based on criteria established in the 1977 CAA amendments. Initially, Congress promulgated areas as either Class I (national parks, national wilderness areas, and memorial parks larger than 5,000 acres, and national parks larger than 6,000 acres) or as Class II (all areas not designated as Class I). No Class III areas, which would be allowed greater deterioration than Class II areas, were designated. EPA then promulgated as regulations the requirements for classifications and area designations.

On October 17, 1988, EPA promulgated regulations to prevent significant deterioration due to nitrogen oxide (NO<sub>x</sub>) emissions and established PSD increments for NO<sub>2</sub> concentrations. The EPA class designations and allowable PSD increments are presented in Table 2.3.7-6. Florida has adopted the EPA allowable increments for PM<sub>10</sub>, SO<sub>2</sub>, and NO<sub>2</sub>.

Citrus County is classified as a Class II area (Rule 62-204.340, F.A.C.) since it is an attainment area for all pollutants. The nearest Class I area to the plant is the Chassahowitzka National Wilderness Area (NWA) located about 22 km (13 miles) to the south. In addition, the St. Marks NWA is located about 175 km to the northwest of the site.

#### Ambient Air Quality Data

The CREC is located in a rural area of Citrus County, which has a minimal number of air pollution sources. Air monitoring data are not collected in the county. However, monitoring data are collected

in nearby counties for SO<sub>2</sub>, PM<sub>10</sub>, O<sub>3</sub>, and NO<sub>2</sub>. Summaries of the maximum pollutant concentrations measured in Pinellas and Marion Counties from 2003 through 2005 are presented in Table 2.3.7-7. These data indicate that the maximum air quality concentrations measured in the region are well below applicable standards.

Given the lack of industrial development in the vicinity of the plant, existing concentrations of other criteria pollutants, i.e., CO and Pb, which are usually associated with an urban environment, are expected to be well below the AAQS.

#### *2.3.7.3 Measurement Programs*

All information (i.e., meteorology and air quality data) was compiled from offsite monitoring stations maintained and operated by the FDEP, Pinellas County, Marion County, or cooperating governmental agencies (i.e., NWS). No significant changes in these programs are anticipated after the construction and operation of the Project.

Meteorological data were obtained from the NWS surface and upper-air station at the Tampa International Airport. These data were obtained for the five-year periods from 2001 through 2005 from which the joint frequency of wind direction and wind speed were developed, and from 1991 through 1995 from which the atmospheric stability and a five-year average of mixing heights were developed. The wind sensors at the Tampa International Airport have been located 22 ft above grade. Regular surface observations are taken just before each hour, seven days per week. Upper-air soundings are conducted twice per day at 0700 and 1900 Eastern Standard Time at Ruskin.

#### *2.3.8 Noise*

##### *2.3.8.1 Background*

In 2005, the county commissioners enacted ordinance No. 2005-05 which can be found in Chapter 21, Article II of the Code of Ordinances for the County of Citrus Florida. The intent of this ordinance is to protect the health, safety, and welfare, and to protect the aesthetic and property values of properties within unincorporated Citrus County by providing for abatement of excessive and unnecessary noise.

Receiving Land Use Category	Time	Sound Limit (dBA)	Level
Residential	7 a.m. — 10 p.m.	60	
	10 p.m. — 7 a.m.	55	
Governmental-owned building or property, institutional or recreational	7 a.m. — 10 p.m.	55	
	10 p.m. — 7 a.m.	50	
Commercial or business	7 a.m. — 10 p.m.	65	
	10 p.m. — 7 a.m.	60	
Industrial or manufacturing	At all times	75	
Agricultural	At all times	75	

As defined in the ordinance, the noise from any activity or from any permissible use of property within the applicable land use district classifications of Citrus County shall be deemed a violation if the total noise level as measured on the A-scale due to both ambient noise, and the alleged source of the offensive noise, exceeds the noise levels which are prescribed in the above table, the measurement of which is based upon decibels. All such measurements as well as the method employed shall be consistent with section 21-17 of Chapter 21, Article II of the Code of Ordinances, and shall represent the A-weighted sound pressure level which is exceeded ten percent of the time ( $L_{10}$ ) during the observation period.

#### 2.3.8.2 Noise Measurement Procedures

A comprehensive ambient noise monitoring program was performed at seven locations at or near the CR3 Uprate Project (Figure 2.3.8-1). The equipment used to monitor the baseline noise levels operated in the slow response mode to obtain accurate, integrated, A-weighted sound pressure levels. A windscreen was used because all measurements were taken outdoors. The microphone was positioned so that a random incidence response, as specified by the American National Standard Institute (ANSI), was achieved. The sound level meter and octave band analyzer were calibrated immediately prior to and just after the sampling period to provide a quality control check of the sound level meter's operation during monitoring.

Integrated sound pressure level (SPL) data consisting of the following noise parameters were collected at each location:

$L_{eq}$  The sound pressure level averaged over the measurement period; this parameter is the continuous steady sound pressure level that would have the same total acoustic energy as the real fluctuating noise over the same time period;

Max The maximum sound pressure level for the sampling period, and;

Min The minimum sound pressure level for the sampling period.

$L_n$  The sound pressure levels which were exceeded  $n\%$  of the time during sampling period.

The SPL data were analyzed and reported in both decibels (dB) and A-weighted decibels (dBA). The higher the decibel value, the louder the sound. The SPL averages were calculated using the following formula:

$$\text{Average SPL} = 10 \log \frac{\sum_{i=1}^N 10^{(\text{SPL}_i/10)}}{N}$$

where:  $N$  = number of observations.

$\text{SPL}_i$  = individual sound pressure level in data set.

Monitoring was conducted using the sound level meter mounted on a tripod at a height of 1.5 m (5 ft) abovegrade. Local meteorological conditions were measured during the monitoring periods. Detailed field notes were recorded by the operator during monitoring and including major noise sources in the area.

The SPLs and octave band data were collected at the monitoring locations, for a minimum of 10 continuous minutes, using measurement techniques set forth by ANSI S12.9-1993/Part 3 (ANSI, 1993).

The noise monitoring equipment used during the study included:

1. Continuous Noise Monitoring Equipment
  - a. Larson Davis Model 824 Precision Integrating Sound Level Meter with Real Time Frequency Analyzer
  - b. Larson Davis Model PRM902 Microphone Preamplifier
  - c. Larson Davis Model 2560 Prepolarized 1/2" Condenser Microphone
  - d. Windscreen, tripod, and various cables
2. Sound Level Meter Calibration Unit
  - a. Larson Davis Model CAL200 Sound Level Calibrator, 94/114 dB at 1,000 Hz.

The Larson Davis sound level meter complies with Type I--Precision requirements set forth for sound level meters and for one-third octave filters. The calibration certificates are provided in Appendix 10.5-1.

Of the seven monitoring locations, four (Sites 1 through 4) were chosen to delineate the laydown and construction areas of the future CR3 Uprate Project. The other three monitoring sites (Sites 5 through 7) were selected to determine the baseline noise levels at property lines.

#### *2.3.8.3 Existing Ambient Sound Pressure Level Conditions*

The daytime and nighttime ambient noise levels for each of the monitoring sites are indicated in Table 2.3.8-1. Since there are no residential communities adjacent to the plant, the commercial sound level limits from the Code of Ordinances for Citrus County were used for comparison. The sound level limits are 65 dBA during the daytime and 60 dBA at night. In accordance with the ordinance, the  $L_{10}$  from each sampling period were used for compliance with the sound level limits.

The highest  $L_{10}$  noise levels measured during the study were 70 dBA at Site 3 during the daytime and 74 dBA at Site 6 during the nighttime. The elevated daytime and nighttime noise levels at Site 3 were due to the constant plant operations in that area. Since the location of Site 3 is not near any boundary, it does not have to comply with any sound level limits. All other daytime noise levels were at or below the 65 dBA limit. The high nighttime noise level at Site 6 was due to a train arriving at the plant. The  $L_{90}$  at this location was 40 dBA which would be more consistent with the nighttime noise levels in the area of Site 6 without the influence of the noise generated by the train. The nighttime noise levels at Sites 5 and 7 were well below the nighttime limit of 60 dBA.

#### *2.3.9 Other Environmental Features*

Several environmental features have been established at the CREC in coordination with state and federal agencies as described below:

The Mariculture Center, a multi-species fish hatchery was established to mitigate fisheries impacts related to the once-through cooling water system at Crystal River Units 1, 2, and 3. The Center has four spawn rooms and eight one-acre ponds. Red drum, spotted seatrout, pink shrimp and striped mullet were the species initially selected for culture. Pigfish, silver fish, blue crab and stone crab were added and cultured at the Center. The Mariculture Center continues to operate to offset the

previously identified fisheries impacts. Approximately 5.18 acres of wetlands were previously established to mitigate wetland impacts associated with the construction of the Mariculture Center and the CR 1, 2, and 3 helper cooling towers.

In 2003, PEF granted permission for the Florida Fish and Wildlife Conservation Commission (FWC) to post signs for the protection of shorebird and sea bird nesting sites in the vicinity of the CREC. The posted areas are on sandbars and spoil islands and was primarily for the protection of nesting least terns, black skimmers and American oystercatchers.

The Crystal River and its headwaters have been designated as Critical Habitat for the Florida Manatee. The Crystal River Critical Habitat is adjacent to the south boundary of the CREC. No other areas designated by the FWC as "Critical Habitat" for endangered species occurs at CR3 or in the vicinity of the CREC.

PEF is currently issuing a conservation easement to FDEP for 90 acres of forested wetlands and tidal marsh associated with Cedar Creek within the CREC site to mitigate for wetland impacts associated with the construction of a new roadway within the CREC.

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October and November 2006).

## **TABLES**

## Overall Emergency Response Organizations and Suborganizations

Organization/Officer	General Location	Specific Location	Classification
CR3 Emergency Organization	On-Site	Crytal River, FL	Corporate
EOF Staff	Off-Site	Crytal River, FL	Corporate
State Warning Point-Tallahassee	Off-Site	Tallahassee, FL	State
Division of Emergency Management	Off-Site	Tallahassee, FL	State
Department of Health, Bureau of Radiation Control	Off-Site	Orlando, FL	State
Division of Florida Highway Patrol, Department of Highway Safety and Motor Vehicles	Off-Site	Crytal River, FL	State
Divison of Road Operations, Department of Transportation	Off-Site	Tallahassee, FL	State
Department of Agriculture & Consumer Services	Off-Site	Tallahassee, FL	State
Division of Forestry and Consumer Services	Off-Site	Tallahassee, FL	State
Division of Law Enforcement, Department of Natural Resources	Off-Site	Tallahassee, FL	State
Fish and Wildlife Conservation Commission	Off-Site	Crytal River, FL	State
Citrus County Emergency Management	Off-Site	Lecanto, FL	County
Citrus County Health Officer	Off-Site	Inverness, FL	County
Citrus County Sheriff	Off-Site	Inverness, FL	County
Citrus County Road Department	Off-Site	Inverness, FL	County
Local Emergency Medical Services	Off-Site	Crytal River, FL	County
Levy County Emergency Management	Off-Site	Bronson, FL	County
Citrus Memorial Hospital	Off-Site	Inverness, FL	Local
Seven Rivers Community Hospital	Off-Site	Crytal River, FL	Local
NRC, Region II	Off-Site	Atlanta, GA	Federal
NRC, Operations Center	Off-Site	Rockville, MD	Federal
Department of Homeland Security Chemical Nuclear Preparedness Protection Division (formely Federal Emergency Management Agency (FEMA)), Region IV	Off-Site	Atlanta, GA	Federal
Institute of Nuclear Power Operations	Off-Site	Atlanta, GA	Private
Nuclear Safety Department, Nuclear Power Division of Electric Power Research Institute	Off-Site	Palo Alto, CA	Private
Framatome Technologies	Off-Site	Lynchburg, VA	Private
Contractors	Off-Site	Various	Private
Radiation Emergency Assistance Center/Training Site	Off-Site	Oak Ridge, TN	Private

## MEAN ANNUAL STREAMFLOW FOR WITHLACOOCHEE AND CRYSTAL RIVERS

Date	Withlacoochee Mean Annual Flow (cfs) <sub>1</sub>	Crystal River Mean Annual Flow (cfs) <sub>2</sub>
1965	NM	979.9
1966	NM	785.4
1967	NM	719.8
1968	NM	839.7
1969	NM	1,149
1970	1,573	1,076
1971	255	798.1
1972	212	594.6
1973	343	956.9
1974	406.6	1,189
1975	95.6	986
1976	139.3	925.1
1977	80.9	1,673
1978	235.3	NM
1979	126.7	NM
1980	397.2	NM
1981	78.8	NM
1982	671.2	NM
1983	1,224	NM
1984	693.4	NM
1985	310.1	NM
1986	344.5	NM
1987	382.6	NM
1988	467.1	NM
1989	311.5	NM
1990	205.5	NM
1991	227.4	NM
1992	122.2	NM
1993	165.6	NM
1994	312.6	NM
1995	741.2	NM
1996	810	NM
1997	123.4	NM
1998	1,645	NM
1999	233.6	NM
2000	134.9	NM
2001	138.4	NM
2002	180.5	NM
2003	1,219	NM
2004	379.4	NM
2005	1,255	NM
2006	305.2	NM

NM = Not measured

1 - USGS Station #02313230 period of record 1969-2006

2 - USGS Station #02310750 period of record 1964-1977

+

June 2007

**TABLE 2.3.4-2  
SURFACE WATER QUALITY, CRYSTAL BAY**

07389531

Parameter	Water Quality Standard <sup>1</sup>	Intake Canal Vicinity <sup>2</sup>					Discharge Canal Vicinity <sup>3</sup>				
		Average	Maximum	Minimum	95th Percentile	Number of Samples	Average	Maximum	Minimum	95th Percentile	Number of Samples
FECAL COLIFORM,A-1 MOD,WATER,44.5C,24HR (MPN/100ML)	<200 monthly ave <400 in 10% <800 on 1 day	3.11	79.00	1.00	13.00	274.00	3.64	33.00	1.00	16.50	74.00
OXYGEN ,DISSOLVED, ANALYSIS BY PROBE (MG/L)	>5.0 24-hr ave, >4.0	8.11	14.30	3.00	11.00	414.00	7.42	11.50	3.20	10.50	125.00
OXYGEN, DISSOLVED, PERCENT OF SATURATION (%)	-	92.90	160.27	36.59	66.33	406.00	89.36	132.00	39.51	54.93	125.00
PH, LAB (SU)	6.5 to 8.5	8.11	8.50	7.50	8.30	173.00	8.01	8.30	7.60	8.20	48.00
SALINITY BASED ON CONDUCTIVITY	-	22.76	36.80	5.80	30.07	490.00	21.59	29.90	5.10	26.99	144.00
TEMPERATURE, WATER (°C)	92°F Max, +2°F AM- Summer 90°F Max, +4°F AM- Remainder	21.77	34.80	6.10	31.00	1171.00	30.43	39.00	11.30	38.00	309.00
TURBIDITY,LAB (NTU)	≤ 29 above background	15.34	80.00	0.00	39.50	171.00	18.55	58.00	0.00	53.40	44.00

Source:

<sup>1</sup> Chapter 62-302, F.A.C.

<sup>2</sup> EPA STORET Station Numbers 21FLA34076SEAS,21FLA34064SEAS, 21FLA34050SEAS, 21FLA34051SEAS, 23010121

<sup>3</sup> EPA STORET Station Numbers 21FLA34069SEAS,21FLA34094SEAS, 23010122



TABLE 2.3.5-1  
FLORIDA NATURAL AREAS INVENTORY  
1018 Thomasville Road, Suite 200-C  
Tallahassee, FL 32303  
(850) 224-8207, FAX (850) 681-9364



January 2004

Citrus County Summary

Page 1

Rare Species and Natural Communities Documented or Reported

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status
<b>AMPHIBIANS</b>					
<i>Notophthalmus perstriatus</i>	Striped Newt	G2G3	S2S3	N	N
<i>Pseudobranchius striatus lustricolus</i>	Gulf Hammock Dwarf Siren	G5T1	S1	N	N
<i>Rana capito</i>	Gopher Frog	G3	S3	N	LS
<b>REPTILES</b>					
<i>Alligator mississippiensis</i>	American Alligator	G5	S4	T(S/A)	LS
<i>Caretta caretta</i>	Loggerhead	G3	S3	LT	LT
<i>Chelonia mydas</i>	Green Turtle	G3	S2	LE	LE
<i>Crotalus adamanteus</i>	Eastern Diamondback Rattlesnake	G4	S3	N	N
<i>Dermochelys coriacea</i>	Leatherback	G2	S2	LE	LE
<i>Drymarchon couperi</i>	Eastern Indigo Snake	G3	S3	N	LT
<i>Eretmochelys imbricata</i>	Hawksbill	G3	S1	LE	LE
<i>Gopherus polyphemus</i>	Gopher Tortoise	G3	S3	N	LS
<i>Lepidochelys kempii</i>	Kemp's Ridley	G1	S1	LE	LE
<i>Nerodia clarkii clarkii</i>	Gulf Salt Marsh Snake	G4T3	S3?	N	N
<i>Pituophis melanoleucus mugitus</i>	Florida Pine Snake	G4T3?	S3	N	LS
<i>Pseudemys concinna suwanniensis</i>	Suwannee Cooter	G5T3	S3	N	LS
<i>Stilosoma extenuatum</i>	Short-tailed Snake	G3	S3	N	LT
<b>BIRDS</b>					
<i>Accipiter cooperii</i>	Cooper's Hawk	G5	S3	N	N
<i>Aimophila aestivalis</i>	Bachman's Sparrow	G3	S3	N	N
<i>Ajaia ajaja</i>	Roseate Spoonbill	G5	S2	N	LS
<i>Ammodramus maritimus peninsulae</i>	Scott's Seaside Sparrow	G4T3	S3	N	LS
<i>Apelocoma coerulescens</i>	Florida Scrub-jay	G2	S2	LT	LT
<i>Aramus guarauna</i>	Limpkin	G5	S3	N	LS
<i>Ardea alba</i>	Great Egret	G5	S4	N	N
<i>Athene cunicularia floridana</i>	Florida Burrowing Owl	G4T3	S3	N	LS
<i>Buteo brachyurus</i>	Short-tailed Hawk	G4G5	S1	N	N
<i>Charadrius melodus</i>	Piping Plover	G3	S2	LT	LT
<i>Cistothorus palustris marianae</i>	Marian's Marsh Wren	G5T3	S3	N	LS
<i>Dendroica discolor paludicola</i>	Florida Prairie Warbler	G5T3	S3	N	N
<i>Egretta caerulea</i>	Little Blue Heron	G5	S4	N	LS
<i>Egretta thula</i>	Snowy Egret	G5	S3	N	LS
<i>Egretta tricolor</i>	Tricolored Heron	G5	S4	N	LS
<i>Elanoides forficatus</i>	Swallow-tailed Kite	G5	S2	N	N
<i>Eudocimus albus</i>	White Ibis	G5	S4	N	LS
<i>Falco columbarius</i>	Merlin	G5	S2	N	N
<i>Falco peregrinus</i>	Peregrine Falcon	G4	S2	N	LE
<i>Falco sparverius paulus</i>	Southeastern American Kestrel	G5T4	S3	N	LT
<i>Fregata magnificens</i>	Magnificent Frigatebird	G5	S1	N	N
<i>Grus canadensis pratensis</i>	Florida Sandhill Crane	G5T2T3	S2S3	N	LT
<i>Haematopus palliatus</i>	American Oystercatcher	G5	S2	N	LS
<i>Haliaeetus leucocephalus</i>	Bald Eagle	G4	S3	LT	LT
<i>Ixobrychus exilis</i>	Least Bittern	G5	S4	N	N
<i>Laterallus jamaicensis</i>	Black Rail	G4	S2	N	N
<i>Mycteria americana</i>	Wood Stork	G4	S2	LE	LE
<i>Nyctanassa violacea</i>	Yellow-crowned Night-heron	G5	S3	N	N
<i>Nycticorax nycticorax</i>	Black-crowned Night-heron	G5	S3	N	N
<i>Pandion haliaetus</i>	Osprey	G5	S3S4	N	LS*
<i>Pelecanus occidentalis</i>	Brown Pelican	G4	S3	N	LS
<i>Picoides borealis</i>	Red-cockaded Woodpecker	G3	S2	LE	LS
<i>Picoides villosus</i>	Hairy Woodpecker	G5	S3	N	N

## Rare Species and Natural Communities Documented or Reported

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status
<b><u>BIRDS</u></b>					
<i>Plegadis falcinellus</i>	Glossy Ibis	G5	S3	N	N
<i>Rallus longirostris scottii</i>	Florida Clapper Rail	G5T3?	S3?	N	N
<i>Rynchops niger</i>	Black Skimmer	G5	S3	N	LS
<i>Sterna antillarum</i>	Least Tern	G4	S3	N	LT
<i>Sterna caspia</i>	Caspian Tern	G5	S2	N	N
<i>Sterna maxima</i>	Royal Tern	G5	S3	N	N
<i>Sterna sandvicensis</i>	Sandwich Tern	G5	S2	N	N
<b><u>MAMMALS</u></b>					
<i>Corynorhinus rafinesquii</i>	Rafinesque's Big-eared Bat	G3G4	S2	N	N
<i>Mustela frenata peninsulæ</i>	Florida Long-tailed Weasel	G5T3	S3	N	N
<i>Mustela vison hallimnetes</i>	Gulf Salt Marsh Mink	G5T3	S3	N	N
<i>Myotis austroriparius</i>	Southeastern Bat	G3G4	S3	N	N
<i>Neofiber alleni</i>	Round-tailed Muskrat	G3	S3	N	N
<i>Podomys floridanus</i>	Florida Mouse	G3	S3	N	LS
<i>Puma concolor coryi</i>	Florida Panther	G5T1	S1	LE	LE
<i>Sciurus niger shermani</i>	Sherman's Fox Squirrel	G5T3	S3	N	LS
<i>Sorex longirostris eionis</i>	Homosassa Shrew	G5T3	S3	N	LS
<i>Trichechus manatus</i>	Manatee	G2	S2	LE	LE
<i>Ursus americanus floridanus</i>	Florida Black Bear	G5T2	S2	N	LT*
<b><u>INVERTEBRATES</u></b>					
<i>Cincinnatia helicogyra</i>	Helicoid Spring Siltsnail	G1	S1	N	N
<i>Crangonyx hobbsi</i>	Hobbs' Cave Amphipod	G2G3	S2S3	N	N
<i>Procambarus lucifugus</i>	Light-fleeing Cave Crayfish	G2G3	S2S3	N	N
<i>Troglocambarus maclanei</i>	North Florida Spider Cave Crayfish	G2G3	S2	N	N
<b><u>PLANTS</u></b>					
<i>Adiantum tenerum</i>	Brittle Maidenhair Fern	G5	S3	N	LE
<i>Agrimonia incisa</i>	Incised Groove-bur	G3	S2	N	LE
<i>Asplenium pumilum</i>	Dwarf Spleenwort	G5	S1	N	LE
<i>Asplenium x curtissii</i>	Curtiss' Spleenwort	GNA	S1	N	N
<i>Blechnum occidentale</i>	Sinkhole Fern	G5	S1	N	LE
<i>Centrosema arenicola</i>	Sand Butterfly Pea	G2Q	S2	N	LE
<i>Cheilanthes microphylla</i>	Southern Lip Fern	G5	S3	N	LE
<i>Glandularia tampensis</i>	Tampa Vervain	G2	S2	N	LE
<i>Matelea floridana</i>	Florida Spiny-pod	G2	S2	N	LE
<i>Monotropsis reynoldsiae</i>	Pigmy Pipes	G1Q	S1	N	LE
<i>Pavonia spinifex</i>	Yellow Hibiscus	G4G5	S2	N	N
<i>Peperomia humilis</i>	Terrestrial Peperomia	G5	S2	N	LE
<i>Pteroglossaspis ectrastata</i>	Giant Orchid	G2	S2	N	LT
<i>Spiranthes polyantha</i>	Green Ladies'-tresses	G4	S1S2	N	LE
<i>Stylisma abdita</i>	Scrub Stylisma	G3	S3	N	LE
<i>Thelypteris reptans</i>	Creeping Maiden Fern	G5	S2	N	LE
<i>Triphora craigheadii</i>	Craighead's Nodding-caps	G1	S1	N	LE
<b><u>NATURAL COMMUNITIES</u></b>					
Aquatic cave		G3	S3	N	N
Basin marsh		G4	S4	N	N
Basin swamp		G4	S3	N	N
Depression marsh		G4	S4	N	N
Floodplain swamp		G4	S4	N	N
Hydric hammock		G4	S4	N	N
Marine tidal marsh		G5	S4	N	N
Marine tidal swamp		G5	S4	N	N
Maritime hammock		G3	S2	N	N
Sandhill		G3	S2	N	N
Sandhill upland lake		G3	S2	N	N
Scrub		G2	S2	N	N
Shell mound		G2	S2	N	N
Sinkhole		G2	S2	N	N



## Rare Species and Natural Communities Documented or Reported

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status
<b><u>NATURAL COMMUNITIES</u></b>					
Terrestrial cave		G3	S2	N	N
Upland hardwood forest		G5	S3	N	N
Upland mixed forest		G4	S4	N	N
Xeric hammock		G3	S3	N	N
<b><u>OTHER ELEMENTS</u></b>					
Bird rookery		GNR	SNR	N	N
Geological feature		GNR	SNR	N	N
Manatee aggregation site		GNR	SNR	N	N

**Total count:**

Number of tracked elements: 109  
Number of distinct occurrences: 325

**TABLE 2.3.7-1**  
**Monthly and Annual Average Temperatures Measured**  
**at Tampa International Airport**

Month	Daily Avg. Temperatures (°F) <sup>a</sup>			Daily Extremes (°F) <sup>b</sup>	
	Average	Maximum	Minimum	Maximum	Minimum
January	61.3	70.1	52.4	86	21
February	62.7	71.6	53.8	88	24
March	67.4	76.3	58.5	91	29
April	71.5	80.6	62.4	93	40
May	77.6	86.3	68.9	98	49
June	81.5	88.9	74.0	99	53
July	82.5	89.7	75.3	97	63
August	82.7	90.0	75.4	98	67
September	81.6	89.0	74.3	96	57
October	75.8	84.1	67.6	94	40
November	69.3	78.0	60.7	90	23
December	63.3	72.0	54.7	86	18
Annual	73.1	81.4	64.8	99	18

<sup>a</sup> 30-year period of record, climatological normal, 1971 to 2000

<sup>b</sup> 59-year period of record, 1947 to 2005.

Source: National Oceanic and Atmospheric Administration (NOAA), 2005.

**TABLE 2.3.7-2**  
**Monthly and Annual Average Precipitation and Relative Humidity Measured**  
**at Tampa International Airport**

Month	Precipitation (inches)	Humidity (%) hour (LT) <sup>a</sup>					
	Average <sup>a</sup>	Maximum <sup>b</sup>	Minimum <sup>b</sup>	1 a.m.	7 a.m.	1 p.m.	7 p.m.
January	2.27	8.02	< 0.01	85	87	60	74
February	2.67	10.82	0.21	84	87	57	70
March	2.84	12.64	0.06	83	87	55	68
April	1.80	10.71	<0.01	82	86	52	64
May	2.85	17.64	0.02	82	85	54	64
June	5.50	13.75	1.46	85	86	60	70
July	6.49	20.59	1.65	86	88	64	74
August	7.60	18.59	2.35	88	90	65	76
September	6.54	13.98	0.79	88	91	63	76
October	2.29	7.36	0.06	86	90	58	73
November	1.62	6.12	<0.01	86	88	59	74
December	2.30	15.57	0.07	86	88	61	75
Annual	44.77	67.71	29.85	85	88	59	72

<sup>a</sup> 30-year period of record, climatological normal, 1971 to 2000.

<sup>b</sup> 59-year period of record, 1947 to 2005.

Note: LT = local time.

Source: NOAA, 2005.

**TABLE 2.3.7-3**  
**Seasonal and Annual Average Wind Direction and Wind Speed Measured**  
**at Tampa International Airport**

Season	Average Wind Speed (mph)	Calm (Percent)	Prevailing Wind Direction
Winter	6.6	13.2	North-northeast
Spring	7.4	10.5	West
Summer	5.7	18.0	West-southwest
Fall	6.7	12.0	Northeast
Annual	6.6	13.4	North-northeast

<sup>a</sup> 5-year period of record, 2001 to 2005. The data for this period were also used in the air quality impact analyses for the project.

Source: NOAA, 2007.

**TABLE 2.3.7-4**  
**Seasonal and Annual Average Atmospheric Stability Classes Determined**  
**at Tampa International Airport**

Season	<u>Occurrence (Percent) of Stability Class <sup>a</sup></u>					
	Very Unstable	Moderately Unstable	Unstable	Slightly Neutral	Stable	Slightly Stable
Winter	0.0	3.5	12.2	41.7	18.4	24.2
Spring	0.5	8.6	17.1	33.1	18.0	22.8
Summer	2.6	13.4	19.0	20.8	14.7	29.6
Fall	0.6	7.5	15.4	30.3	17.5	28.8
Annual	0.9	8.3	15.9	31.4	17.1	26.3

<sup>a</sup> 5-year period of record, 1991 to 1995.

Source: NOAA, 1995.

**TABLE 2.3.7-5**  
**Seasonal and Annual Average Morning and Afternoon Mixing Heights Determined**  
**at Tampa International Airport**

Season	Mixing Height (m)	
	Morning	Afternoon
Winter	475	1,032
Spring	691	1,531
Summer	657	1,398
Fall	481	1,132
Annual	577	1,275

<sup>a</sup>5-year period of record, 1991 to 1995. Mixing heights based on surface temperatures and upper-air data from the NWS stations at Tampa International Airport and Ruskin, respectively.

Source: NOAA, 1995.

**TABLE 2.3.7-6  
NATIONAL AND STATE AAQS, ALLOWABLE PSD INCREMENTS, AND SIGNIFICANT IMPACT LEVELS**

Pollutant II	Averaging Time	National AAQS ( $\mu\text{g}/\text{m}^3$ ) <sup>a</sup>		Florida AAQS <sup>a</sup> ( $\mu\text{g}/\text{m}^3$ )	Significant Impact PSD Increments ( $\mu\text{g}/\text{m}^3$ ) <sup>a</sup>		Levels ( $\mu\text{g}/\text{m}^3$ ) <sup>b</sup>	
		Primary Standard	Secondary Standard		Class I	Class II	Class I	Class II
Particulate Matter (PM <sub>10</sub> )	Annual Arithmetic Mean	50	50	50	4	17	0.2	1
	24-Hour Maximum	150	150	150	8	30	0.3	5
Particulate Matter <sup>c</sup> (PM <sub>2.5</sub> )	Annual Arithmetic Mean	15	15	50	NA	NA	NA	NA
	24-Hour Maximum	35	35	150	NA	NA	NA	NA
Sulfur Dioxide	Annual Arithmetic Mean	80	NA	60	2	20	0.1	1
	24-Hour Maximum	365	NA	260	5	91	0.2	5
	3-Hour Maximum	NA	1,300	1,300	25	512	1.0	25
Carbon Monoxide	8-Hour Maximum	10,000	10,000	10,000	NA	NA	NA	500
	1-Hour Maximum	40,000	40,000	40,000	NA	NA	NA	2,000
Nitrogen Dioxide	Annual Arithmetic Mean	100	100	100	2.5	25	0.1	1
Ozone <sup>c</sup>	1-Hour Maximum <sup>d</sup>	235	235	235	NA	NA	NA	NA
	8-Hour Maximum <sup>e</sup>	160	160					
Lead	Calendar Quarter Arithmetic Mean	1.5	1.5	1.5	NA	NA	NA	NA

Note: Particulate matter (PM<sub>10</sub>) = particulate matter with aerodynamic diameter less than or equal to 10 micrometers.

Particulate matter (PM<sub>2.5</sub>) = particulate matter with aerodynamic diameter less than or equal to 10 micrometers.

NA = Not applicable, i.e., no standard exists or not promulgated yet.

<sup>a</sup> Short-term maximum concentrations are not to be exceeded more than once per year, except for PM<sub>10</sub>, PM<sub>2.5</sub>, and O<sub>3</sub> AAQS which are based on expected exceedances.

<sup>b</sup> Maximum concentrations are not to be exceeded.

<sup>c</sup> 24-hour standard based on the 3-year averages of the 98th percentile values; annual standard based on 3-year average at community monitors. These standards must be implemented in the 2007-2008 timeframe. On October 17, 2006, EPA finalized the PM AAQS (71 FR 61236). The 24-hour PM<sub>2.5</sub> standard was changed to 35  $\mu\text{g}/\text{m}^3$ . The FDEP has not yet adopted the revised standards.

<sup>d</sup> 0.12 ppm; achieved when the expected number of days per year with concentrations above the standard is fewer than 1.

<sup>e</sup> 0.08 ppm; achieved when the 3-year average of 99th percentile values is 0.08 ppm or less. These standards must be implemented in the 2007-2008 timeframe. The FDEP has not yet adopted the revised standards.

Sources: Federal Register, Vol. 43, No. 118, June 19, 1978; 40 CFR 50; 40 CFR 52.21; Florida Chapter 62.204, F.A.C. Golder, 2006.

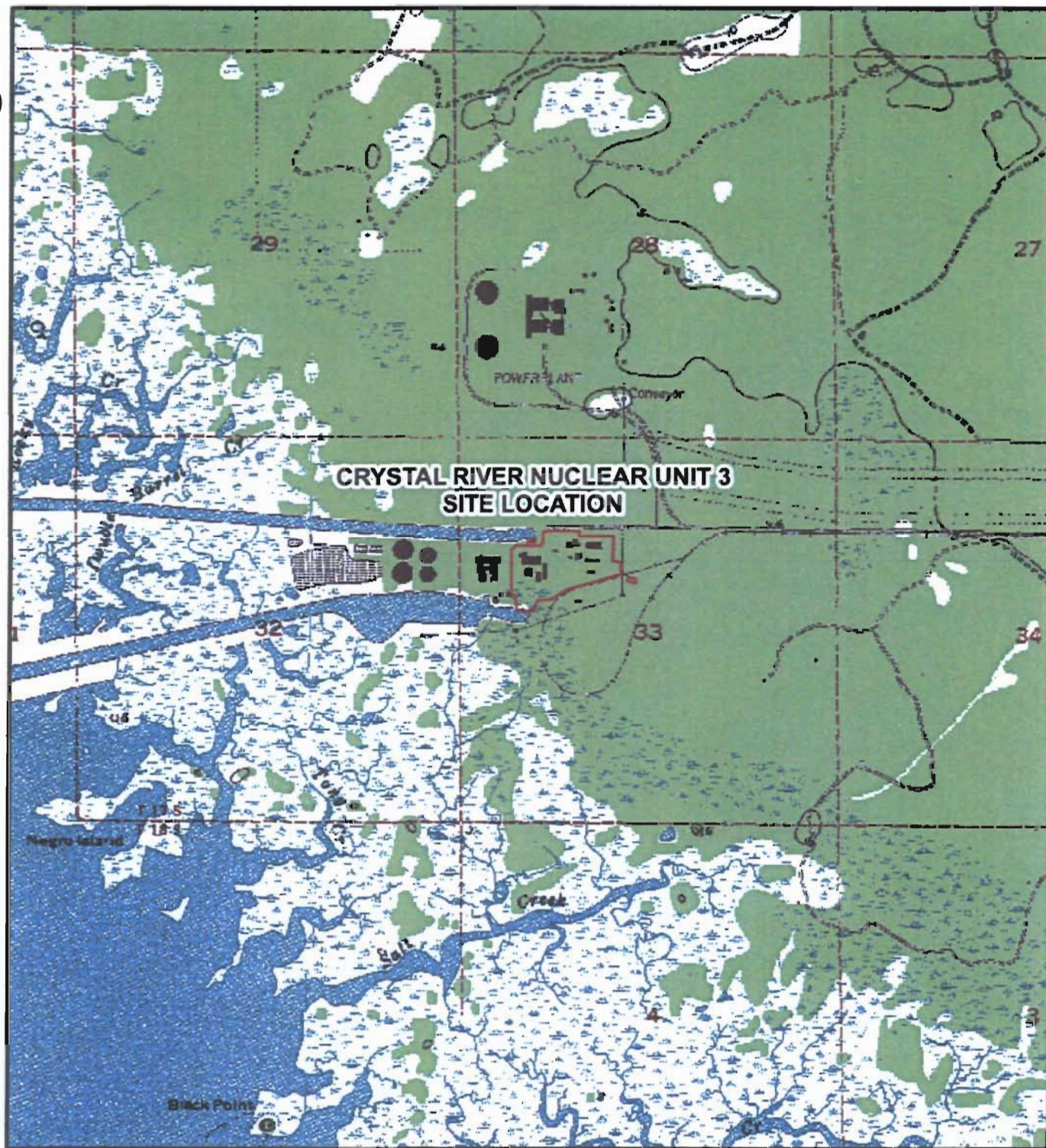
**TABLE 2.3.8-1**  
**Baseline Ambient Sound Pressure Levels (dBA) Observed at the Crystal River Energy Complex**

Site	Coordinates	Date	Time	Sound Levels (dBA)				Observations
				Min	Max	L <sub>10</sub>	Leq	
1. On-site North of reactor	28° 57' 32.6" N	11-Apr-07	Daytime	60	85	65	66	Plant traffic and plant operations
	82° 41' 52.7" W	11-Apr-07	Nighttime	61	76	62	63	Plant traffic, plant operations, and insect noise
2. On-site East of reactor	28° 57' 28.1" N	11-Apr-07	Daytime	63	68	65	64	Plant operations, conveyor, and fence construction
	82° 41' 37.6" W	11-Apr-07	Nighttime	62	66	63	63	Plant operations, conveyor, and insect noise
3. On-site South of reactor	28° 57' 22.96" N	11-Apr-07	Daytime	67	75	70	70	Plant operations, conveyor, and traffic
	82° 41' 51.3" W	11-Apr-07	Nighttime	69	72	71	70	Plant operations, conveyor, and insect noise
4. West of plant near cooling towers	28° 57' 34.7" N	11-Apr-07	Daytime	52	60	57	55	Plant traffic, plant operations, and cooling tower ops,
	82° 42' 15.2" W	11-Apr-07	Nighttime	56	63	60	59	Plant traffic and rain
5. Northeast corner of fence line	28° 58' 11.0" N	11-Apr-07	Daytime	47	57	51	50	Coal plant operations and air plane traffic
	82° 41' 07.8" W	11-Apr-07	Nighttime	47	63	57	55	Coal plant operations and insect noise
6. Intersection of Tallahassee and Powerline Rd	28° 57' 35.4" N	11-Apr-07	Daytime	42	68	56	53	Traffic, powerline buzz, and neighboring facility noise
	82° 38' 00.2" W	11-Apr-07	Nighttime	39	95	74	73	Traffic, powerline buzz, insects, and train passing
7. Middle point on Powerline Rd	28° 57' 34.2" N	11-Apr-07	Daytime	39	74	62	59	Traffic, powerline buzz, and airplane traffic
	82° 39' 37.5" W	11-Apr-07	Nighttime	44	54	47	46	Plant operations and powerline buzz
Commercial Maximum Allowable Sound Pressure Levels (L <sub>10</sub> )			Daytime			65		
			Nighttime			60		

Source: Golder Associates Inc, 2007

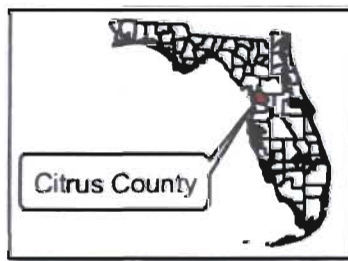


## **FIGURES**



# LEGEND

Crystal River Nuclear Unit 3 Site Location



## REFERENCE

1. Topo scanned from existing USGS 7.5" quads in 1997.

0 0.4 0.8  
Miles



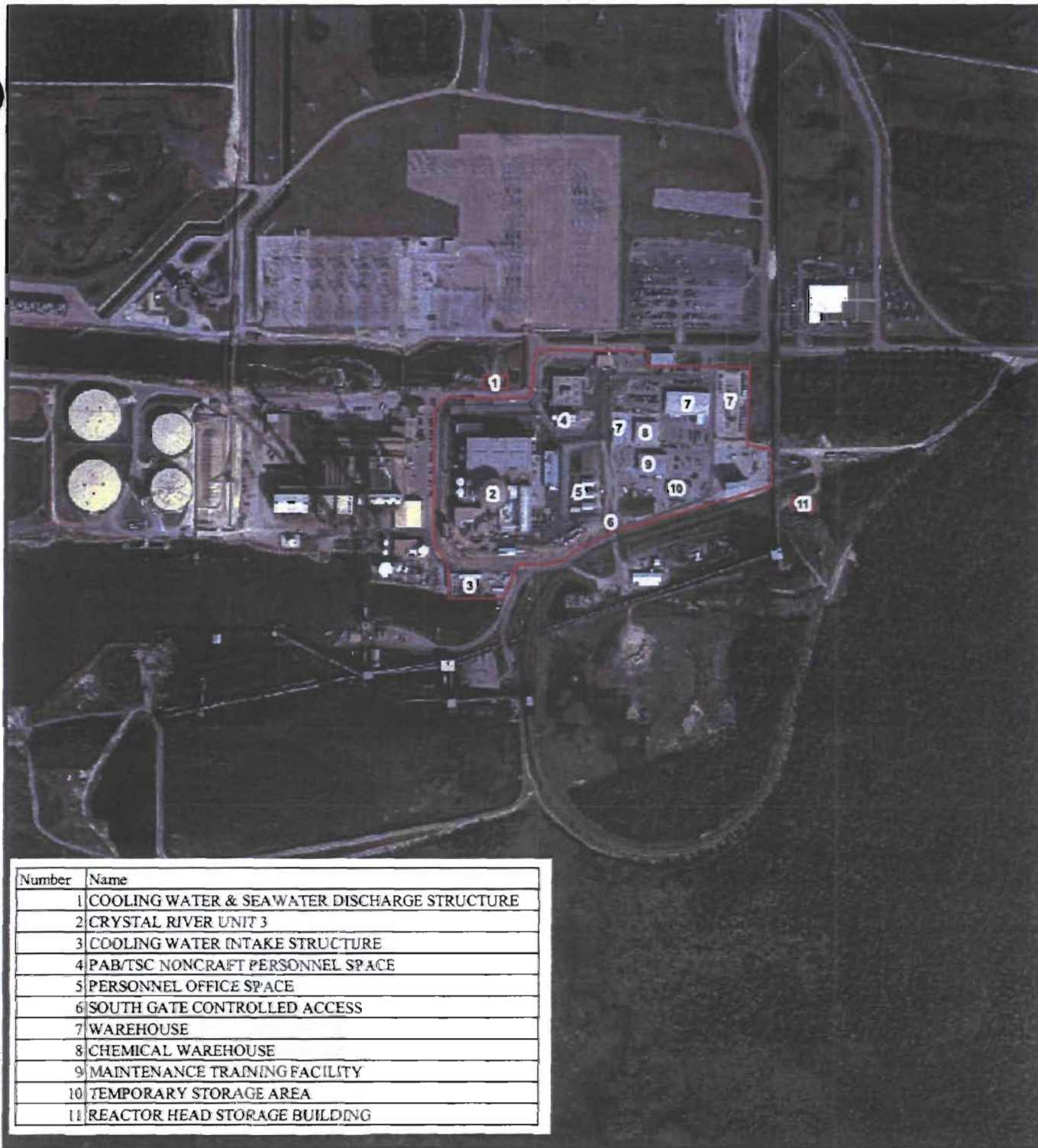
PROJECT  
PROGRESS ENERGY FLORIDA, CRYSTAL RIVER  
NUCLEAR UNIT 3 UPRATE PROJECT

TITLE  
**SITE LOCATION**



PROJECT No. 073-89531	SCALE AS SHOWN	REV. 0
DESIGN JG April 17, 2007	<b>FIGURE 2.1.1-1</b>	
GIS JG April 17, 2007		
CHECK KG April 17, 2007		
REVIEW MM April 17, 2007		





Number	Name
1	COOLING WATER & SEAWATER DISCHARGE STRUCTURE
2	CRYSTAL RIVER UNIT 3
3	COOLING WATER INTAKE STRUCTURE
4	PAB/TSC NONCRAFT PERSONNEL SPACE
5	PERSONNEL OFFICE SPACE
6	SOUTH GATE CONTROLLED ACCESS
7	WAREHOUSE
8	CHEMICAL WAREHOUSE
9	MAINTENANCE TRAINING FACILITY
10	TEMPORARY STORAGE AREA
11	REACTOR HEAD STORAGE BUILDING

#### LEGEND

Crystal River Nuclear Unit 3 Site Location

#### REFERENCE

1. 2006 S/WFWD Aerial.
2. Crystal River Unit 3 Site Location by Golder Associates Inc.

0 0.1 0.2  
Miles



PROJECT PROGRESS ENERGY FLORIDA, CRYSTAL RIVER NUCLEAR UNIT 3 UPRATE PROJECT			
TITLE CRYSTAL RIVER NUCLEAR UNIT 3 SITE LAYOUT/CERTIFICATION BOUNDARY			
 Golder Associates Tampa, Florida		PROJECT No. 073-89531	SCALE AS SHOWN    REV. 0
DESIGN	JG	April 17, 2007	<b>FIGURE 2.1.2-1</b>
GIS	JG	April 17, 2007	
CHECK	KG	April 17, 2007	
REVIEW	MM	April 17, 2007	



### LEGEND


Crystal River Nuclear Unit 3 Site Location

### REFERENCE

1. 2006 SWFWMD Aerial.
2. Crystal River Unit 3 Site Location by Golder Associates Inc.

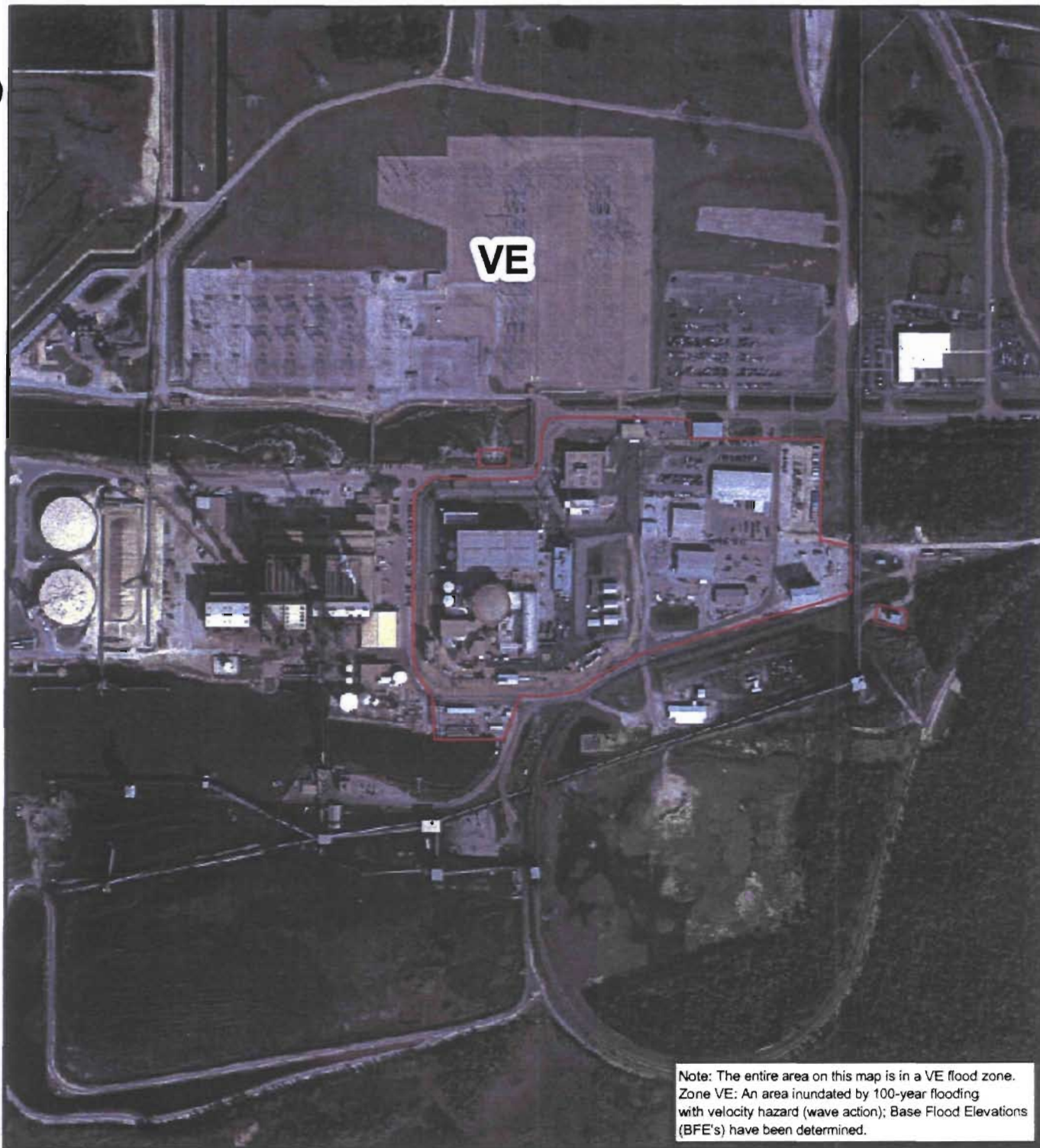
0 0.1 0.2 Miles



PROJECT			
PROGRESS ENERGY FLORIDA, CRYSTAL RIVER NUCLEAR UNIT 3 UPRATE PROJECT			
TITLE			
AERIAL PHOTOGRAPH			
 Golder Associates Tampa, Florida		PROJECT No. 073-88501	SCALE AS SHOWN    REV. 0
DESIGN	JS	April 17, 2007	<b>FIGURE</b> <b>2.1.2-2</b>
DS	JS	April 17, 2007	
CHECK	KG	April 17, 2007	
REVIEW	MM	April 17, 2007	



F:\PROJECTS\2007\03-89531 - CR 3 Nuclear Upgrade\SCA\A-PG Crystal River Nuclear Site Upgrade\GIS\X2073-09531\A017 Flood Zone F



**LEGEND**

-  Crystal River Nuclear Unit 3 Site Location

**REFERENCE**

1. 2006 S/WFWMD Aerial.
2. FEMA flood zone information from the FDEP.
3. Crystal River Site Location by Golder Associates Inc.

0 0.1 0.2 Miles



PROJECT  
PROGRESS ENERGY FLORIDA, CRYSTAL RIVER  
NUCLEAR UNIT 3 UPRATE PROJECT

TITLE

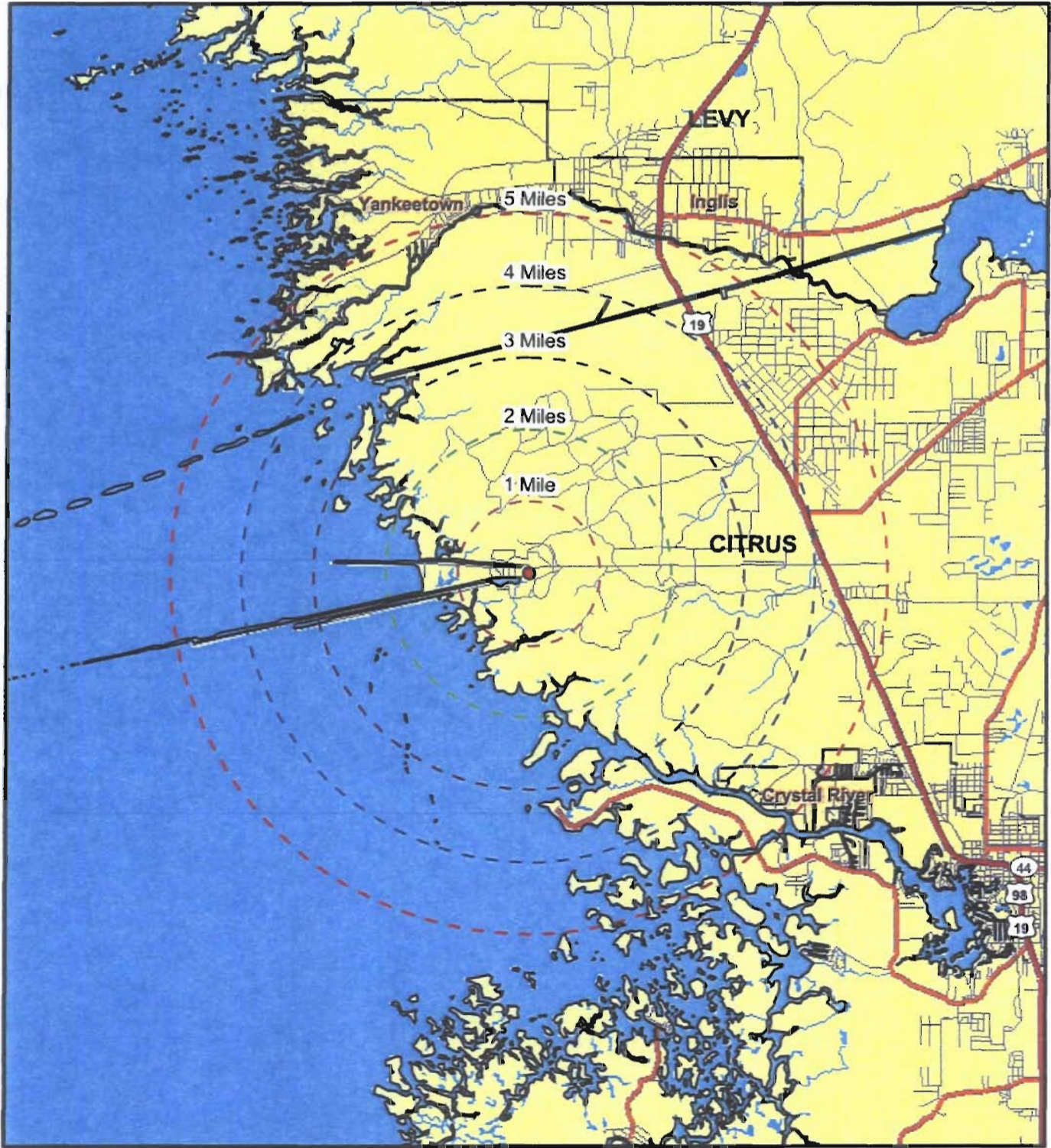
**FLOOD ZONE**



PROJECT No. 073-89531			SCALE AS SHOWN	REV. 0
DESIGN	JG	April 17, 2007	<b>FIGURE 2.1.5-1</b>	
GIS	JG	April 17, 2007		
CHECK	KG	April 17, 2007		
REVIEW	MM	April 17, 2007		



\\P:\PROJECTS\2007\73-89531\_CFR 3 Nuclear Upgrade\820434A-PG Crystal River Nuclear Site Upgrade\GIS\MXD\073-89531A010 Governmental Jurisdictions Within 1, 2, 3, 4, and 5 Mile Radii Fig 2.2.1-1.mxd



#### LEGEND

- Crystal River Nuclear Unit 3 Site Location
- County Boundaries
- 5 Mile Radius
- 4 Mile Radius
- 3 Mile Radius
- 2 Mile Radius
- 1 Mile Radius
- Highway
- Major Road
- Local Road
- Municipalities

#### REFERENCE

1. ESRI Street Map was used as background.

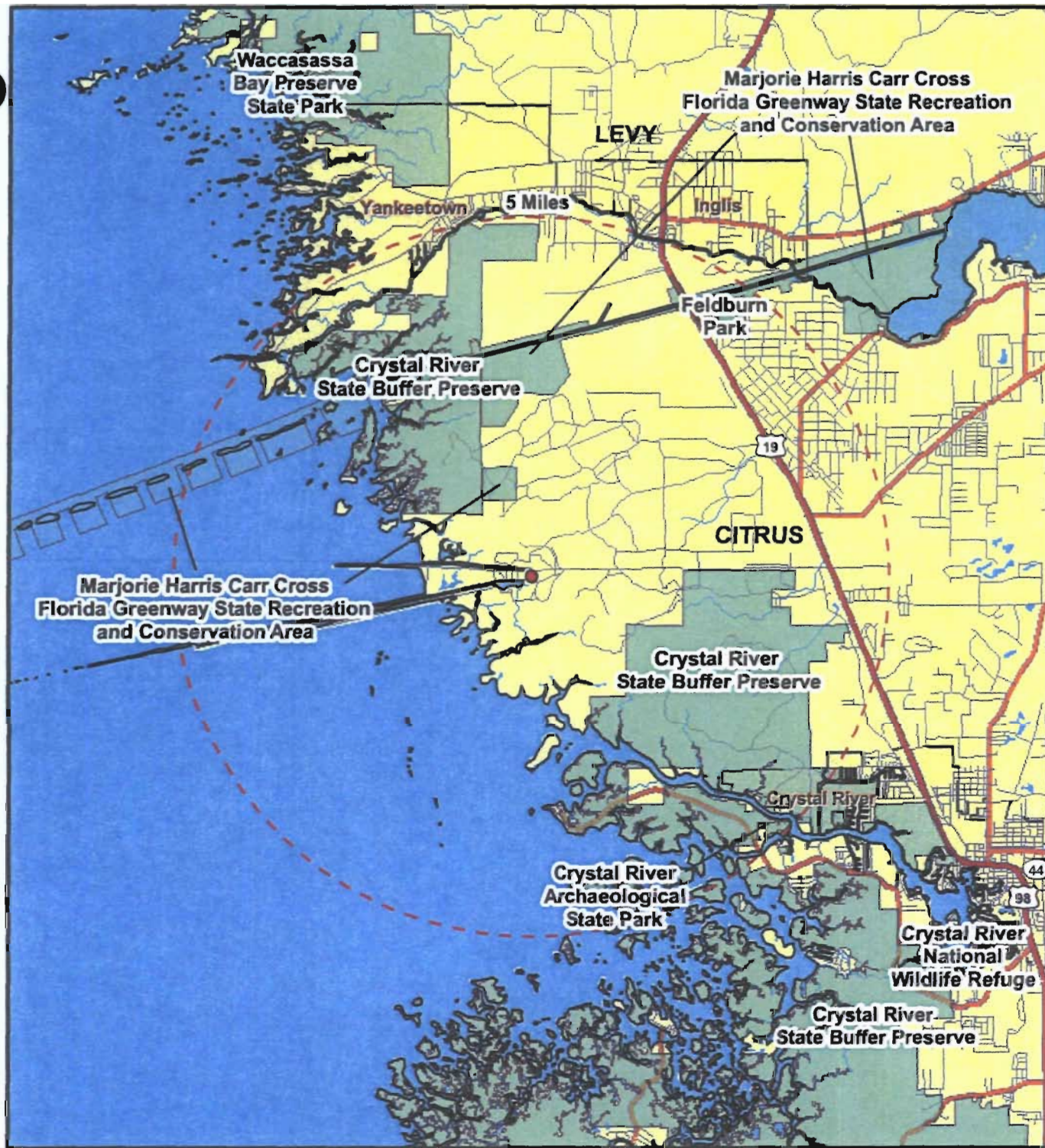
0 2 4 Miles



PROJECT			
PROGRESS ENERGY FLORIDA, CRYSTAL RIVER NUCLEAR UNIT 3 UPRATE PROJECT			
TITLE			
GOVERNMENTAL JURISDICTIONS (Within 1,2,3,4, and 5 Mile Radii)			
PROJECT No. 073-89531		SCALE AS SHOWN	REV. 0
DESIGN	JG	April 17, 2007	FIGURE 2.2.1-1
GIS	JG	April 17, 2007	
CHECK	KG	April 17, 2007	
REVIEW	MM	April 17, 2007	







#### LEGEND

- Crystal River Nuclear Unit 3 Site Location
- 5 Mile Radius
- Highway
- Major Road
- Local Road
- Conservation Lands
- Municipalities
- County Boundaries

#### REFERENCE

1. ESRI Street Map was used as background.
2. Conservation Lands represent public and some private lands that the Florida Natural Areas Inventory (FNAI) has identified as having natural resource value and are being managed at least partially for conservation.

0 2 4 Miles



PROJECT  
PROGRESS ENERGY FLORIDA, CRYSTAL RIVER  
NUCLEAR UNIT 3 UPRATE PROJECT

TITLE  
**CONSERVATION LANDS  
WITHIN 5 MILE RADIUS**



PROJECT No.	073-89531
DESIGN	JG April 17, 2007
CIS	JG April 17, 2007
CHECK	RG April 17, 2007
REVIEW	VM April 17, 2007

SCALE AS SHOWN REV. 0

**FIGURE  
2.2.1-2**





#### LEGEND


- |   |   |
|---|---|
| <span style="color: red;">●</span> Crystal River Nuclear Unit 3 Site Location | <span style="color: red;">---</span> Existing Trails  |
| <span style="color: red;">---</span> 5 Mile Radius                            | <span style="background-color: #90EE90; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> State Parks   |
| <span style="color: red;">---</span> Highway                                  | <span style="background-color: yellow; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> Municipalities |
| <span style="color: red;">---</span> Major Road                               | <span style="border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> County Boundaries                        |
| <span style="color: red;">---</span> Local Road                               |   |

#### REFERENCE

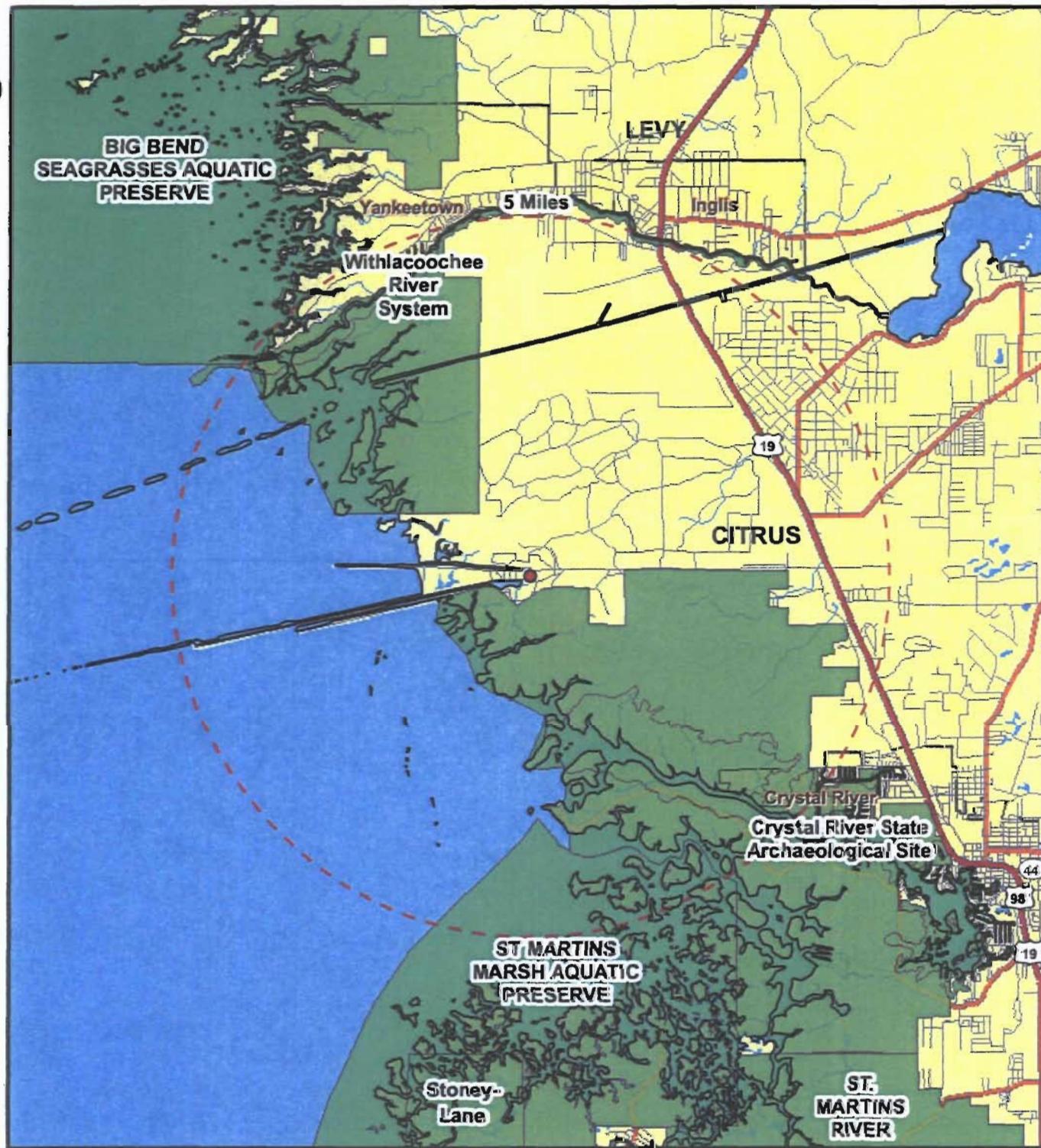
1. ESRI Street Map was used as background.
2. State Parks & Existing Trails from the Florida Department of Environmental Protection.

0 2 4 Miles



PROJECT			
PROGRESS ENERGY FLORIDA, CRYSTAL RIVER NUCLEAR UNIT 3 UPRATE PROJECT			
TITLE			
STATE PARKS & EXISTING TRAILS WITHIN 5 MILE RADIUS			
 Grubler Associates Tampa, Florida		PROJECT No. 073-38631	SCALE AS SHOWN
		CHECKED JG April 17, 2007	REV. 1
		DESIGNED JG April 17, 2007	
		CHECKED KG April 17, 2007	
		REVIEW WMR April 17, 2007	
			<b>FIGURE 2.2.1-3</b>





#### LEGEND

- Crystal River Nuclear Unit 3 Site Location
- Highway
- Major Road
- Local Road
- 5 Mile Radius
- Outstanding Florida Waters
- Municipalities
- County Boundaries

#### REFERENCE

1. ESRI Street Map was used as background.
2. Outstanding Florida Waters from the Florida Department of Environmental Protection.

0 2 4 Miles



PROJECT  
 PROGRESS ENERGY FLORIDA, CRYSTAL RIVER  
 NUCLEAR UNIT 3 UPRATE PROJECT

TITLE  
 OUTSTANDING FLORIDA WATERS  
 WITHIN 5 MILE RADIUS

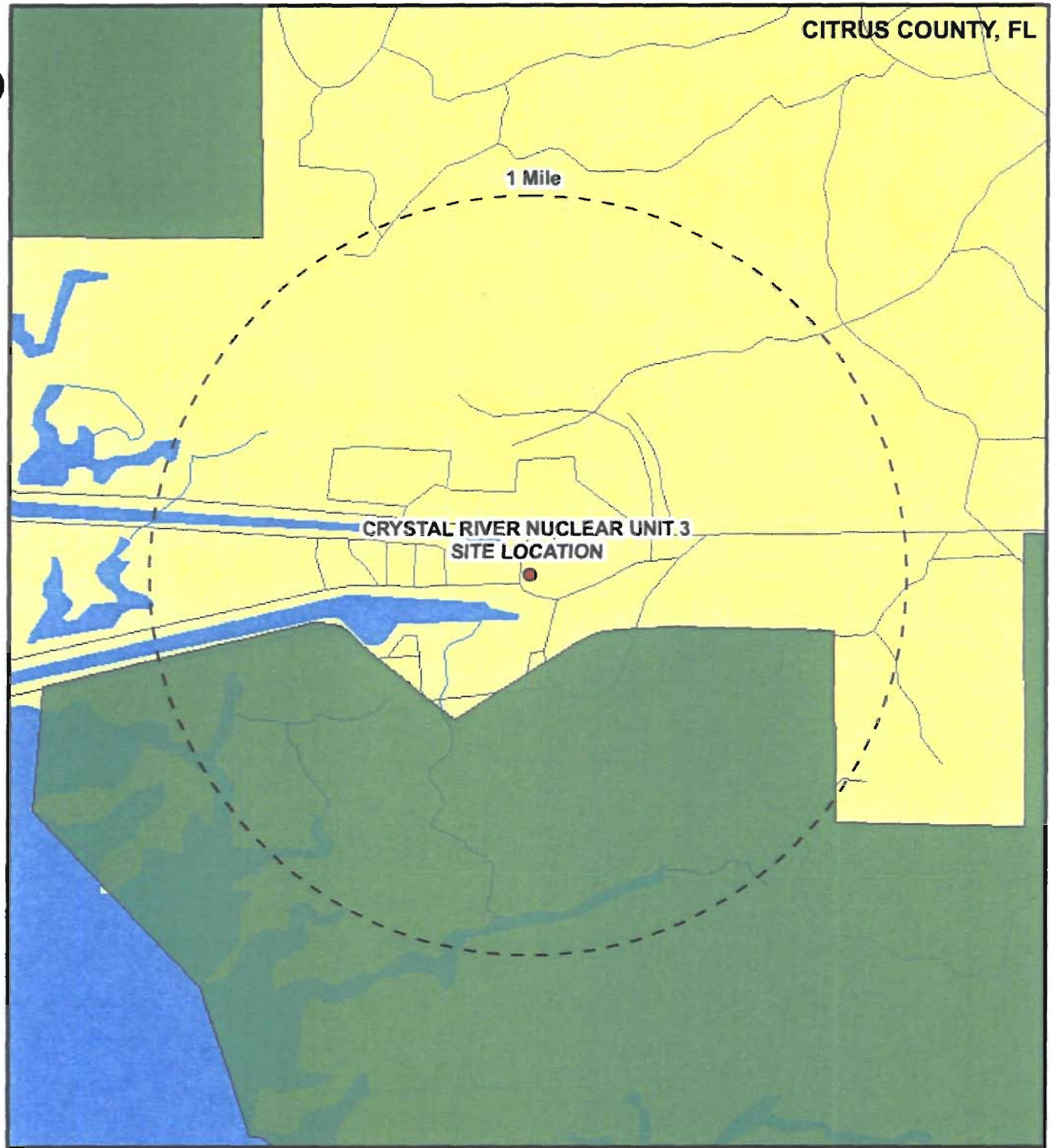


PROJECT No.	073-89531
DESIGN	JG April 17, 2007
CS	JG April 17, 2007
CHECK	AG April 17, 2007
REVIEW	MM April 17, 2007

SCALE AS SHOWN 1"=1/2 MI

**FIGURE**  
 2.2.14





#### LEGEND

- Crystal River Nuclear Unit 3 Site Location
- Outstanding Florida Waters
- 1 Mile Radius
- Local Road

#### REFERENCE

1. ESRI Street Map was used as background.
2. Outstanding Florida Waters from the Florida Department of Environmental Protection.



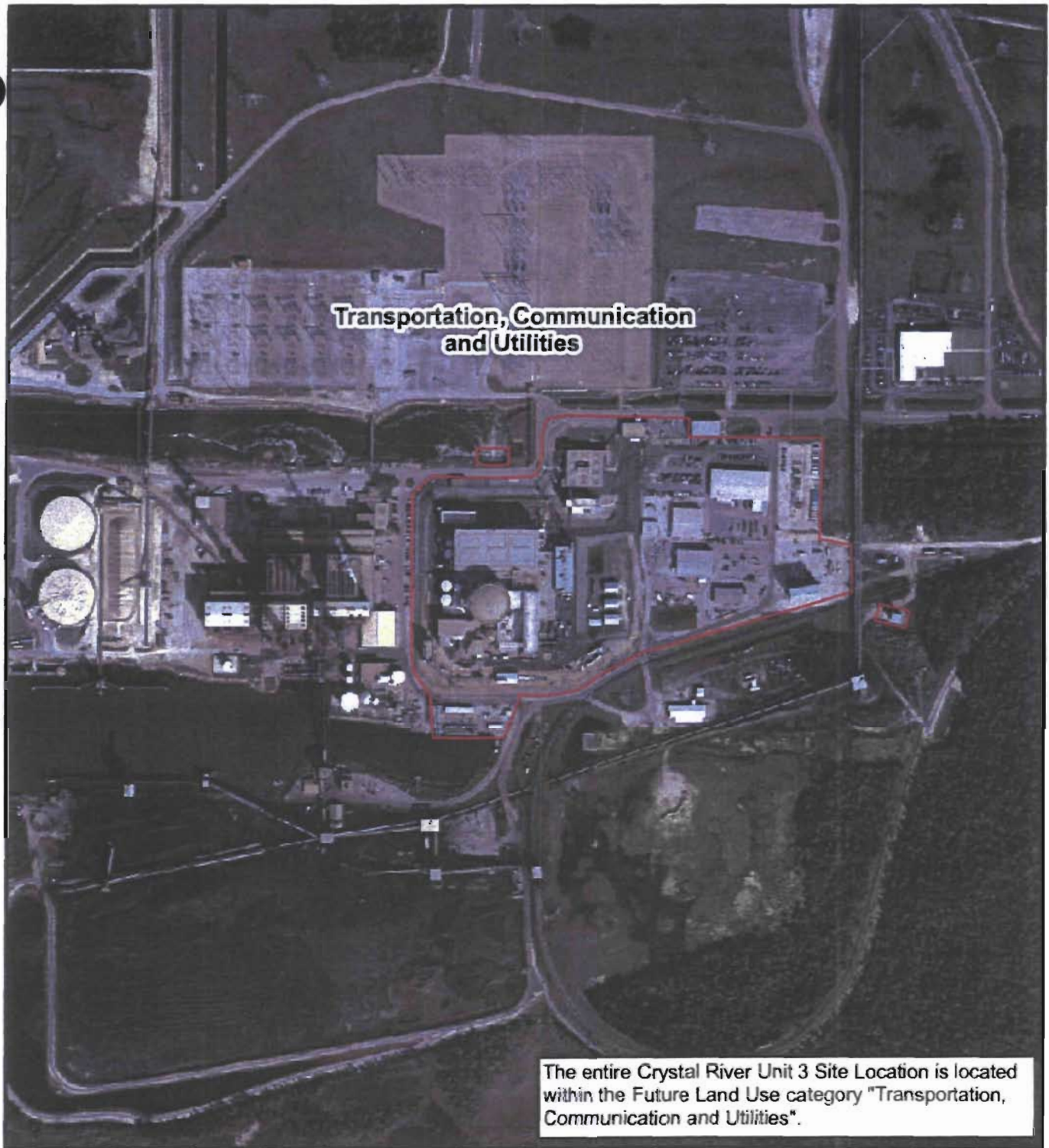
PROJECT  
PROGRESS ENERGY FLORIDA, CRYSTAL RIVER  
NUCLEAR UNIT 3 UPRATE PROJECT

TITLE  
**GOVERNMENTAL JURISDICTIONS  
WITHIN 1 MILE RADIUS**



PROJECT No.	073-89531	SCALE AS SHOWN	REV. 0
DESIGN	JG	April 17, 2007	
GIS	JG	April 17, 2007	
CHECK	KG	April 17, 2007	
REVIEW	MM	April 17, 2007	

**FIGURE  
2.2.1-5**



#### LEGEND


- Crystal River Nuclear Unit 3 Site Location

#### REFERENCE

1. 2006 Southwest Florida Water Management District Aerial.
2. Future Land Use Map from Citrus County.
3. Crystal River Site Location by Golder Associates Inc.

0 0.1 0.2 Miles



PROJECT			
PROGRESS ENERGY FLORIDA, CRYSTAL RIVER NUCLEAR UNIT 3 UPRATE PROJECT			
TIME			
FUTURE LAND USE			
		PROJECT No. 073-89531	SCALE AS SHOWN
		DESIGN JG	April 17, 2007
		IGS JG	April 17, 2007
		CHECK KG	April 17, 2007
		REVIEW MM	April 17, 2007
			<b>FIGURE</b> <b>2.2.2-1</b>





#### LEGEND


Crystal River Nuclear Unit 3 Site Location

#### REFERENCE

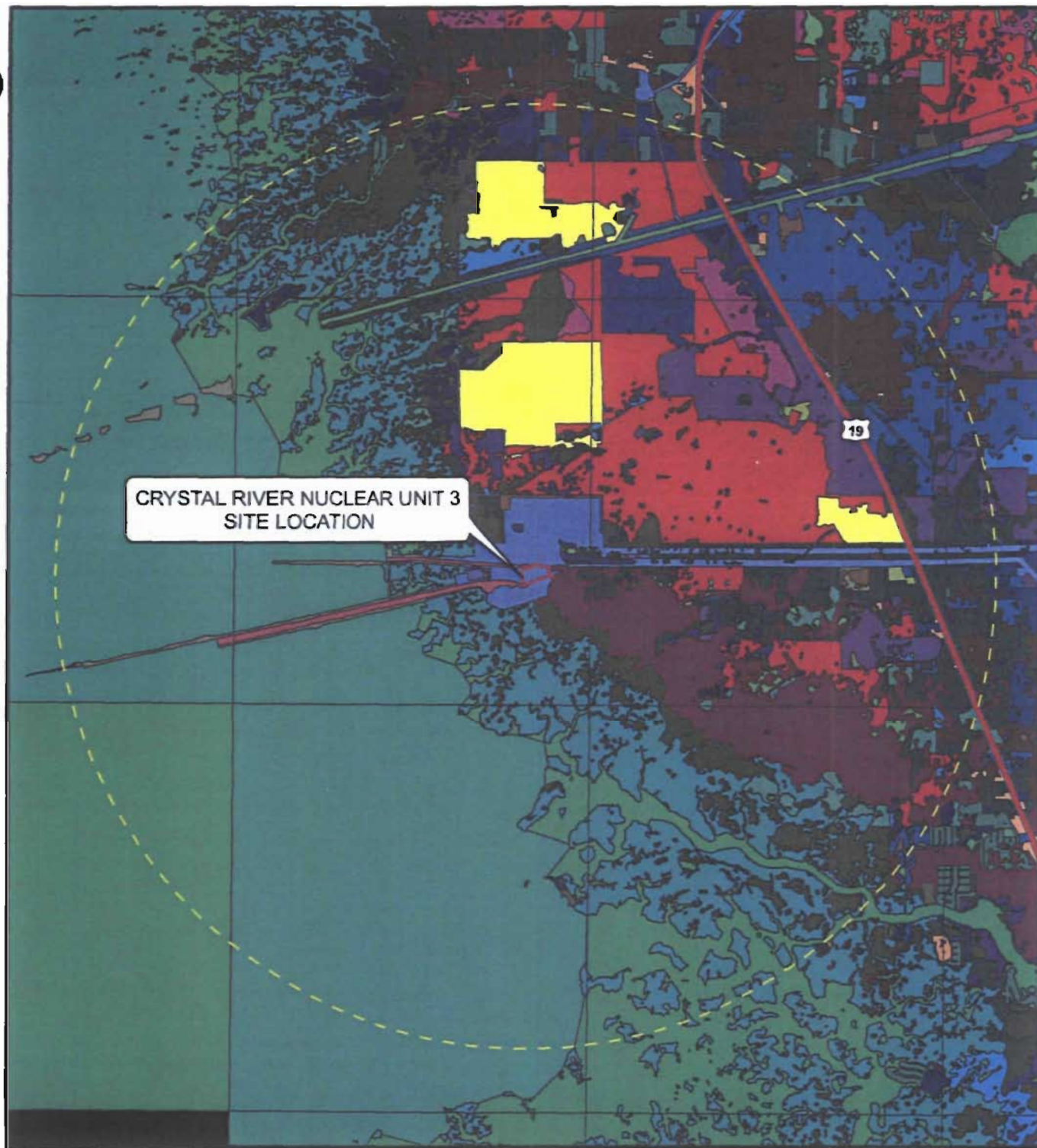
1. 2006 Southwest Florida Water Management District Aerial.
2. Zoning map from Citrus County zoning maps.
3. Crystal River Site Location by Golder Associates Inc.

0 0.1 0.2  
Miles



PROJECT			
PROGRESS ENERGY FLORIDA, CRYSTAL RIVER NUCLEAR UNIT 3 UPRATE PROJECT			
TITLE			
ZONING			
 Tampa, Florida		PROJECT No. 073-89531	SCALE AS SHOWN
		DESIGN JG April 17, 2007	<b>FIGURE</b> <b>2.2.2-2</b>
		GIS JG April 17, 2007	
		CHECK KG April 17, 2007	
		REVIEW MM April 17, 2007	





## LEGEND

- Crystal River Nuclear Unit 3 Site Location
- Highway
- 5 Mile Radius

### Florida Land Use and Cover Classification System LEV2, FLUCCS CODE, DESCRIPTION

- 11, 1100, RESIDENTIAL LOW DENSITY < 2 DWELLING UNITS
- 12, 1200, RESIDENTIAL HIGH DENSITY
- 14, 1400, COMMERCIAL AND SERVICES
- 15, 1500, INDUSTRIAL
- 16, 1600, EXTRACTIVE
- 17, 1700, INSTITUTIONAL
- 18, 1800, RECREATIONAL
- 19, 1900, OPEN LAND

- 21, 2100, CROPLAND AND PASTURELAND
- 25, 2500, OTHER OPEN LANDS < RURAL >
- 31, 3100, HERBACEOUS
- 32, 3200, SHRUB AND BRUSHLAND
- 33, 3300, MIXED RANGELAND
- 41, 4120, LONGLEAF PINE - XERIC OAK
- 41, 4110, PINE FLATWOODS
- 41, 4100, UPLAND CONIFEROUS FOREST
- 43, 4340, HARDWOOD-CONIFER MIXED
- 44, 4400, TREE PLANTATIONS
- 51, 5100, STREAMS AND WATERWAYS
- 52, 5200, LAKES
- 54, 5400, RESERVOIRS
- 54, 5400, BAYS AND ESTUARIES
- 57, 5700, GULF OF MEXICO
- 61, 6100, STREAM AND LAKE SWAMPS (BOTTOMLAND)
- 62, 6200, CYPRESS
- 63, 6300, WETLAND-FORESTED MIXED
- 64, 6420, SALTWATER MARSHES
- 64, 6440, EMERGENT AQUATIC VEGETATION
- 64, 6410, FRESHWATER MARSHES
- 64, 6430, WET PRAIRIES
- 65, 6500, INTERMITTENT PONDS
- 71, 7100, DISTURBED LAND
- 81, 8100, TRANSPORTATION
- 83, 8300, UTILITIES

## REFERENCE

- Florida Land Use and Cover Classification System (2004) from Southwest Florida Water Management Department (SWFWMD).
- Crystal River Site Location by Golder Associates Inc.

0 2 4 Miles



PROJECT  
PROGRESS ENERGY FLORIDA, CRYSTAL RIVER  
NUCLEAR UNIT 3 UPRATE PROJECT

TITLE

## EXISTING LAND USE

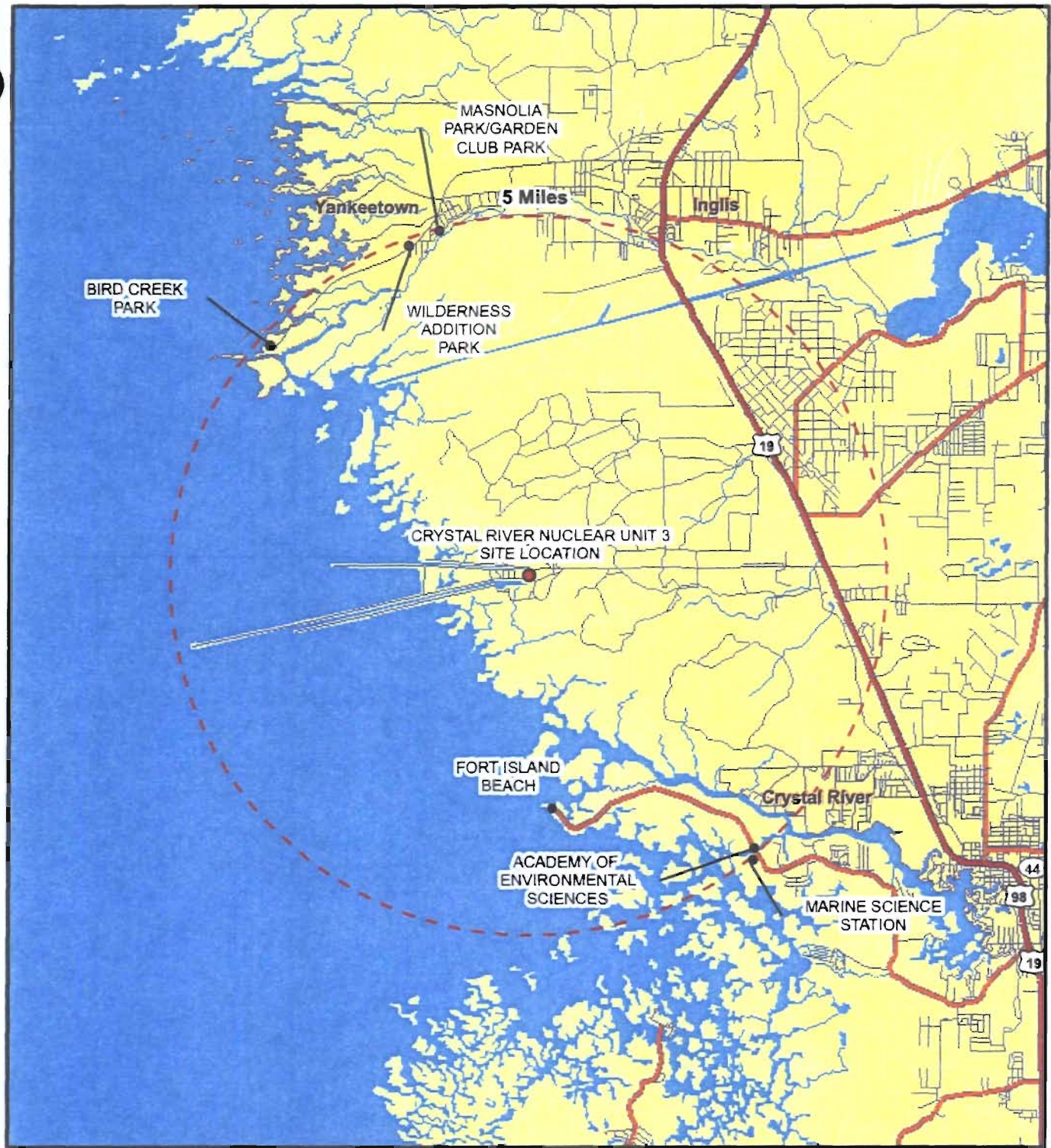


PROJECT No.	073-89531
DESIGN	JG April 17, 2007
GS	JG April 17, 2007
CHECK	KG April 17, 2007
REVIEW	MM April 17, 2007

SCALE AS SHOWN REV. 0

FIGURE  
2.2.3-1






#### LEGEND

- Crystal River Nuclear Unit 3 Site Location
- Schools & Recreation Locations
- 5 Mile Radius

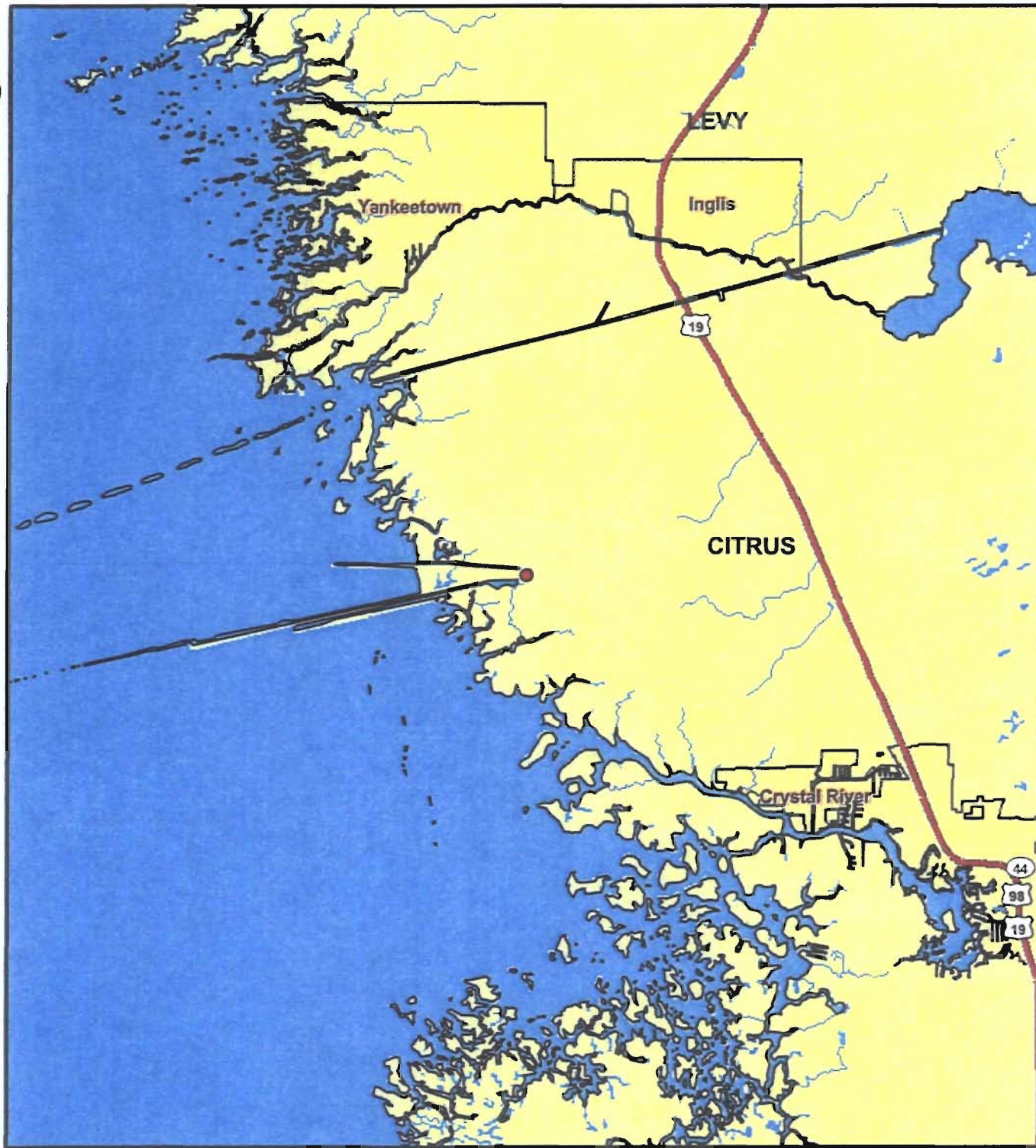
#### REFERENCE

1. ESRI Street Map was used as background.
2. Schools & Recreation Locations from FGDL (Florida Geographic Data Library).



PROJECT				PROGRESS ENERGY FLORIDA, CRYSTAL RIVER NUCLEAR UNIT 3 UPRATE PROJECT			
TITLE				SCHOOLS & RECREATION LOCATIONS			
 <b>Golder Associates</b> Tampa, Florida				PROJECT No. 073-49531		SCALE AS SHOWN	REV. 0
				DESIGN	JG	April 17, 2007	<b>FIGURE</b> <b>2.2.8-1</b>
				GIS	JG	April 17, 2007	
				CHECK	KG	April 17, 2007	
				REVIEW	MM	April 17, 2007	





#### LEGEND


- Crystal River Nuclear Unit 3 Site Location
- Municipalities
- Major Roads**
- Highway
- County Boundaries

#### REFERENCE

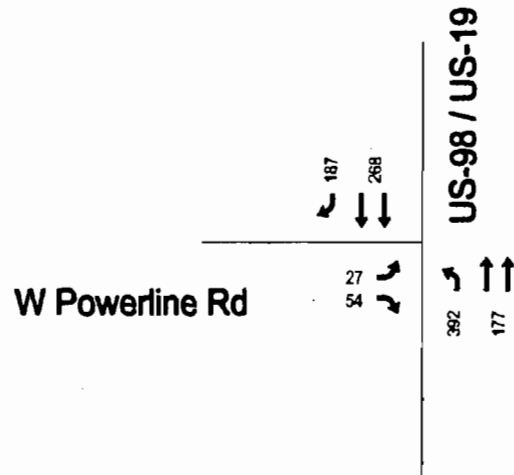
1. ESRI Street Map was used as background.

0 2 4 Miles

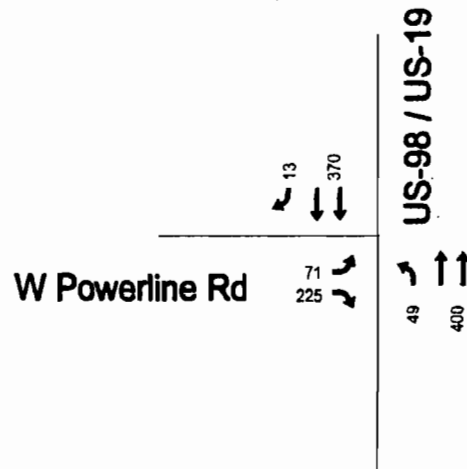


PROJECT					
PROGRESS ENERGY FLORIDA, CRYSTAL RIVER NUCLEAR UNIT 3 UPRATE PROJECT					
TITLE					
MAJOR ROADS					
 <b>Golder Associates</b> Tampa, Florida		PROJECT No. 073-89531		SCALE AS SHOWN	REV. 0
		DESIGN	JG	April 17, 2007	<b>FIGURE</b> <b>2.2.8-2</b>
		GIS	JG	April 17, 2007	
		CHECK	KG	April 17, 2007	
		REVIEW	MM	April 17, 2007	

## AM PEAK HOUR



## PM PEAK HOUR



SCALE: N.T.S.



Transportation Solutions for Today and Tomorrow  
Park Tower Suite 1140 / 400 North Tampa Street  
Tampa, Florida 33602 / (813) 386-3630

PROJECT NO. GOLAS00-07199

PROJECT: CR3 Uprate Project

TITLE: 2007 Existing Traffic Volumes

FIGURE

2.2.8-3

D.B. N.A.S.

C.B. N.A.S.

REV. \_\_\_\_\_



## Quaternary

### Holocene

**Qh** Holocene sediments

### Pleistocene/Holocene

**Qal** Alluvium  
**Qbd** Beach ridge and dune  
**Qu** Undifferentiated sediments

### Pleistocene

**Qa** Anastasia Formation  
**Qk** Key Largo Limestone  
**Qm** Miami Limestone  
**Qtr** Trail Ridge sands

### Tertiary/Quaternary

#### Pliocene/Pleistocene

**TQsu** Shelly sediments of Plio-Pleistocene age  
**TQu** Undifferentiated sediments  
**TQd** Dunes  
**TQuc** Reworked Cypresshead sediments

### Tertiary

#### Pliocene

**Tc** Cypresshead Formation  
**Tci** Citronelle Formation  
**Tmc** Miccosukee Formation  
**Tic** Intracoastal Formation  
**Tt** Tamiami Formation  
**Tjb** Jackson Bluff Formation

#### Miocene/Pliocene

**Thcc** Hawthorn Group, Coosawhatchie Formation, Chertan Member  
**Thp** Hawthorn Group, Peace River Formation  
**Thpb** Hawthorn Group, Peace River Formation, Bone Valley Member

#### Miocene

**Trm** Residuum on Miocene sediments  
**Tab** Alum Bluff Group  
**Th** Hawthorn Group  
**Thc** Hawthorn Group, Coosawhatchie Formation  
**Ths** Hawthorn Group, Statenville Formation  
**Tht** Hawthorn Group, Torreya Formation  
**Teh** Chatahoochee Formation  
**Tsmk** St. Marks Formation

#### Oligocene/Miocene

**Tha** Hawthorn Group, Arcadia Formation  
**That** Hawthorn Group, Arcadia Formation, Tampa Member

#### Oligocene

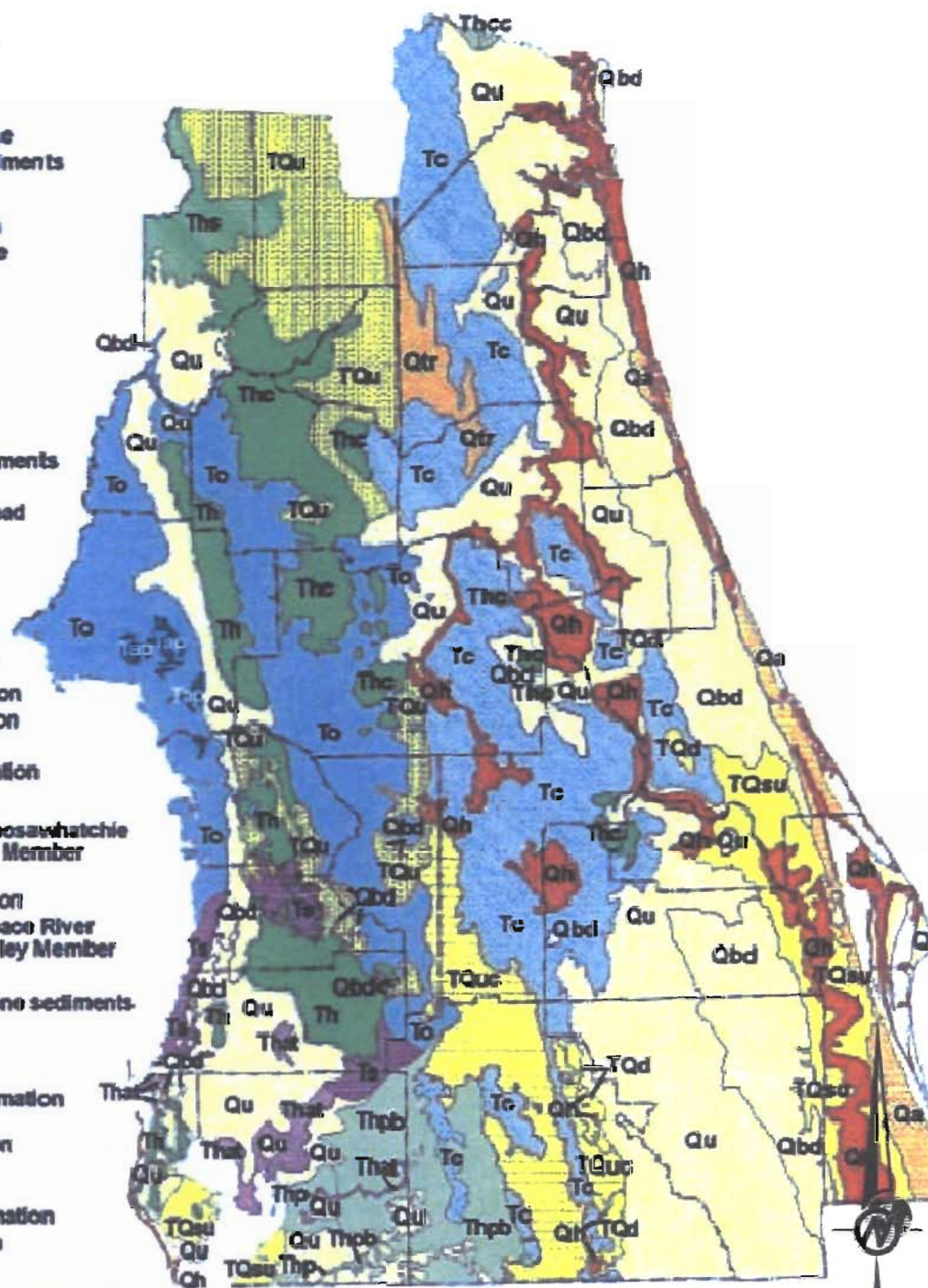
**Tro** Residuum on Oligocene sediments  
**Ts** Suwannee Limestone  
**Tsm** Suwannee Limestone - Marianna Limestone undifferentiated

#### Eocene

**Tre** Residuum on Eocene sediments  
**To** Ocala Limestone  
**Tap** Avon Park Formation

## REFERENCES

1.) FLORIDA GEOLOGICAL SURVEY OPEN FILE REPORT 80, 2001



30 0 30  
 1" TO 1 MILE MILES

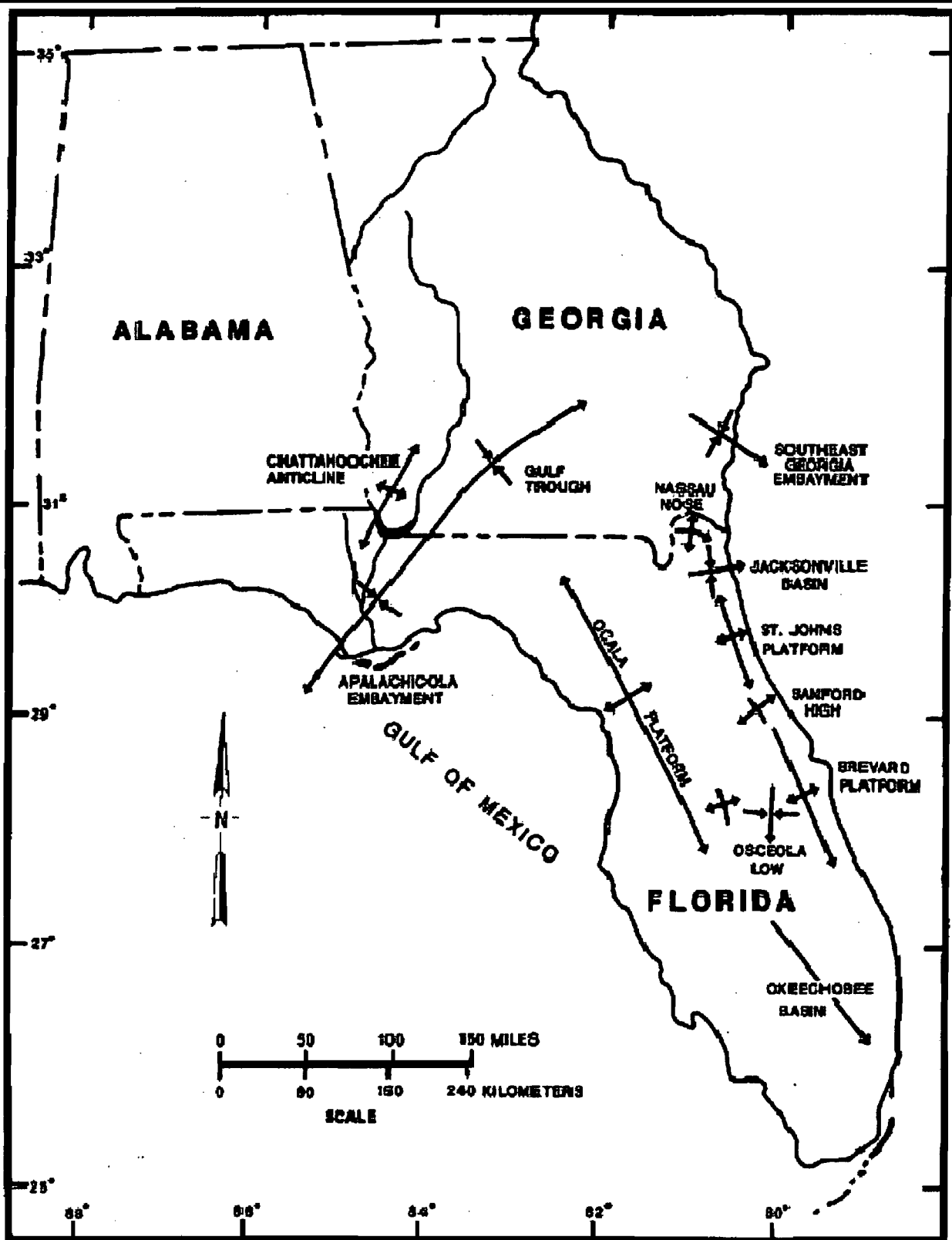
PROJECT  
 PROGRESS ENERGY - FLORIDA  
 CRYSTAL RIVER UNIT 3  
 POWER UPRATE PROJECT  
 CITRUS COUNTY, FLORIDA

TITLE  
 NORTHERN PENINSULA GEOLOGIC MAP



PROJECT No.	073-89531	FILE No.	07389531B004
DESIGN	MEF	04/24/07	SCALE AS SHOWN REV. 0
CADD	GAV	04/24/07	
CHECK	MEF	04/30/07	
REVIEW	MM	04/30/07	

FIGURE 2.3.1-1

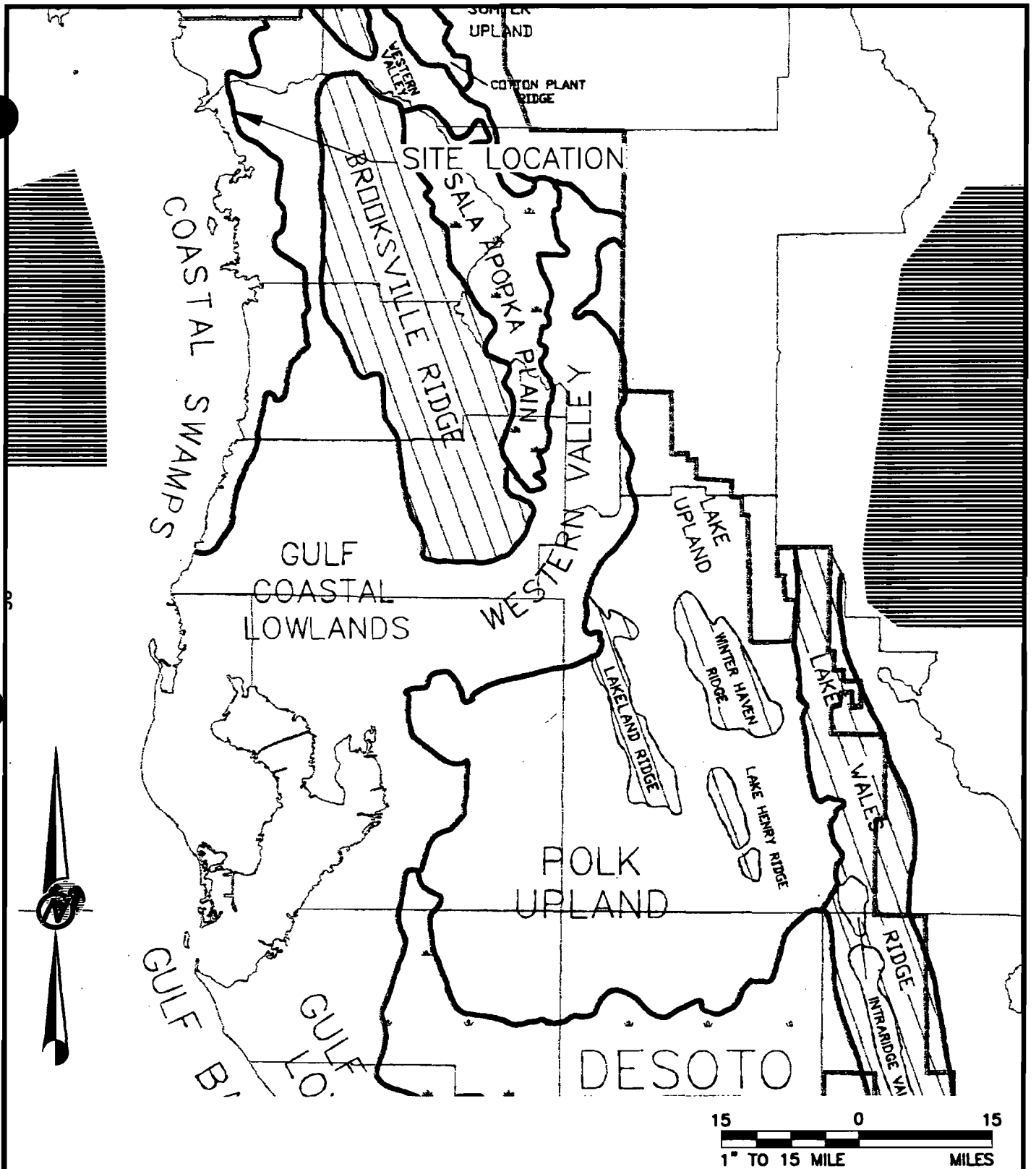


PROJECT		PROGRESS ENERGY - FLORIDA CRYSTAL RIVER UNIT 3 POWER UPRATE PROJECT CITRUS COUNTY, FLORIDA			
TITLE		FLORIDA GEOLOGIC STRUCTURES			
PROJECT No.		073-89531		FILE No.	
DESIGN	MEF	04/24/07	SCALE	AS SHOWN	REV. 0
CADD	GAV	04/24/07	FIGURE 2.3.1-2		
CHECK	MEF	04/30/07			
REVIEW	MM	04/30/07			




## REFERENCES

- 1.) FLORIDA GEOLOGICAL SURVEY OPEN FILE REPORT 80, 2001

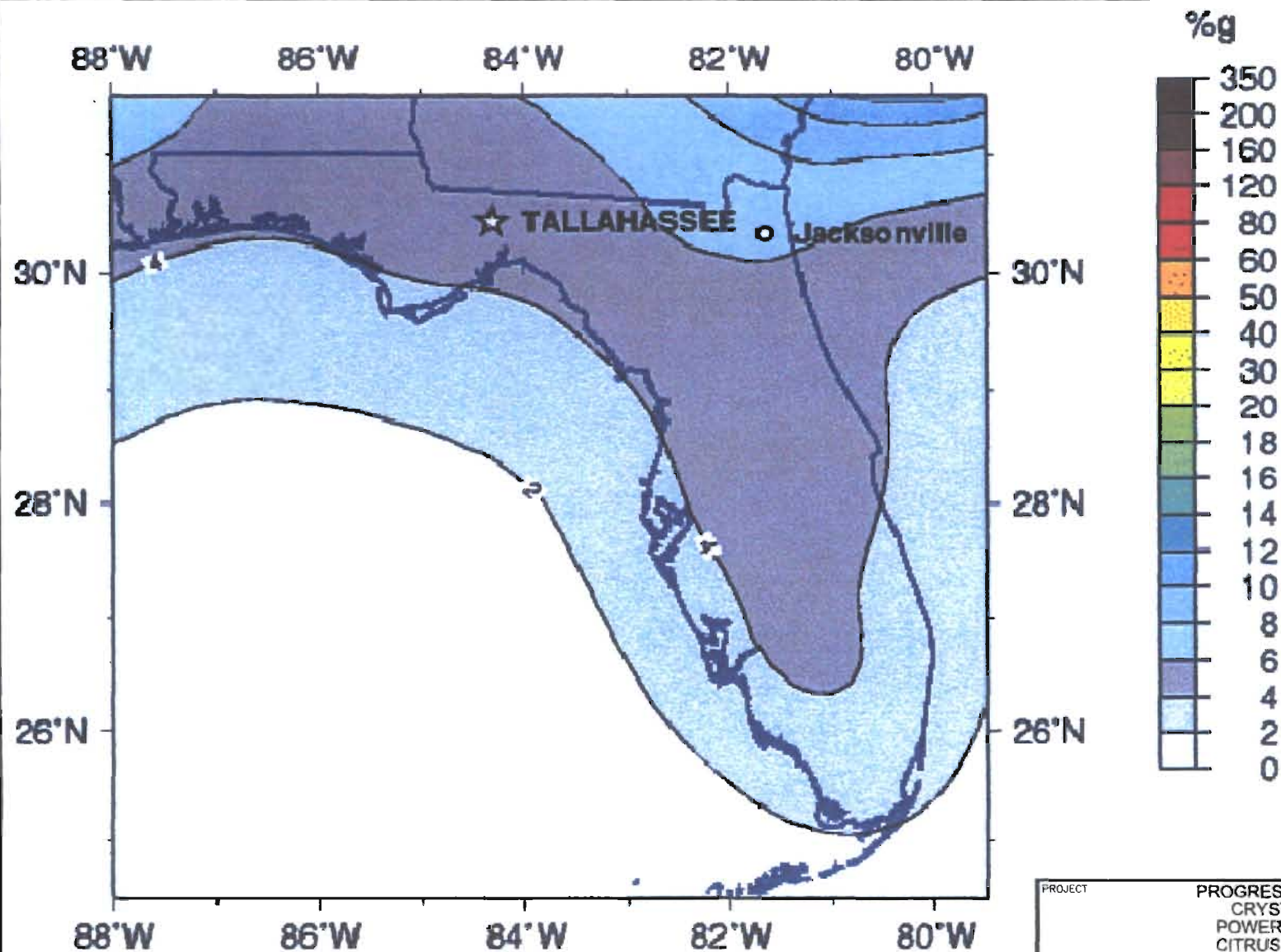


## REFERENCES

- 1.) FLORIDA GEOLOGICAL SURVEY GEOLOGICAL OVERVIEW OF CRYSTAL RIVER, FLORIDA 1992.

PROJECT		PROGRESS ENERGY - FLORIDA CRYSTAL RIVER UNIT 3 POWER UPRATE PROJECT CITRUS COUNTY, FLORIDA	
TITLE		<b>GEOMORPHOLOGIC FEATURES OF SWFWMD WATER MANAGEMENT DISTRICT</b>	
 <b>Golder Associates</b> Tampa, Florida		PROJECT No.	073-89531
		DESIGN	MEF 04/24/07
		CADD	GAV 04/27/07
		CHECK	MEF 04/27/07
		REVIEW	MM 04/30/07
		FILE No.	07389531B006
		SCALE	AS SHOWN
		REV.	0
<b>FIGURE 2.3.1-3</b>			





## REFERENCES

- 1.) NATIONAL SEISMIC HAZARD MAPPING PROJECT SITE:NEHRP  
B-C BOUNDARY

PROJECT  
 PROGRESS ENERGY - FLORIDA  
 CRYSTAL RIVER UNIT 3  
 POWER UPRATE PROJECT  
 CITRUS COUNTY, FLORIDA

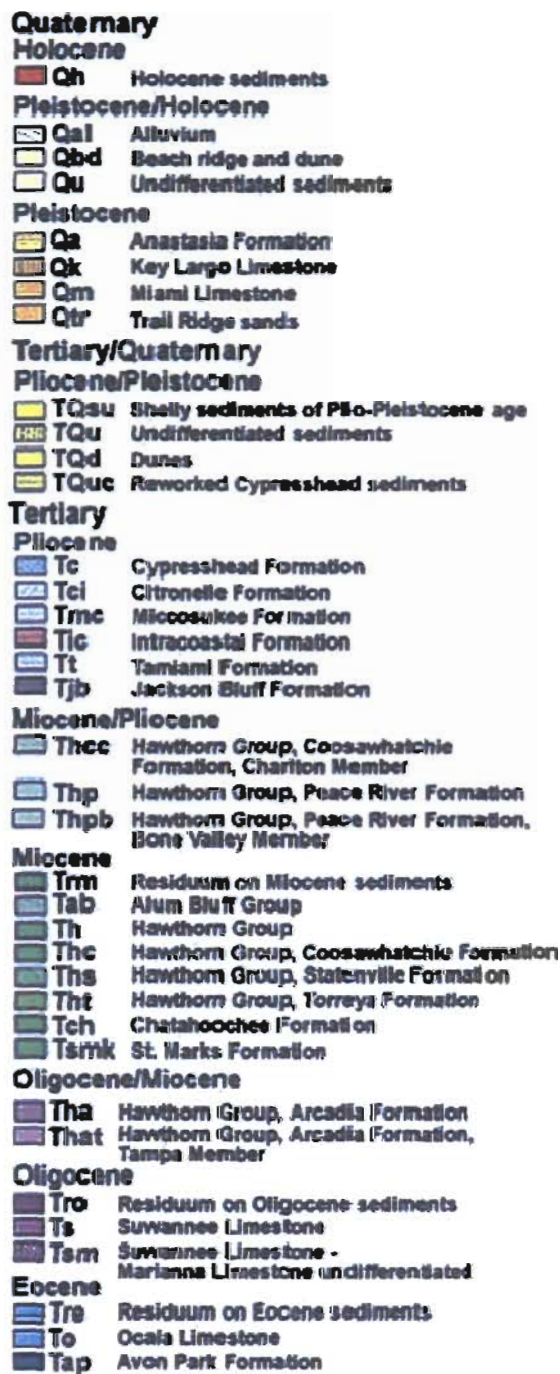
TITLE  
**PEAK ACCELERATION WITH 2%  
 PROBABILITY OF EXCEEDANCE IN 50  
 YEARS**



**Golder  
 Associates**  
 Tampa, Florida


PROJECT No.	073-89531	FILE No.	07389531B007
DESIGN	MEF	04/24/07	SCALE AS SHOWN REV. 0
CADD	GAV	04/24/07	
CHECK	MEF	04/30/07	
REVIEW	NM	04/30/07	

**FIGURE 2.3.1-4**

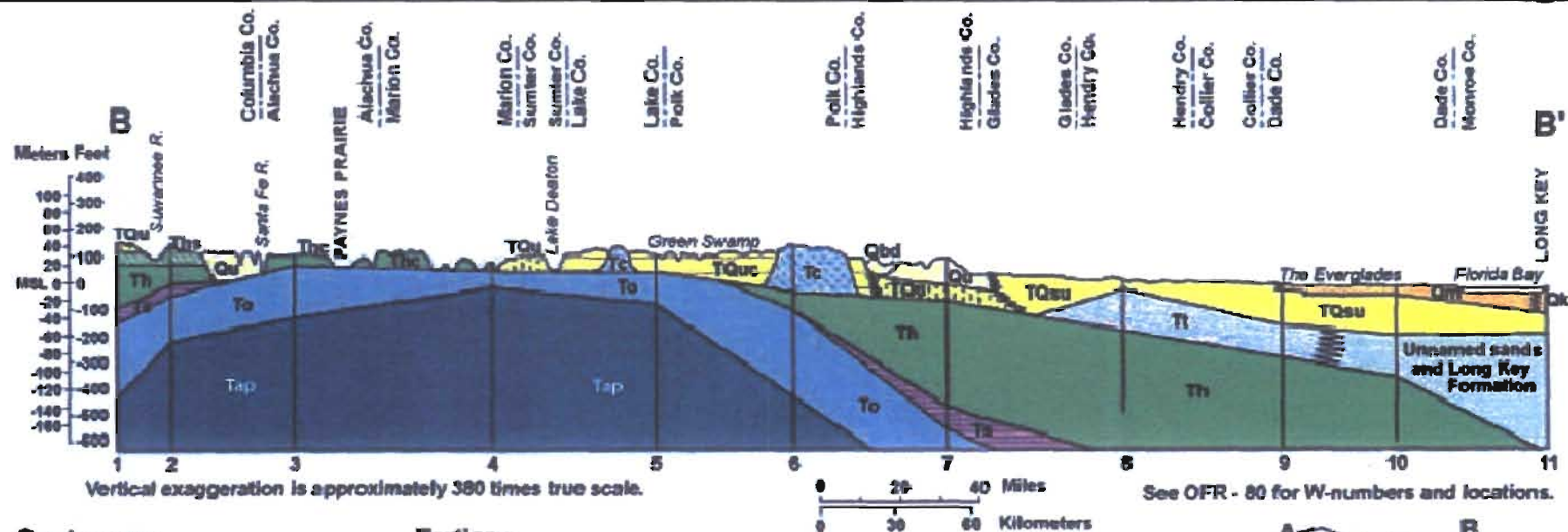


## REFERENCES

1.) FLORIDA GEOLOGICAL SURVEY OPEN FILE REPORT 80,  
2001

PROJECT		PROGRESS ENERGY - FLORIDA CRYSTAL RIVER UNIT 3 POWER UPRATE PROJECT CITRUS COUNTY, FLORIDA				
TITLE						
STRATIGRAPHIC COLUMN SHOWING LITHOSTRATIGRAPHIC UNITS						
	PROJECT No.		073-89531		FILE No.	073895318008
	DESIGN	MEF	04/24/07		SCALE	AS SHOWN
	CADD	CAV	04/24/07		REV.	0
	CHECK	MEF	04/30/07		FIGURE 2.3.1-5	
	REVIEW	MM	04/30/07			





### Quaternary

- Holocene**
- Qh Holocene sediments
- Pleistocene/Holocene**
- Qal Alluvium
  - Qbd Beach ridge and dune
  - Qu Undifferentiated sediments
- Pleistocene**
- Qa Anastasia Formation
  - Qk Key Largo Limestone
  - Qm Miami Limestone
  - Qtr Trail Ridge sands

### Tertiary/Quaternary

- Pliocene/Pleistocene**
- TQsu Shelly sediments of Plio-Pleistocene age
  - TQu Undifferentiated sediments
  - TQd Dunes
  - TQuc Reworked Cypresshead sediments

### Tertiary

- Pliocene**
- Tc Cypresshead Formation
  - Tci Citronelle Formation
  - Tmc Miccosukee Formation
  - Tic Intracoastal Formation
  - Tt Tamiami Formation
  - Tjb Jackson Bluff Formation
- Miocene/Pliocene**
- Thcc Hawthorn Group, Coosawhatchie Formation, Charlton Member
  - Thp Hawthorn Group, Peace River Formation
  - Thpb Hawthorn Group, Peace River Formation, Bone Valley Member
- Miocene**
- Trm Residuum on Miocene sediments
  - Tab Alum Bluff Group
  - Th Hawthorn Group
  - Thc Hawthorn Group, Coosawhatchie Formation
  - Ths Hawthorn Group, Statenville Formation
  - Tht Hawthorn Group, Torreya Formation
  - Tch Chalahoochee Formation
  - Tsmk St. Marks Formation

### Oligocene/Miocene

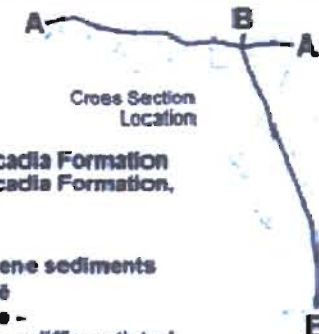
- Tha Hawthorn Group, Arcadia Formation
- That Hawthorn Group, Arcadia Formation, Tampa Member

### Oligocene

- Tro Residuum on Oligocene sediments
- Ts Suwannee Limestone
- Tsm Suwannee Limestone - Marianna Limestone undifferentiated

### Eocene

- Tre Residuum on Eocene sediments
- To Ocala Limestone
- Tap Avon Park Formation



## REFERENCES

- 1.) FLORIDA GEOLOGICAL SURVEY OPEN FILE REPORT 80, 2001


PROJECT	PROGRESS ENERGY-FLORIDA CRYSTAL RIVER UNIT 3 POWER UPRATE PROJECT CITRUS COUNTY, FLORIDA			
TITLE	GEOLOGIC CROSS-SECTION B			
	PROJECT No.	073-89531	FILE No.	073895318019
	DESIGN	MEF	04/30/07	SCALE AS SHOWN
	CADD	MEF	04/30/07	REV. 0
	CHECK	MM	04/30/07	
	REVIEW	MM	04/30/07	

FIGURE 2.3.1-6

## LEGEND



SAND



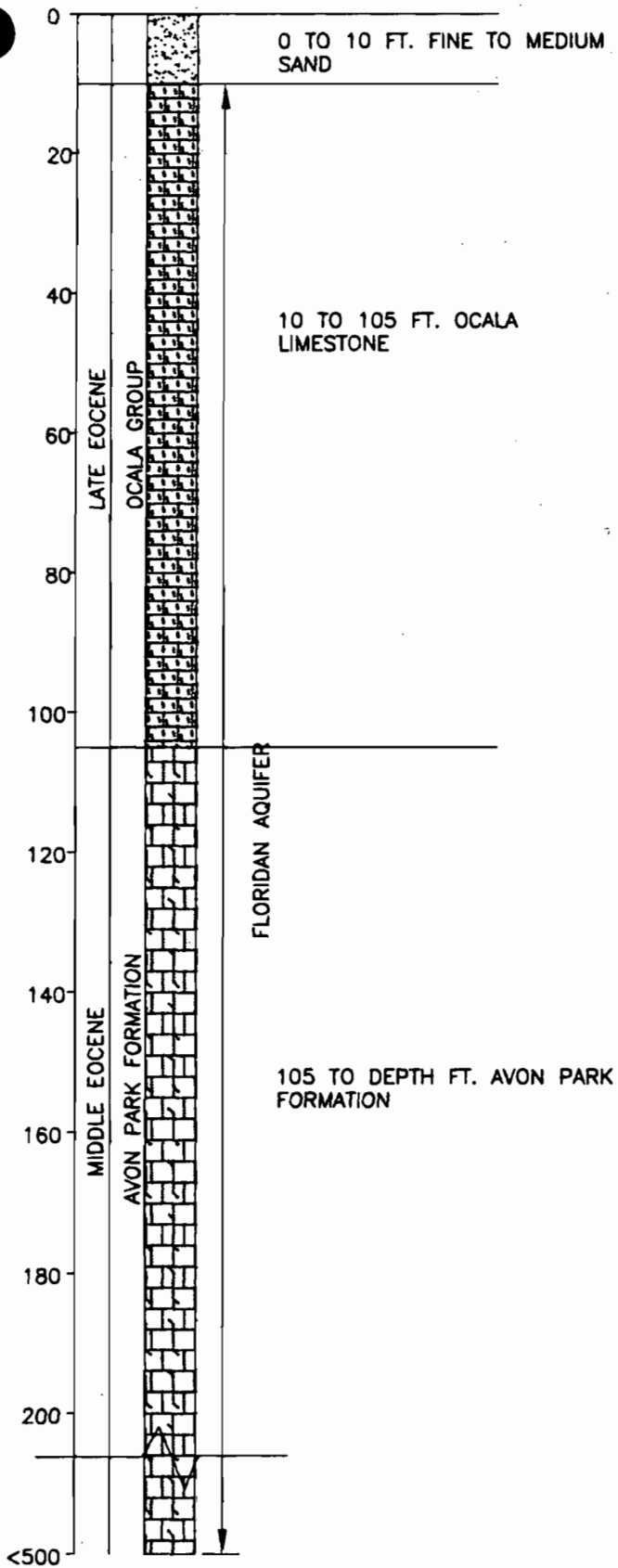
FRACTURED LIMESTONE



LIMESTONE

## REFERENCES

- 1.) GERAGHTY AND MILLER, INC, 1977.



0 00 00 00  
SCALE: 1" = 00'


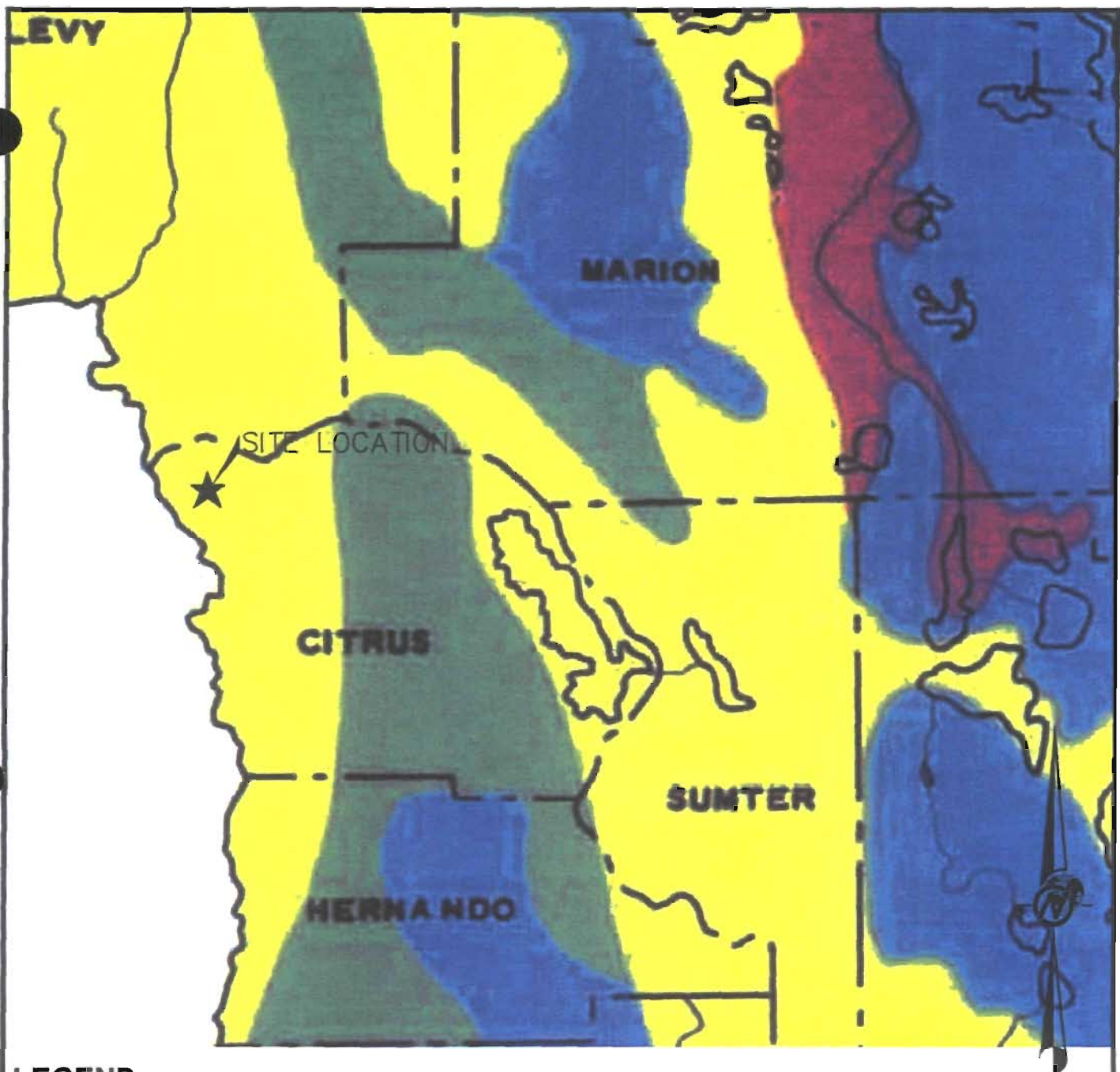
PROJECT		PROGRESS ENERGY-FLORIDA CRYSTAL RIVER UNIT3 POWER UPRATE PROJECT CITRUS COUNTY, FLORIDA	
TITLE		GENERALIZED STRATIGRAPHIC COLUMN	
 <b>Golder Associates</b> Tampa, Florida		PROJECT No.	073-89531
		DESIGN	MEF 04/30/07
		CADD	MEF 04/30/07
		CHECK	MM 04/30/07
		REVIEW	MM 04/30/07
		FILE No.	07895318020
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		REV.	0

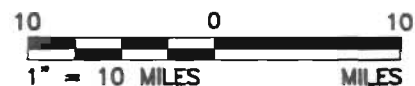
FIGURE 2.3.1-7






## LEGEND

- AREA I. BARE OR THINLY COVERED LIMESTONE**  
Sinkholes are few, generally shallow and broad, and develop gradually. Solution sinkholes dominate
- AREA II. COVER IS 30 TO 200 FEET THICK**  
Consists mainly of incohesive and permeable sand. Sinkholes are few, shallow, of small diameter, and develop gradually. Cover-subsidence sinkholes dominate
- AREA III. COVER IS 30 TO 200 FEET THICK**  
Consists mainly of cohesive clayey sediments of low permeability. Sinkholes are most numerous, of varying size, and develop abruptly. Cover-collapse sinkholes dominate
- AREA IV. COVER IS MORE THAN 200 FEET THICK**  
Consists of cohesive sediments interlayered with discontinuous carbonate beds. Sinkholes are very few, but several large diameter, deep sinkholes occur. Cover-collapse sinkholes dominate

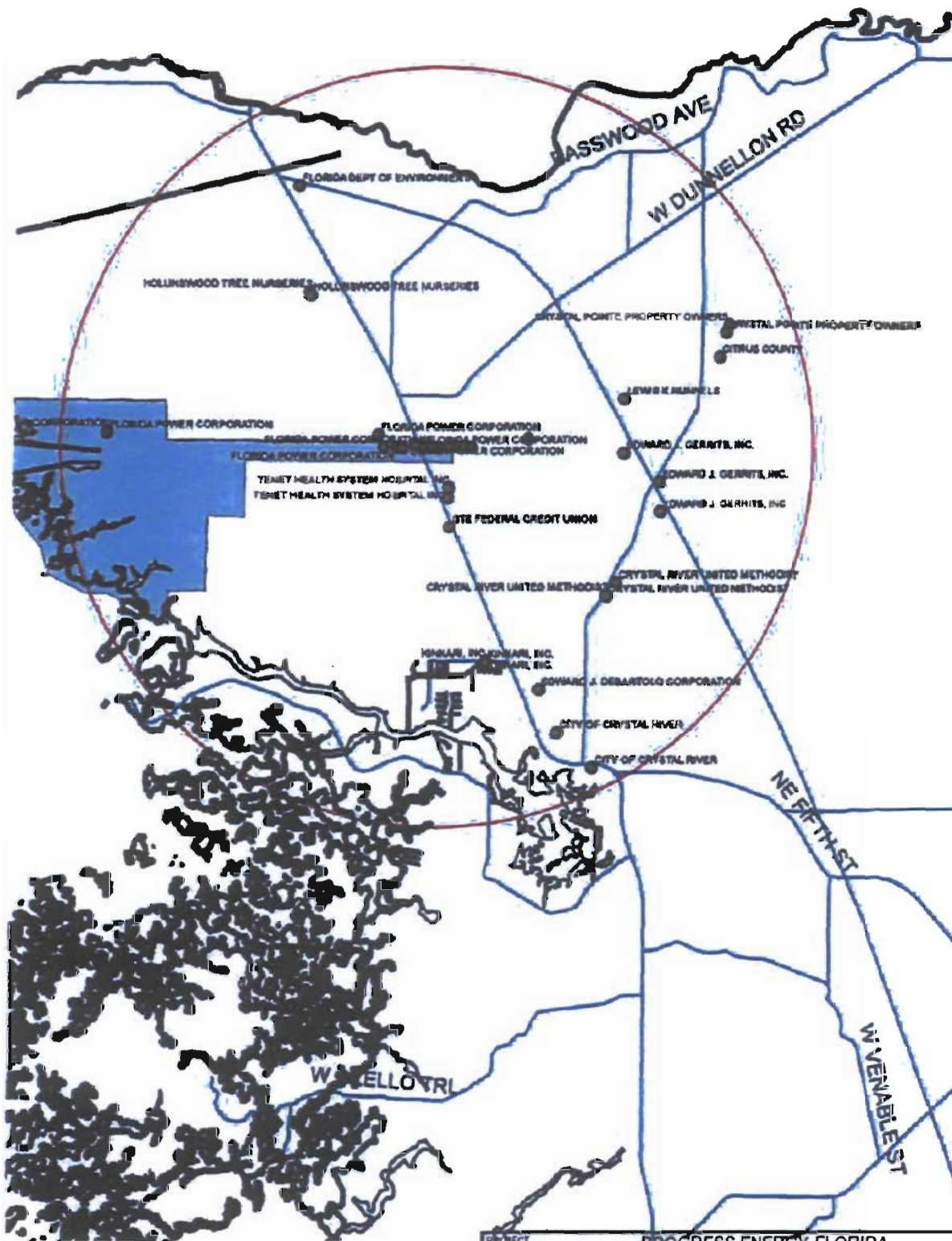


## REFERENCES

1.) FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION  
MAP SERIES 110


PROJECT	PROGRESS ENERGY - FLORIDA CRYSTAL RIVER UNIT 3 POWER UPRATE PROJECT CITRUS COUNTY, FLORIDA			
TITLE	<b>SINKHOLE TYPE, DEVELOPMENT AND DISTRIBUTION IN FLORIDA MAP</b>			
 <b>Golder Associates</b> Tampa, Florida	PROJECT No.	073-89531	FILE No.	07389531B017
	DESIGN	MEF	04/24/07	SCALE AS SHOWN
	CADD	GAV	04/24/07	REV. 0
	CHECK	MM	04/30/07	
	REVIEW	MM	04/30/07	<b>FIGURE 2.3.2-1</b>



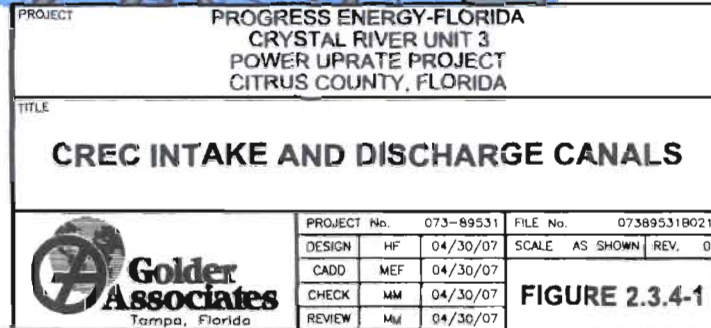


## REFERENCES

- 1.) PROGRESS ENERGY FLORIDA, WUP APPLICATION, 2006

PROJECT				PROGRESS ENERGY-FLORIDA CRYSTAL RIVER UNIT3 POWER UPRATE PROJECT CITRUS COUNTY, FLORIDA						
TITLE				SWFWMD PERMITTED WATER USE WELLS WITHIN 5 MILES OF CREC						
 <b>Golder Associates</b> Tampa, Florida		PROJECT No.		073-89531		FILE No.		0789531B026		
		DESIGN	MEF	05/21/07		SCALE	AS SHOWN		REV.	0
		CADD	MEF	05/21/07		<b>FIGURE 2.3.3-1</b>				
		CHECK	MM	05/21/07						
		REVIEW	MM	05/21/07						



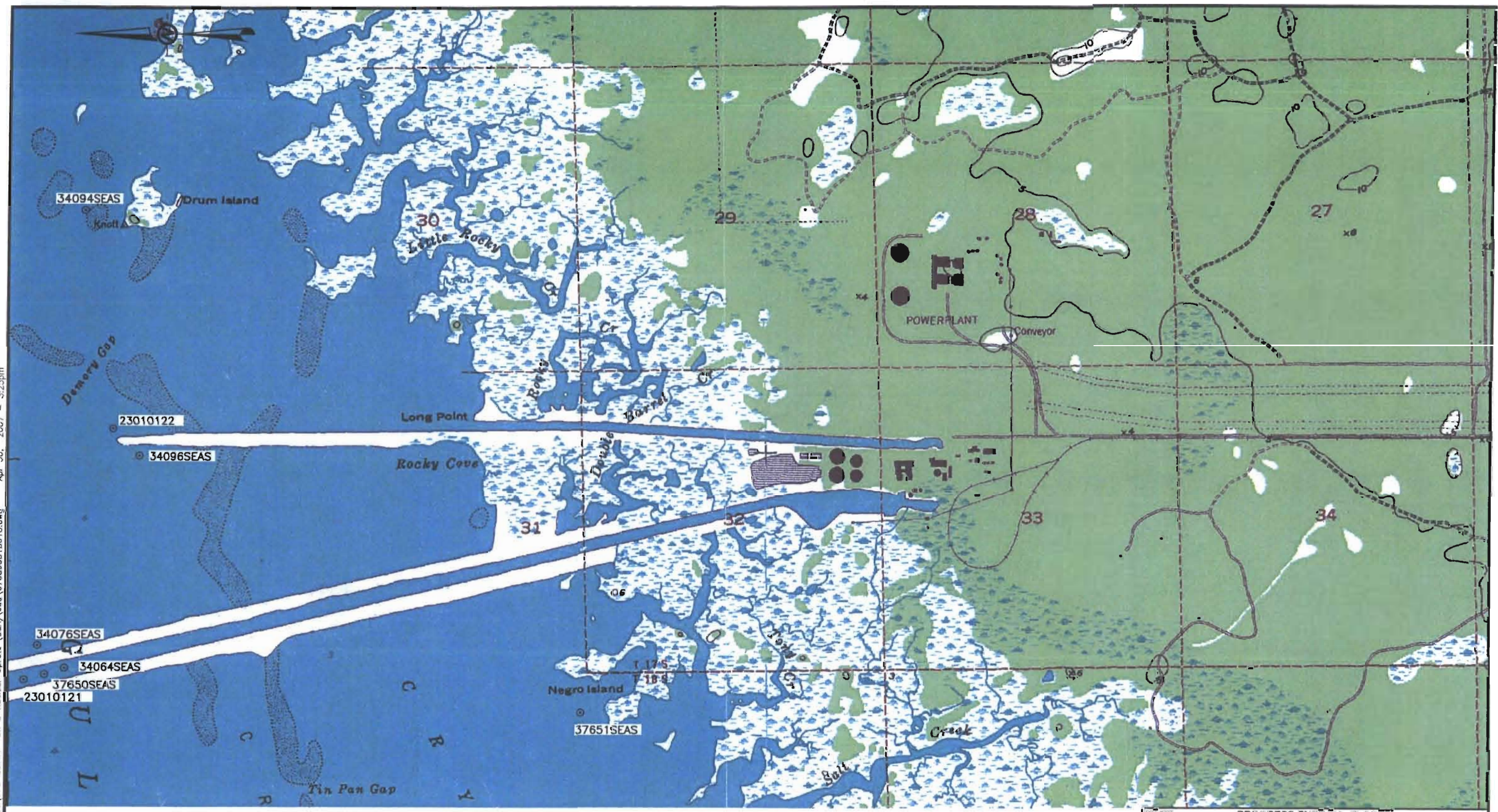


## REFERENCES

- 1.) NOAA NAUTICAL CHART



Drawing file: F:\PROJECTS\2007 PROJ\073-89531 CR 3 Nuclear Uprate (SCA)\cad\07389531B018.dwg Apr 30, 2007 - 3:25pm

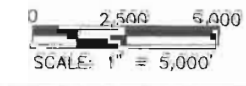


### REFERENCES

- 1.) USGS 7.5 MIN DRG (FLORIDA)  
RED LEVEL

### LEGEND

- CRYSTAL BAY WATER QUALITY STATION

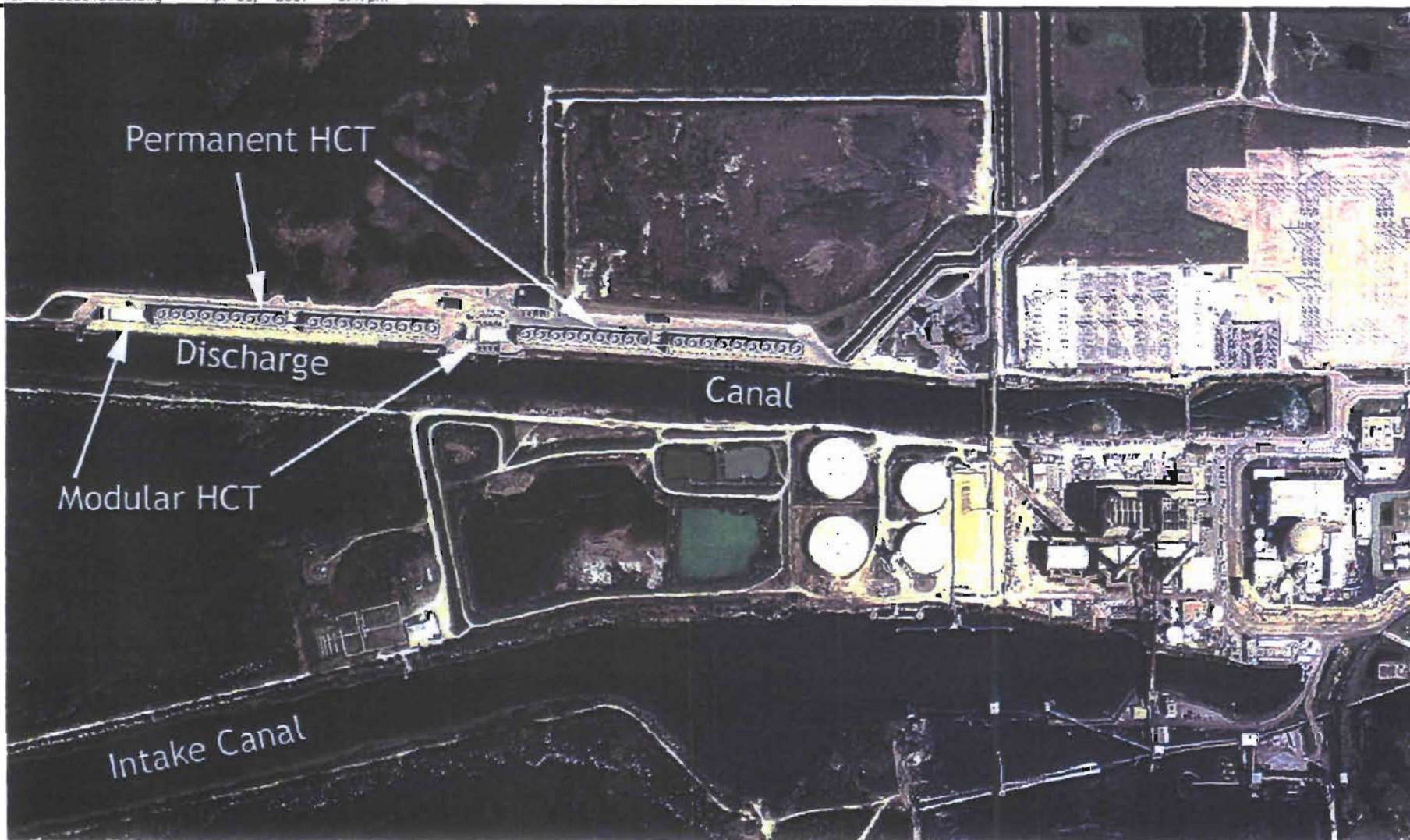



PROJECT		PROGRESS ENERGY - FLORIDA CRYSTAL RIVER UNIT 3 POWER UPRATE PROJECT CITRUS COUNTY, FL	
TITLE		WATER QUALITY STATIONS	
PROJECT No. 073-89531		FILE No. 07389531 R018	
DESIGN	MEF	04/26/07	SCALE AS SHOWN
DRAW	DAY	04/27/07	
CHECK	MEF	04/27/07	
REVIEW	NM	04/30/07	

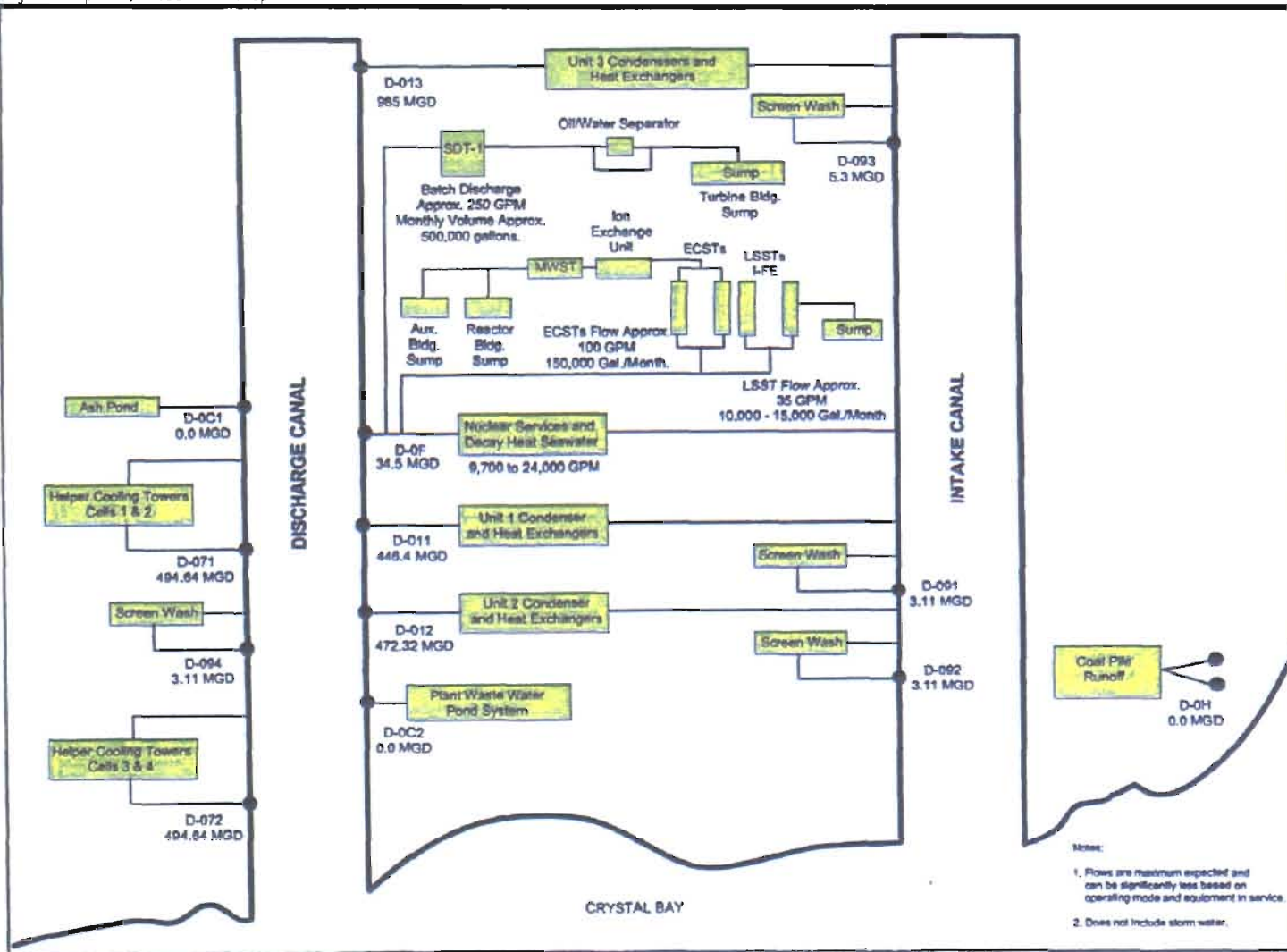
**FIGURE 2.3.4-2**

**Golden Associates**  
Tampa, Florida





PROJECT		PROGRESS ENERGY-FLORIDA CRYSTAL RIVER UNIT 3 POWER UPRATE PROJECT CITRUS COUNTY, FLORIDA			
TITLE		EXISTING CR 1,2,3 HEAT DISSIPATION SYSTEM FEATURES			
 <b>Golder Associates</b> Tampa, Florida		PROJECT No.	073-89531	FILE No.	07389531B025
		DESIGN	HF 04/30/07	SCALE	AS SHOWN REV. 0
		CADD	MEF 04/30/07	<b>FIGURE 2.3.4-3</b>	
		CHECK	MM 04/30/07		
		REVIEW	MM 04/30/07		



## REFERENCES

1.) NPDES FLOW DIAGRAM #FL0000159

PROJECT

PROGRESS ENERGY-FLORIDA  
CRYSTAL RIVER UNIT 3  
POWER UPRATE PROJECT  
CITRUS COUNTY, FLORIDA

TITLE

EXISTING CR 1,2,3 WATER USE FLOW  
DIAGRAM



PROJECT No.	073-89531	FILE No.	07389531B022
DESIGN	HF	04/30/07	SCALE AS SHOWN
CADD	MEF	04/30/07	REV. 0
CHECK	MM	04/30/07	
REVIEW	MM	04/30/07	

FIGURE 2.3.4-4

Figure 2.3.4-5 Once Through Cooling Water Flow

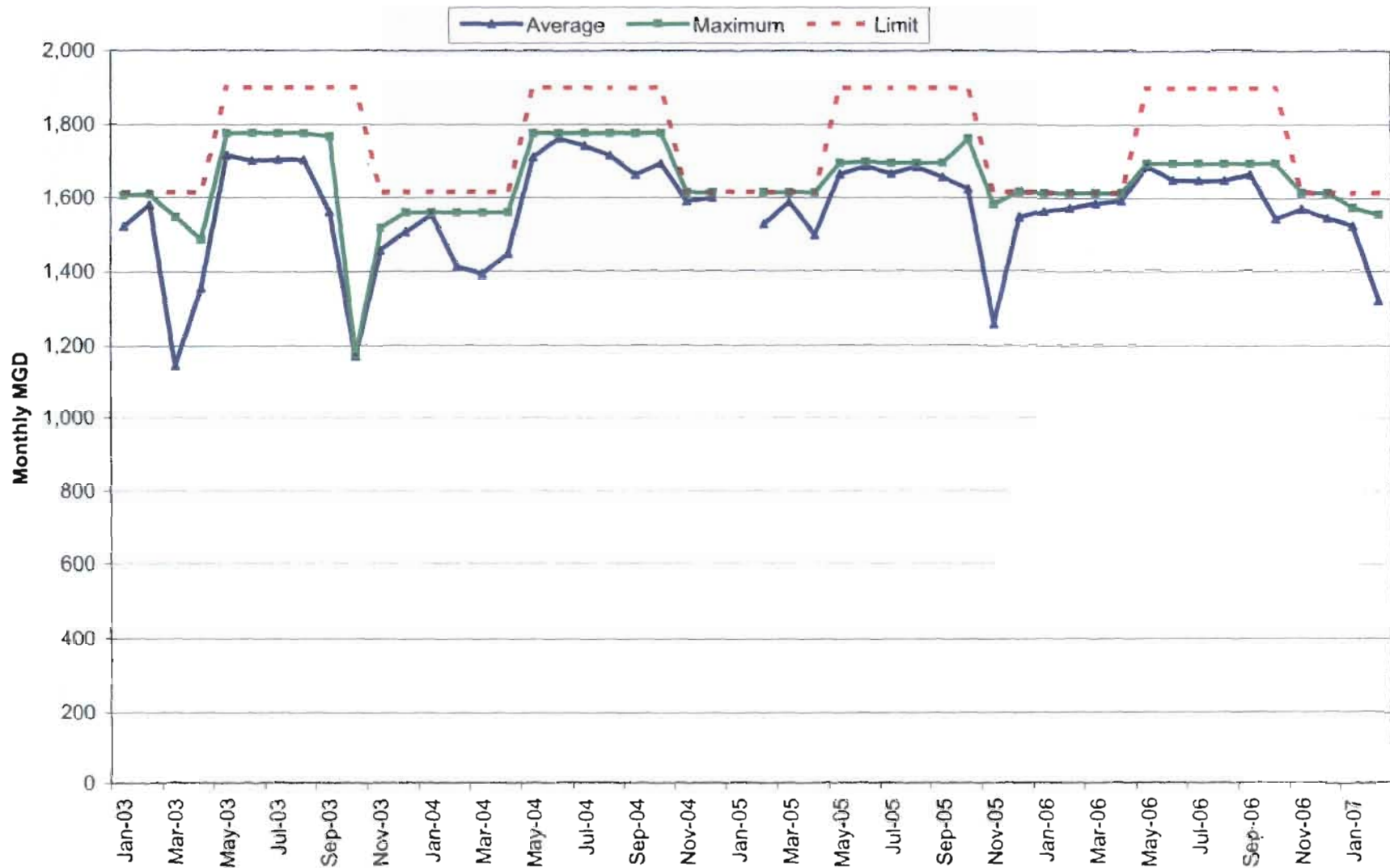




Figure 2.3.4-6 Total Dissolved Solids in the Discharge Channel

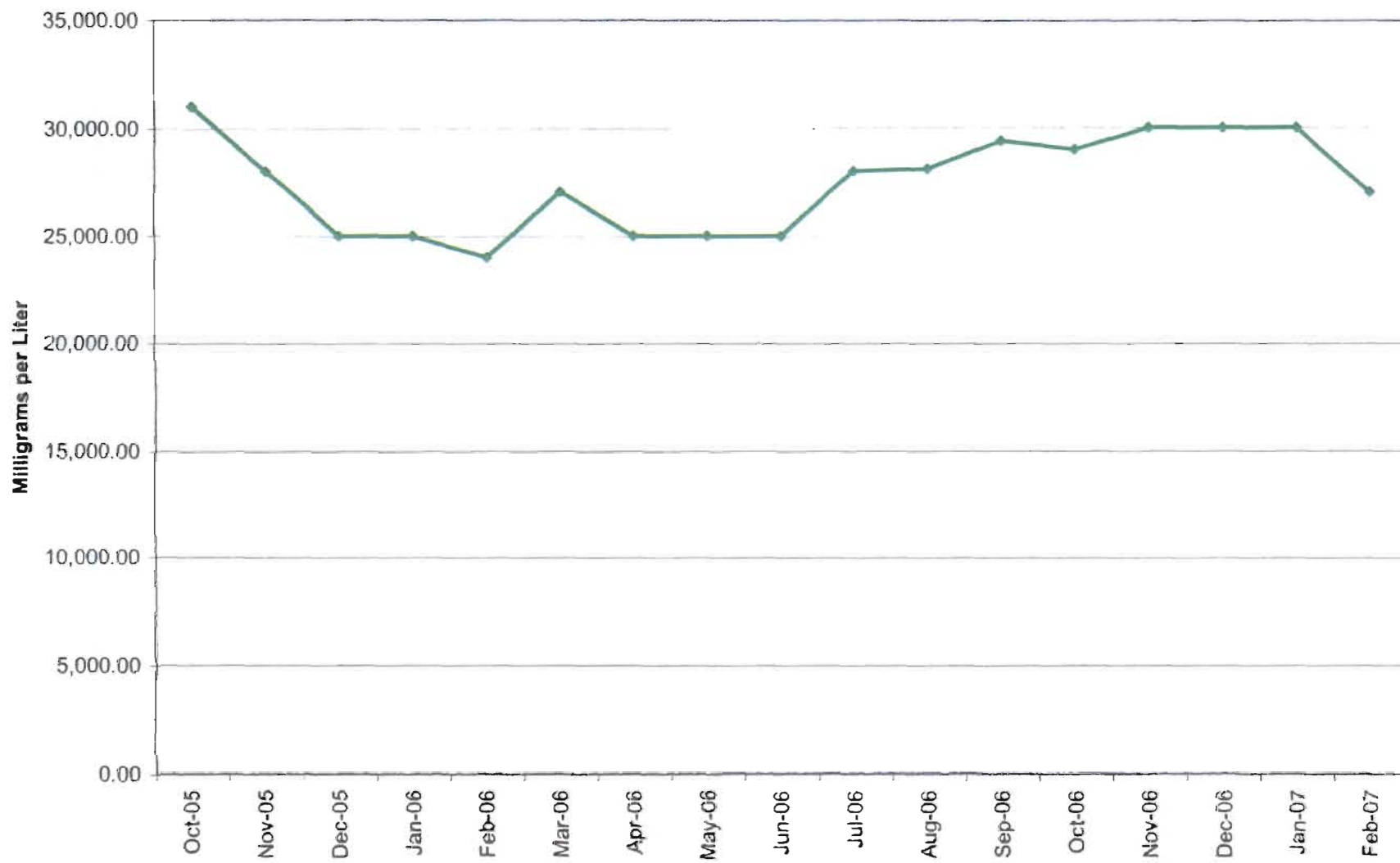


Figure 2.3.4-7 Once Through Cooling Water Temperatures

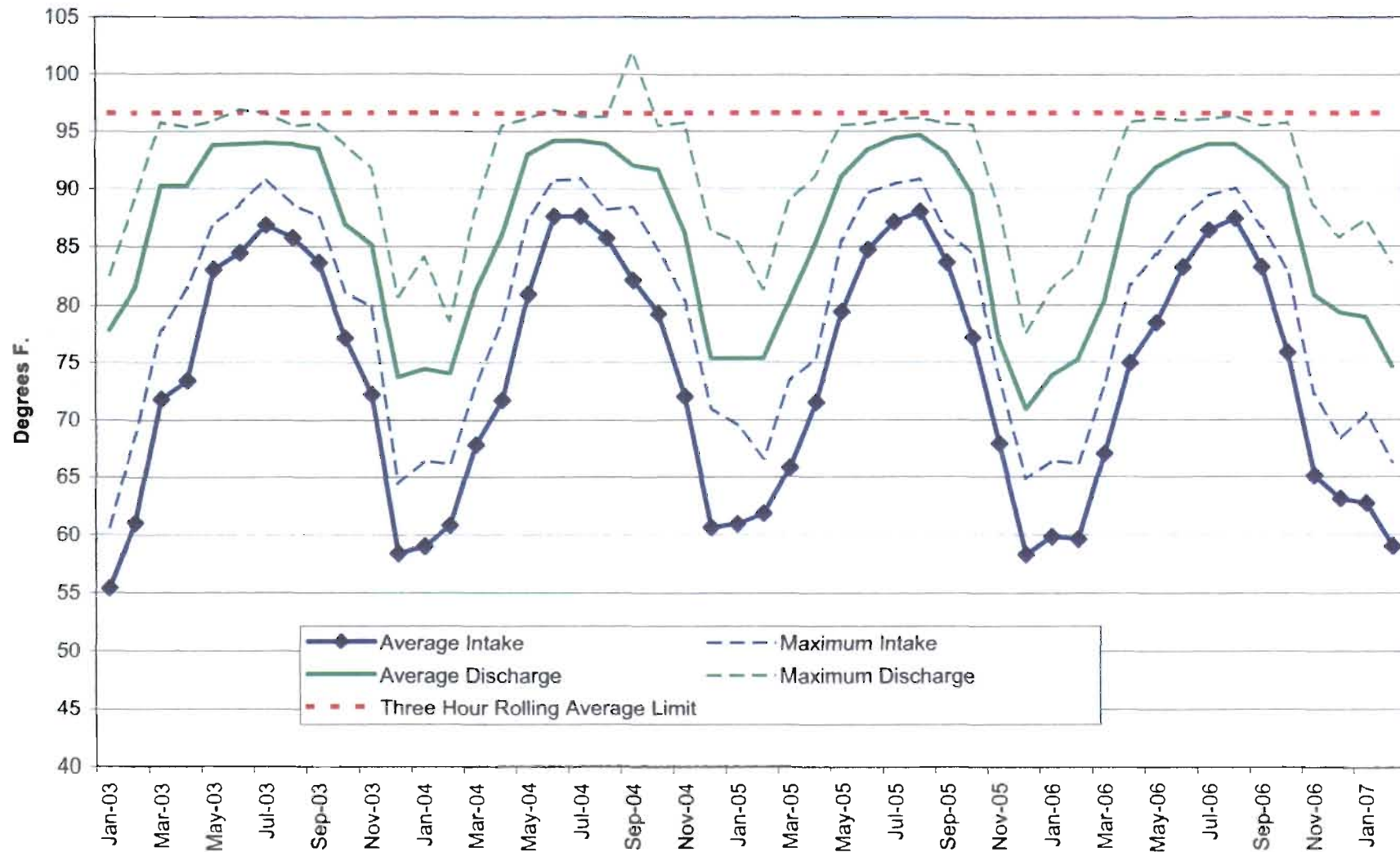
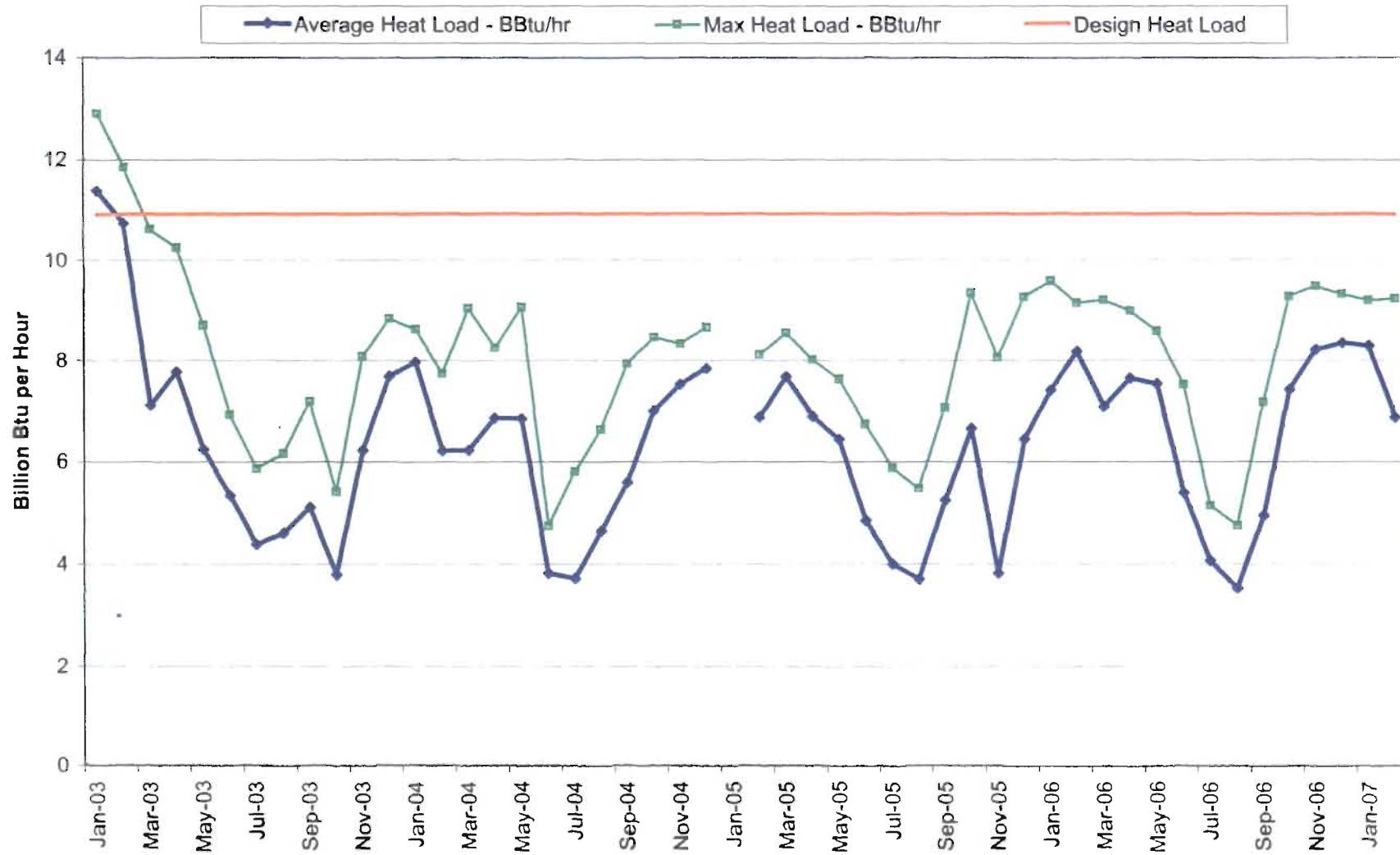




Figure 2.3.4-8 Discharge Canal Heat Load






1. 2006 Southwest Florida Water Management Aerial.
2. Crystal River Unit 3 Site Location by Golder Associates Inc.
3. FLUCFCS by Golder Associates Inc.

**PROJECT**  
**PROGRESS ENERGY FLORIDA, CRYSTAL RIVER  
 NUCLEAR UNIT 3 UPRATE PROJECT**

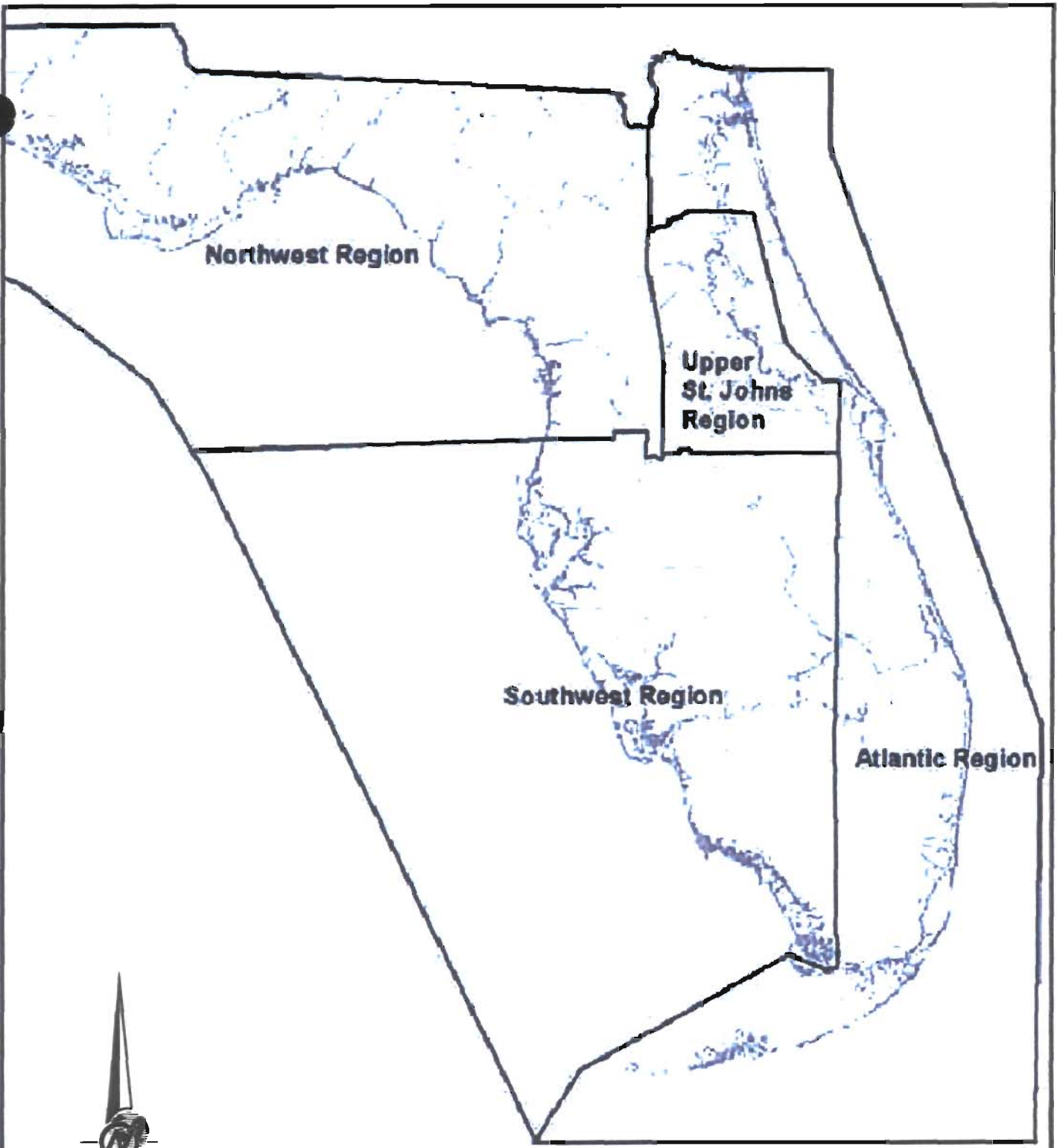
**TITLE**  
**FLORIDA LAND USE, COVER, AND FORMS  
 CLASSIFICATION SYSTEM MAP**

PROJECT No. 073-89531		SCALE AS SHOWN	REV. 0
DESIGN	JG June 01, 2007	<b>FIGURE</b> <b>2.3.5-1</b>	
GIS	JG June 01, 2007		
CHECK	KG June 01, 2007		
REVIEW	MM June 01, 2007		

 **Golder Associates**  
 Tampa, Florida




Drawing file: 07385-1B026.dwg Apr 30, 2007 - 3:35pm



**REFERENCES**

- 1.) USFWS 2001.

<b>PROJECT</b>				PROGRESS ENERGY-FLORIDA CRYSTAL RIVER UNIT3 POWER UPRATE PROJECT CITRUS COUNTY, FLORIDA					
<b>TITLE</b>				<b>SUBPOPULATIONS OF THE MANATEE IN FLORIDA</b>					
 <b>Golder Associates</b> Tampa, Florida		PROJECT No.		073-89531		FILE No.		0789531B026	
		DESIGN	AP	04/30/07		SCALE	AS SHOWN	REV.	0
		CADD	MEF	04/30/07					
		CHECK	MM	04/30/07					
		REVIEW	MM	04/30/07					

**FIGURE 2.3.6-1**

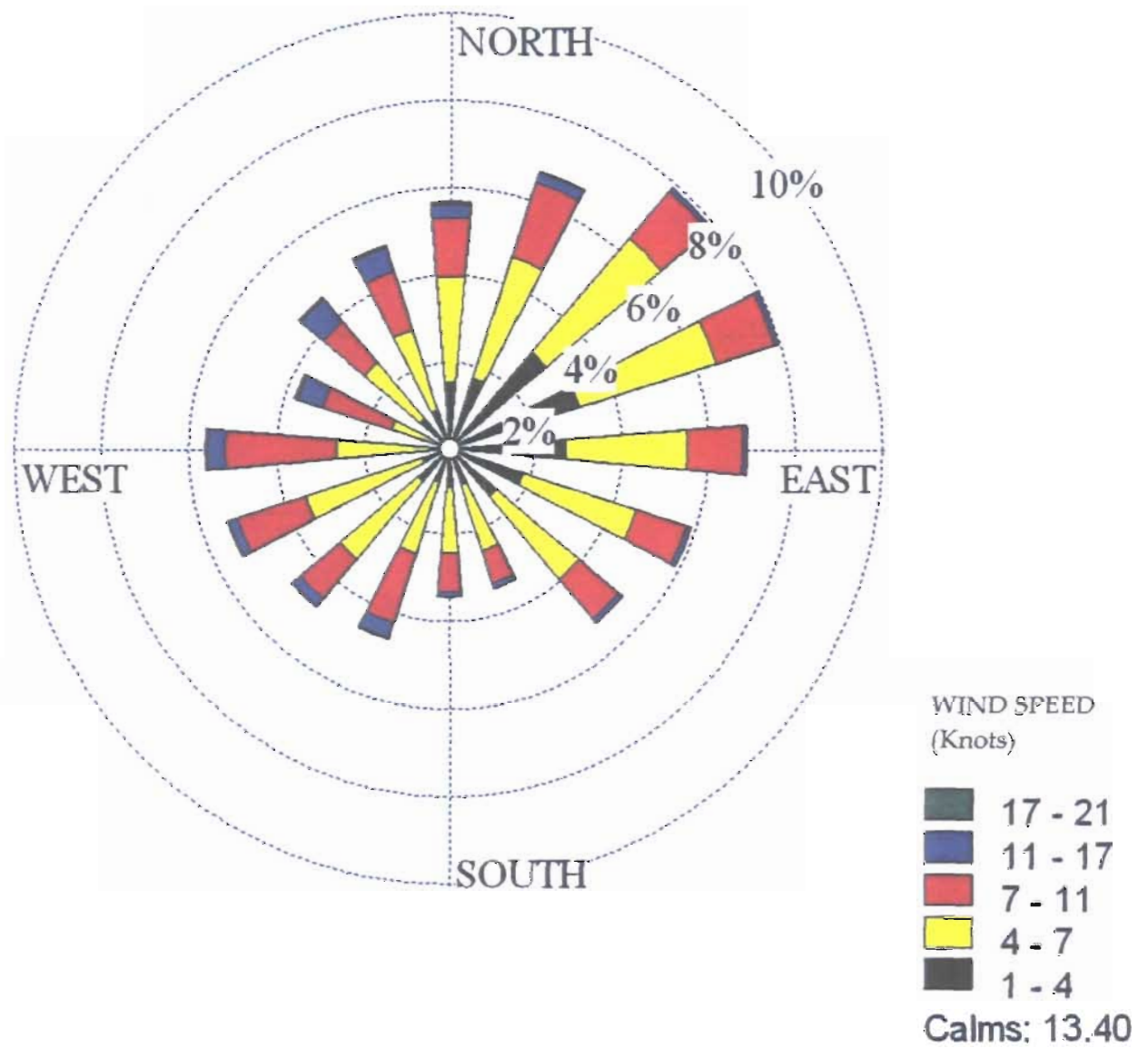
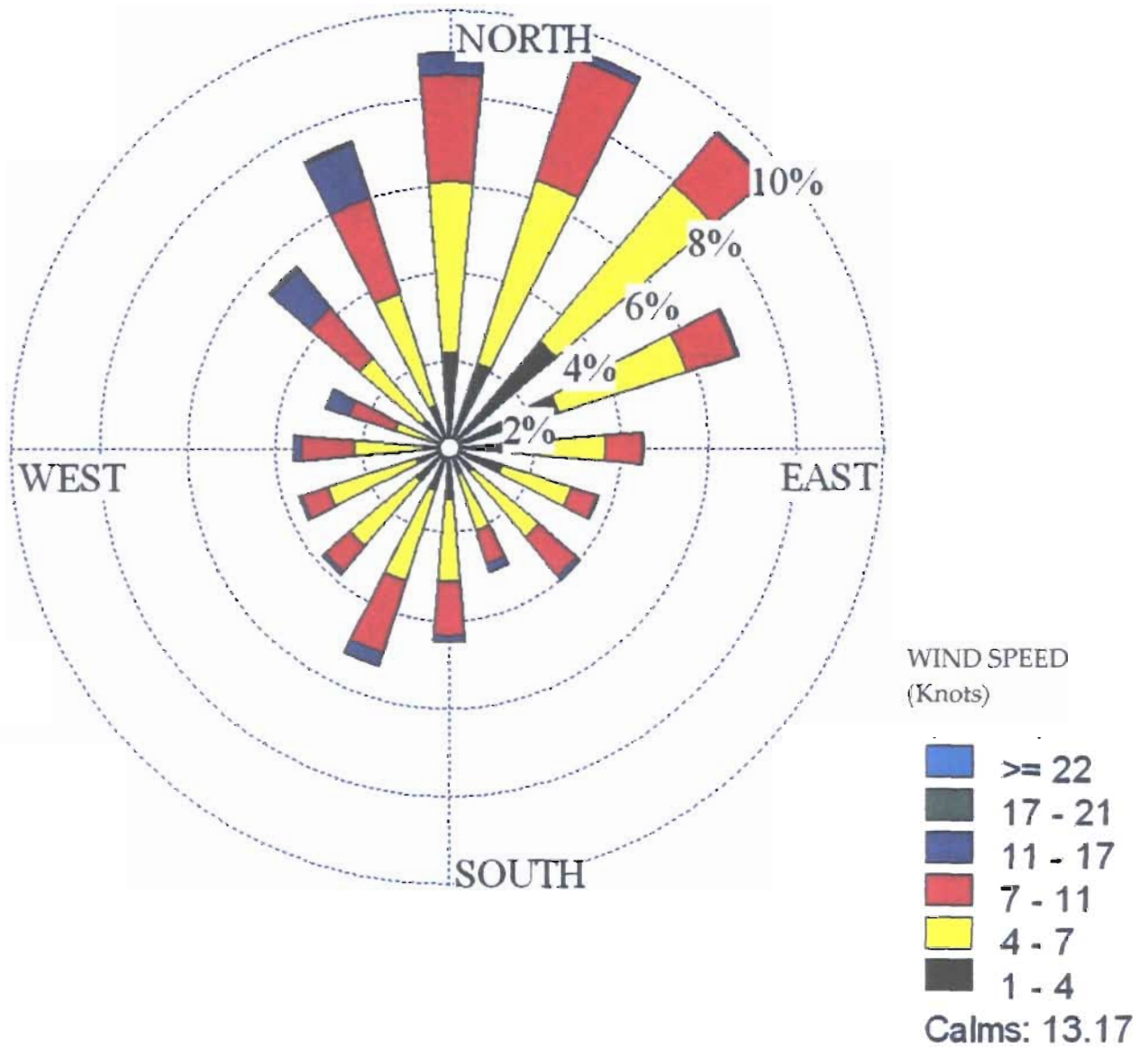


Figure 2.3.7-1.  
Annual Wind Rose for 2001 to 2005  
Tampa International Airport (Station No. 12842)

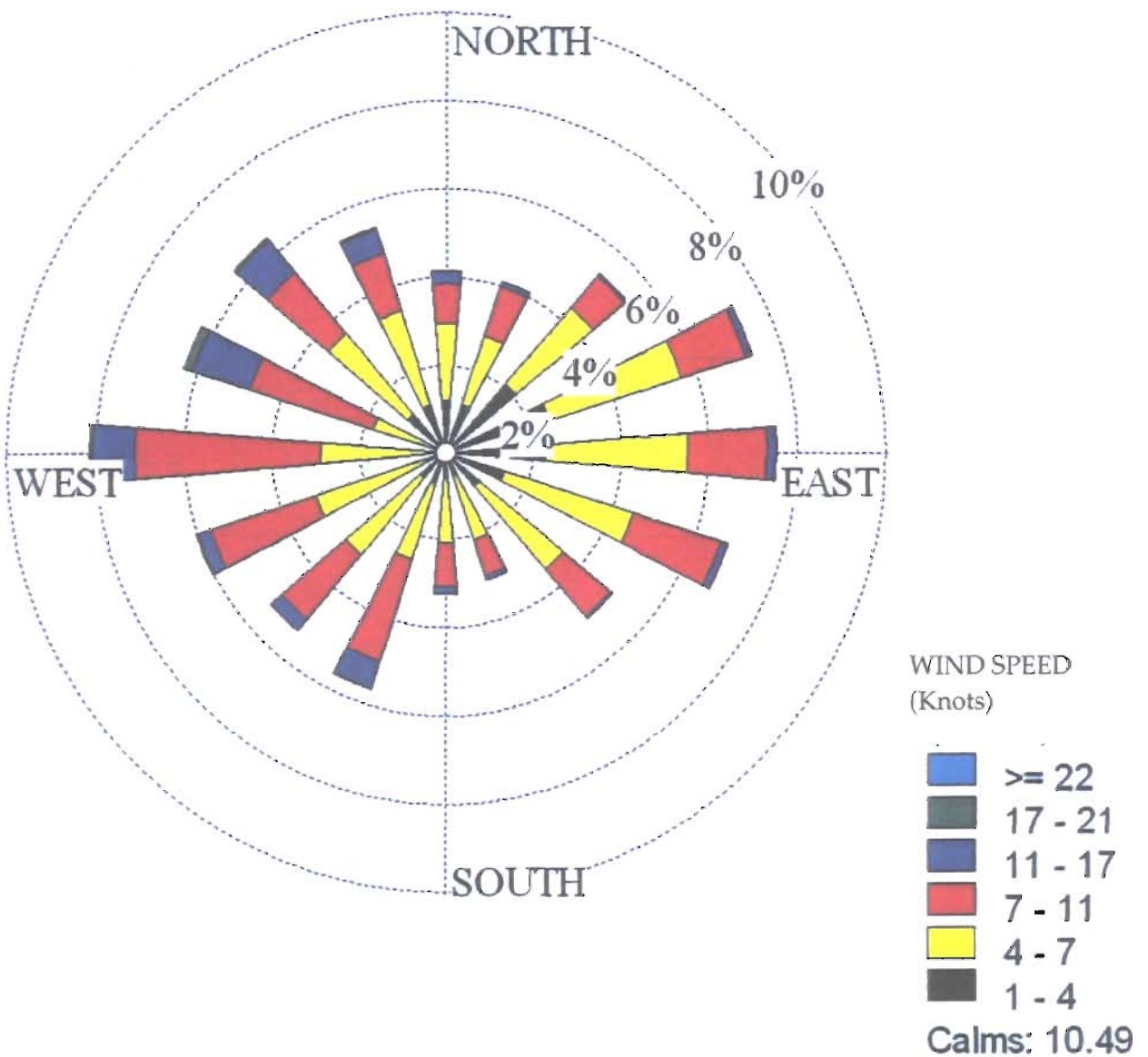
Source: National Climatic Data Center, 2001-2005.



Average Wind Speed	5.74 Knots
Calm Winds	13.17 %
Note: 1 knot = 1.151 miles per hour.	

Figure 2.3.7-2.  
Winter Wind Rose for 2001 to 2005  
Tampa International Airport (Station No. 12842)

Source: National Climatic Data Center, 2001-2005.

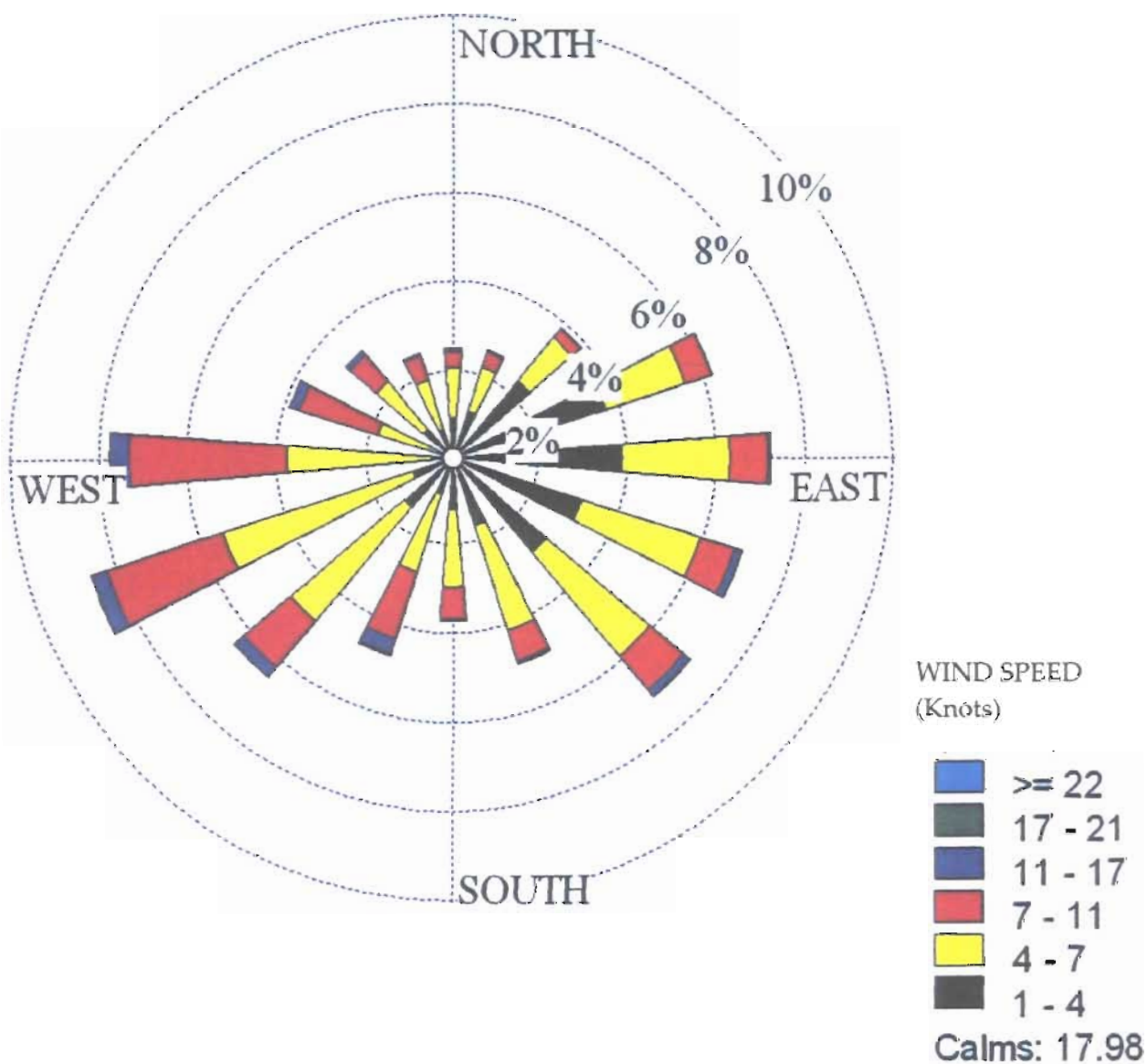


Average Wind Speed	6.39 Knots
Calm Winds	10.49 %
Note: 1 knot = 1.151 miles per hour.	

Figure 2.3.7-3.  
Spring Wind Rose for 2001 to 2005  
Tampa International Airport (Station No. 12842)

Source: National Climatic Data Center. 2001-2005.

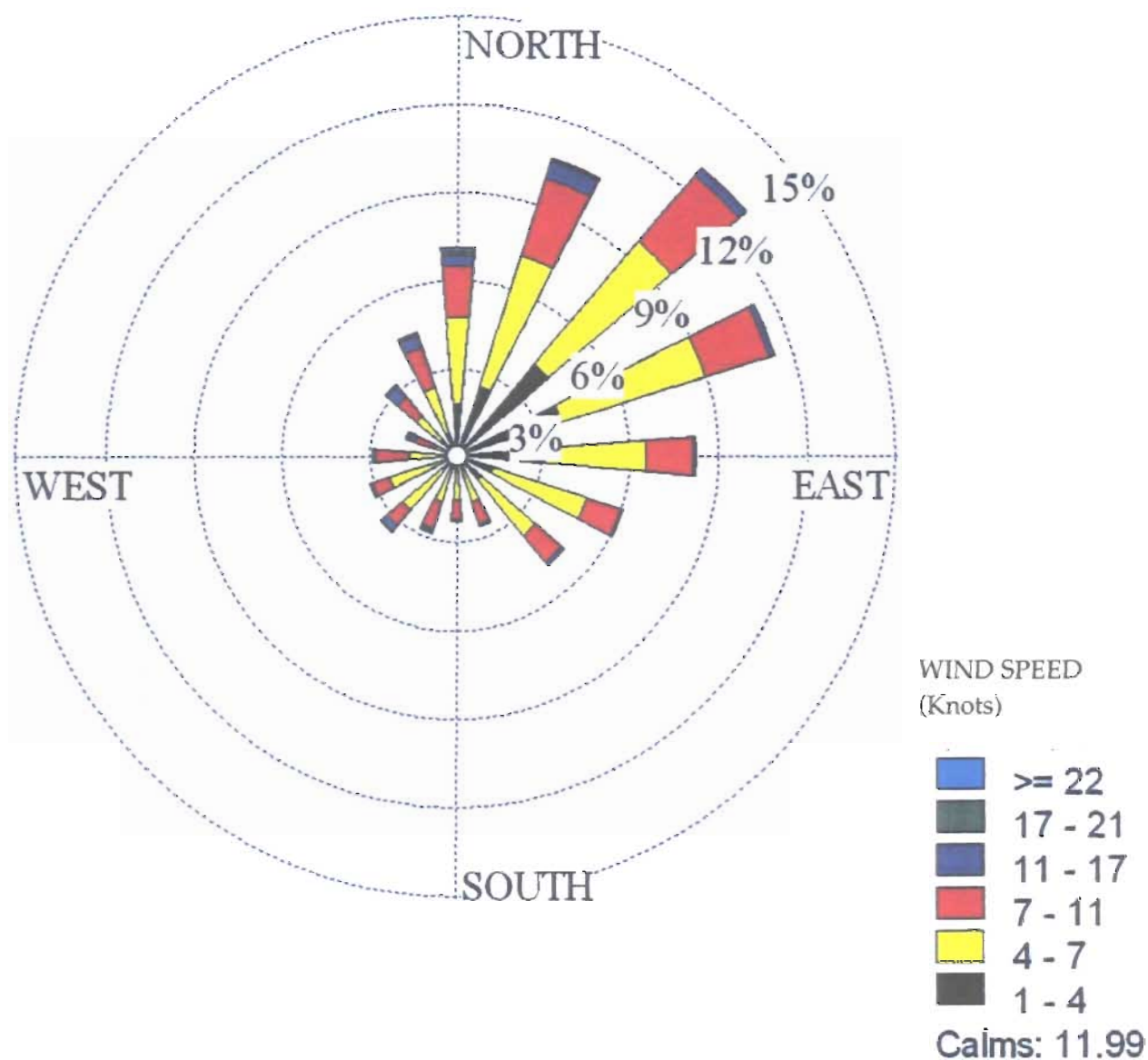




Average Wind Speed	4.98 Knots
Calm Winds	17.98 %
Note: 1 knot = 1.151 miles per hour.	

Figure 2.3.7-4.  
Summer Wind Rose for 2001 to 2005  
Tampa International Airport (Station No. 12842)

Source: National Climatic Data Center, 2001-2005.

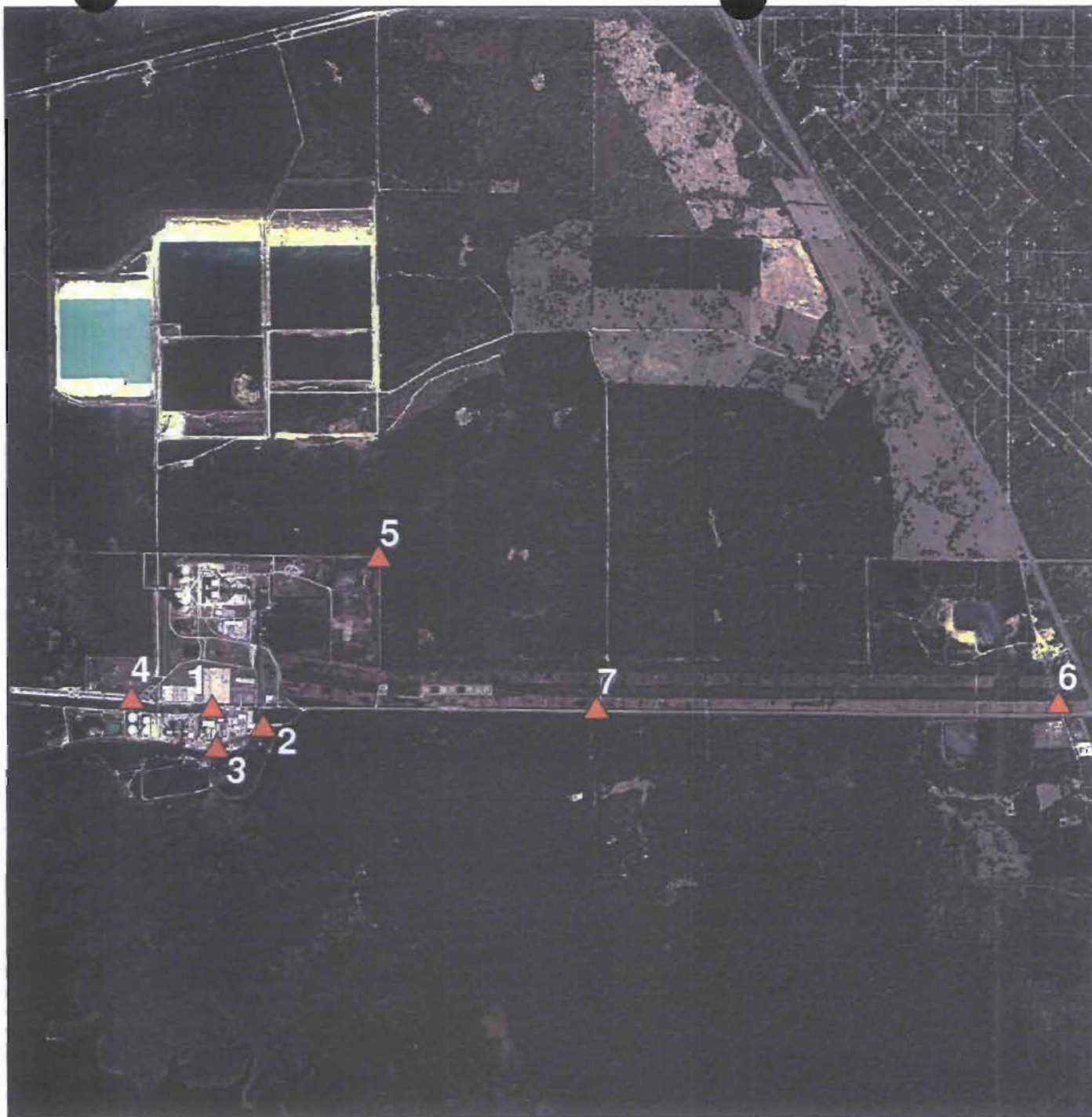


Average Wind Speed	5.78 Knots
Calm Winds	11.99 %
Note: 1 knot = 1.151 miles per hour.	


Figure 2.3.7-5.  
Fall Wind Rose for 2001 to 2005  
Tampa International Airport (Station No. 12842)

Source: National Climatic Data Center. 2001-2005.





# LEGEND

 Noise Monitoring Locations

## REFERENCE

Projection: Transverse Mercator Datum: NAD 1983 Coordinate System: UTM Zone 17N




PROJECT		Crystal River Power Plant	
VOLUME		Noise Monitoring Locations	
 <b>Golder Associates</b> Gainesville, Florida	PROJECT No.	073-BR311	SCALE AS SHOWN
	DESIGN	JM 02 May 2007	REV 0
	CHECK	GM 02 May 2007	
	REVIEW		

Figure 2.3.8-1

### **3.0 THE PLANT AND DIRECTLY ASSOCIATED FACILITIES**

#### **3.1 Background**

PEF plans to add 180 MW of electrical generation resources to its system in order to continue to provide reliable, safe, and cost-effective service to its customers. The CR3 Uprate Project is an innovative application of technological advancements and efficiencies that will increase the power output of the plant approximately 180 MW, from 900 MW to 1,080 MW. The extra power output will result from improving the performance of the steam turbine and from using more highly enriched fuel which will result in increased thermal MWs produced in the reactor core. The additional heat will raise the temperature exchange between the primary and secondary systems, creating more steam for turning the turbines.

To safely proceed with the uprate, modifications to supporting equipment are necessary to accommodate the additional heat created from the more highly enriched fuel and to accommodate all designed conditions in the plant.

The uprate project will occur over two phases. The first phase (Phase I) will occur during a 2009 planned refueling outage and scheduled steam generator replacement. The improvement to the turbine line components will increase the efficiency of power production resulting in decreasing consumer costs. The existing steam turbine high-pressure rotor was designed in the 1960s and is a multi-piece assembly which causes more drag than current technology deems necessary. PEF will replace the outdated rotor with current rotor blade technology, a single piece model, which will effectively decrease the drag factor. Replacing the outdated turbine technology will enable the turbines to increase megawatt output by 40 MW with the same steam input.

Phase II will take place during the 2011 planned refueling outage. The second phase will result in an additional 140 MW of power and include alterations that will elevate temperatures within the reactor and the use of the enriched uranium fuel. In order to ensure that fusion reactions inside the core are maintained safely, cooling water flow rates will be increased and adjustments will be made to the safety systems. A larger pumping capacity than currently exists in the water flow system supplying the steam generators is required in order to elevate the flow rate. Therefore, modifications to or replacement of pumps and heat exchangers will occur. In order to determine appropriate replacement and modification needs, an engineering evaluation will be conducted to characterize the most cost effective upgrade necessary for each motor and pump to achieve the optimal flow rate.

### 3.1.1 Description of Other Onsite Projects

There are a number of projects which are currently being implemented at CR3 over the next several years. Several of the projects are ongoing and are described below as current and base-line conditions and may be referenced throughout the SCA. None of these projects are the subject of this SCA.

- Main step-up transformer replacement. The main step-up transformer will be replaced due to degradation which has led to recent on-line failures which adversely impact plant availability.
- Measurement Uncertainty Recapture. Since 2002, CR3 has been licensed to 2,568 MWt (megawatts thermal) based on maintaining a standard two percent measurement uncertainty margin to the requisite analyses and system evaluations performed at 2,619 MWt. Relatively recent guidance allows a reduction of this margin based on improved instrumentation so the plant can be licensed to operate at a slightly higher power level. The application for this increase was submitted to the NRC on April 25, 2007 to allow a restart from the 2007 outage at this slightly higher power level. This project can be implemented with existing permits and regulatory approvals.
- CR3 License Renewal. The license renewal is a comprehensive assessment of CR3 operations to demonstrate compliance with NRC regulatory requirements. The relicensing process will allow an additional 20 years of plant operation beyond the current CR3 licensed operating period of 40 years. It is anticipated that the License Renewal Application will be submitted to the NRC early in 2009.
- Steam Generator Replacement Project (SGRP). The once-through steam generators will be replaced in 2009 due to long-term degradation that will not support reliable operation to the end of plant life. The project will necessitate the utilization of a number of undisturbed areas for lay-down areas, transportation off-loading and equipment assembly areas. Many of these same areas will also be utilized to support the CR3 Uprate Project. The appropriate environmental permits to authorize the disturbance of these areas will be obtained separate from the site certification process.

### 3.1.2 Description of CR3 Uprate Project

The project that triggers the need for this application is power level upgrades scheduled for 2009 through 2011. The most substantial of the plant modifications will be installed during the refueling outages scheduled for 2009 and 2011. While not all the final engineering decisions have been made, the current plans include:

- In 2009, CR3 is planning to refurbish the low pressure turbines and electrical generator. Several main feed-water heat exchangers and main steam re-heaters will be modified or replaced. The net impact of these modifications is a substantially more efficient secondary plant. Thus, while the NRC licensed power level will remain constant; the electrical generation will be increased and the heat released to the environment will be

lessened. The net generation increase from current levels is expected to be approximately 40 MW.

- Leading up to 2011, PEF will seek NRC license changes to allow operation of CR3 at the increased output. It will be necessary to make a large number of smaller, yet substantial, modifications to assure long term reliability of all plant systems at the conditions necessary to support this higher licensed power level. The most environmentally significant of these modifications is an increase in circulating water flow and an increase in discharge temperatures to the existing discharge canal. The higher, licensed power level is currently anticipated to result in a net electrical generation increase of 180 MW above current levels.

### **3.2 Site Layout**

The CREC contains four coal-fired steam electric generating units - CR 1, 2, 4, and 5, and a single nuclear unit - CR3. The CREC is the largest power-producing complex in the state of Florida with a total generating capacity of 3,140 MW. Figure 3.2.1-1 provides the property boundary and Figure 3.2.1-2 provides the general layout of the various facilities within the CREC.

### **3.3 Fuel**

The CR3 Uprate Project will not significantly alter fuel utilization as part of any of the above referenced projects. The primary fuel involved is the nuclear fuel used directly in power production. There will be no change in the nature of the fuel; no increase in maximum fuel enrichment and no substantial change in fuel assembly mechanical design will be required. There will be increases in the size of the refueling batch necessary to supply the necessary energy to support operation at the higher power levels.

Diesel fuel is used in a number of emergency generators. The main station emergency generators may be increased in capacity which will increase fuel use. However, these generators are for stand-by use only. Other than testing, these diesels, as well as a number of others, which power fire and emergency feedwater pumps, etc, are not routinely operated. Diesel fuel is delivered and unloaded as needed. The size of storage and refilling frequency is not expected to change significantly. There is no expected increase in use of other fuels.

### 3.4 Air Emissions and Controls

#### 3.4.1 Air Emission Types and Sources

The entire CREC, including the nuclear unit's associated process equipment, is currently addressed under the site's Title V (TV) air operating permit. This permit (Final Permit No. 0170004-015-AV) is active until December 31, 2009, when renewal is required. The TV permit addresses four coal-fired fossil fuel steam generating units; two natural draft cooling towers; helper mechanical draft cooling towers; modular cooling towers; coal, fly ash and bottom ash handling facilities and relocatable diesel-fired generators. Although CR3 (the nuclear generating unit) is not considered an emission generating unit under the TV permit, certain emissions units associated with CR3 are appropriately considered.

The CREC is classified as an existing major facility. A "major facility" is defined as any 1 of 28 named source categories that have the potential to emit 100 tons per year (TPY) or more or any other stationary facility that has the potential to emit 250 TPY or more of any pollutant regulated under CAA. "Potential to emit" means the capability, at maximum design capacity, to emit a pollutant after the application of control equipment. A modification to an existing major facility that results in a significant net emissions increase equal to or exceeding the significant emissions rates (SER) listed in Section 62-212.400, Table 62-212.400-2, F.A.C., is classified as a major modification and will be subject to the PSD preconstruction permitting program for those pollutants that exceed the PSD SERs. The procedures for determining applicability of the Prevention of Significant Deterioration (PSD) permitting program to the project are specified in Rule 62-212.400(2), F.A.C. For each regulated pollutant, PSD is triggered as a result of a modification at an existing unit if the difference between the projected actual emissions and the baseline actual emissions equals or exceeds the SER for that pollutant, as defined at Rule 62-210.200(243), F.A.C.

The scope of the proposed project includes an uprate of 40 MW associated with equipment modifications made during the 2009 refueling outage and 140 MW to be added after upgrades to the plant during the 2011 refueling outage. The uprate will increase the electrical output from CR3 and the associated circulating intake water flow rate. The air emission impacts associated with increased intake water flow (i.e., increased flow through additional new cooling towers) will trigger PSD for particulate matter (PM), but not for PM less than 10 microns (PM<sub>10</sub>). Other regulated air emissions (e.g., NO<sub>x</sub> and SO<sub>2</sub>) will not be affected, as there will be no additional fuel combustion sources (e.g., additional diesel generator capacity) that may trigger PSD for these pollutants.

The project design is still evolving; however, as stated above, the engineering and design data currently indicate that the Project will be characterized as a major source subject to PSD. Therefore, this SCA addresses Best Available Control Technology (BACT) for PM emissions, which are the significant emission increase of concern. Federal PSD requirements are contained in 40 CFR 51.166, *Prevention of Significant Deterioration of Air Quality*. The state of Florida's PSD regulations are found in Rule 62-212.400, F.A.C.

The types and sources of air emissions associated with the CR3 Upgrade Project will consist of a potential new mechanical draft cooling tower to be designated the South Cooling Towers (SCT). PM and PM<sub>10</sub> emissions will result from cooling tower operation in the form of drift. Drift is water aerosols emitted from the cooling tower containing dissolved minerals from the water circulating in the cooling tower. The dissolved minerals become PM, including PM<sub>10</sub>, when the water in the drift is evaporated. Cooling tower drift will be controlled using mist eliminators that will be designed to limit drift to no more than 0.0005 percent of the circulating water rate of the cooling tower.

In addition to adding a cooling tower to remove the incremental heat required to be dissipated by the uprate project, PEF is considering replacement of the existing modular cooling towers with additional permanent cooling towers (the South Cooling Tower (SCT)). Based on the relative design heat dissipation rates, approximately 11 additional cells similar to the existing permanent helper cooling tower cells will be required to replace the modular cooling tower in full. Coupled with the six cells required to dissipate the incremental heat rejected due to the uprate project, a total of 17 cells would be required. The status of the existing modular cooling tower is unknown, therefore, in order to present a worst-case air quality assessment, it is assumed that the new SCT will include a safety factor (of at least one cell) and consist of 18 cells arranged in a 9 by 2 configuration. The estimated cooling water flow into the proposed 18 cell SCT is estimated at approximately 342,306 gpm. Again, this estimate assumes that the existing bank of modular towers would be replaced by the proposed SCT associated with this uprate project, which may not necessarily be the case.

Figure 3.4.1-1 presents the proposed location of the air emission sources. Estimated hourly emission rates, as a result of the proposed cooling tower addition are presented in Table 3.4.1-1, for both PM and PM<sub>10</sub> emissions. In addition, the proposed cooling tower design parameters and annual PM/PM<sub>10</sub> emissions estimates are provided in Table 3.4.1-2 for the maximum operating load. That is, the information presented is for the proposed cooling tower design that represents the worst-case emissions and flow characteristics. Appendix 10.1.5, the PSD Application, presents the basis for the



emission rates and maximum annual emissions of regulated pollutants, as well as unit performance. As indicated, PSD review is triggered for PM (i.e., due to cooling tower impacts associated with the uprate).

#### 3.4.2 Air Emission Controls

State-of-the-art air pollution control equipment will be installed on the project to minimize air emissions. The control techniques proposed for this project are based on an evaluation of economic, energy, and environmental impacts and have been determined to represent BACT on similar projects. The following subsection presents a summary of the Control Technology and the BACT analysis, which is presented in the PSD permit application in Appendix 10.1.5.

#### 3.4.3 Control Technology Description/Best Available Control Technology

BACT review is required under FDEP rules and EPA regulations pertaining to PSD. Federal regulations are codified in 40 Code of Federal Regulations (CFR) Parts 51.166 and 52.21, and FDEP has adopted PSD rules in Rule 62-212.400, F.A.C. The BACT review is part of the evaluation of control technology under the Florida PSD rules. BACT is applicable to all pollutants for which PSD review is required and is pollutant-specific. It is an emission limitation that is based on the maximum degree of reduction for each regulated pollutant, which is determined to be appropriate after taking into account energy, environmental, economic impacts, and other costs. BACT cannot be any less stringent than the federal New Source Performance Standards (NSPS) applicable to the source under evaluation.

The FDEP and EPA have established a policy for BACT review in which the most stringent control alternatives are evaluated first. The alternatives are either rejected based on technological, environmental, energy or economic reasons or they are proposed as BACT. This procedure is referred to as the "top-down" approach. For the project, BACT is applicable for emissions of PM.

Appendix 10.1.5 of the SCA for the project contains a complete PSD Application. The PSD Application includes the BACT evaluation for the project and addresses those pollutants for which BACT is applicable. A discussion of the environmental, economic, and energy aspects of alternative control techniques and methods are included. The remainder of this section briefly describes those control technologies that are proposed for the CR3 Uprate Project.

PM emissions will be emitted from the cooling towers in the form of drift. Cooling tower drift will be controlled through the use of mist eliminators that will be designed to limit drift to no more than 0.0005 percent of the circulating water rate of the cooling tower. This level of control represents the best that is currently available. The total circulation water use will be limited to 1.8 E11 gallons per year, based on 8,760 hours per year at a maximum circulation rate of 342,306 gallons per minute (gpm).

#### 3.4.4 Design Data for Control Equipment

Design information for the air pollution control equipment is presented in Section 5.0 of Appendix 10.1.5 (PSD Application).

#### 3.4.5 Design Philosophy

The project minimizes air pollutant emissions by using efficient design and state-of-the-art air pollution control equipment that will meet a BACT emission rate. In addition, by maximizing the megawatt output per unit of cooling water consumed, the air pollutant emissions per megawatt output are minimized. Collectively, the design of the CR3 Uprate Project will incorporate features that will make it one of the most efficient and lowest emitting, with respect to the amount of air emissions emitted per MWs produced.

### 3.5 Plant Water Use

The primary water use for the CR3 Uprate Project will be an increase in cooling water flow through the CR3 condenser to cool the increased heat rejected by the CR3 condenser. The quantitative water use diagram for the existing CR 1, 2, and 3 is shown in Figure 2.3.4-4. This figure does not show the evaporative losses from the existing HCTs, however, that evaporation is estimated to range up to a maximum of only about 9,957 gpm. The only significant change in flow rates anticipated as a result of the CR3 Uprate Project is that of the potential increase of condenser cooling water flow for CR3 by approximately 150,000 gpm.

A new SCT has been proposed both to offset the increased circulating water rejected heat and to replace the existing modular HCT. A small portion of the increased flow associated with the uprate project (up to about 1,288 gpm) will be evaporated in the recirculating portion of the new SCT, which will be used to dissipate the increase in rejected heat. The new SCT has also been designed to avoid

any increase in flow into the intake canal from Crystal Bay/Gulf of Mexico, and to avoid any increase in heat load or temperature rise leaving the discharge canal to Crystal Bay/Gulf of Mexico. For the purpose of this SCA, a conservative and conceptual design plan for the South Cooling Tower has been proposed. Detailed design will be addressed as part of the NPDES renewal process in 2009.

### 3.5.1 Heat Dissipation System

In Section 2.3.4, the design value of the existing heat rejection rate via the condenser cooling water for CR3 was quantified as 5.88 Billion Btu per hour. CR3 currently produces approximately 900 MWe (megawatts electrical) and 2,609 MWt (megawatts thermal). The net result of the uprate project will be to increase CR3's output to approximately 1,080 MWe and 3,014 MWt. These quantities can all be converted to Btu per hour by the formula 1 watt = 3.412141 Btu/hour. The result is shown in the table below, Heat Dissipation System Comparison. The difference between MWt and MWe is the amount of heat produced by the unit that is not converted to electricity and which is therefore rejected via the condenser cooling water system. The net increase in heat rejection is 225 MWt, which is equivalent to 0.768 Billion Btu per hour, and represents an increase of about 13.2 percent relative to the current baseline heat rejection rate of 5.88 Billion Btu per hour for CR3, and about seven percent for the design three-unit heat rejection rate of 10.91 Billion Btu per hour currently leaving the discharge canal.

The size and shape of the discharge thermal plume varies with plant and meteorological conditions. The thermal plume is generally proportional to the amount of heat rejected, which is a function of the product of the flow rate and the temperature rise. PEF is proposing additional recirculating cooling towers to remove the increased rejected heat anticipated by the uprate project (0.768 Billion Btu/hour), therefore, the size of the thermal plume will not increase beyond existing conditions.

As described in Section 2.3.4, CR 1, 2 and 3 currently operate both permanent and modular HCTs. The permanent HCT consists of four separate tower structures, each containing nine cells.

Heat Dissipation System Comparison		
	Pre-Existing (Baseline) Unit 3	Post-Uprate Unit 3
MWe	900	1,080
MWt	2,609	3,014
Billion Btu per hour (electrical)	3.070	3.685
Billion Btu per hour (thermal)	5.831	6.599
Increase in Billion Btu per hour (electrical)	Base	0.615
Increase in Billion Btu per hour (thermal)	Base	0.768

Each cell has a water flow rate of 19,017 gpm, and a heat dissipation rate of 0.127 Billion Btu per hour. To achieve the dissipation of the increase of 0.768 Billion Btu per hour, a preliminary estimate indicates that a new cooling tower consisting of six cells, similar to the permanent HCT cells, would be required. A six-cell cooling tower would be approximately 50 ft wide by 300 ft long by 55 ft tall, or roughly 2/3 the size of one of the existing permanent HCT.

PEF has the option during the uprate of increasing either the CR3 condenser cooling water flow rate, or temperature rise, or both. The amount of heat that the new cooling towers must dissipate is independent of the specific choice of flow rate and temperature rise. If the CR3 flow rate is held constant at the existing 680,000 gpm, the temperature rise is expected to increase from 17.5 °F to 19.8 °F for CR3, and the overall temperature rise for the 3-unit flow rate of 1,318,000 gpm *prior to the use of HCT* is expected to increase from 16.7 to 17.9 °F. The use of the existing HCT and the new SCT in the helper mode would then reduce the combined discharge temperature rise down to 7.7 °F, assuming the full use of all HCT and ignoring the HCT evaporation. This is the same temperature rise that would be expected under the same conditions with the existing plant configuration.

Similarly, if the condenser cooling water flow rate for CR3 is increased to 830,000 gpm, and to 1,468,000 gpm for all three units, the delta T for CR3 will be reduced to approximately 14.3 °F, whereas the combined three-unit temperature rise will decrease from 16.74 °F to 15.03 °F prior to the use of HCT. The use of the existing HCT and the new six-cell cooling tower in the helper mode would then reduce the combined discharge temperature rise down to 6.46 °F. This is a temperature 1.24 °F less than would be expected under the same conditions with the existing plant configuration, and is less because the three-unit flow rate has been increased by 150,000 gpm, which is about

11.4 percent of the present three-unit flow rate. Although the flow rate has been increased, the rate of heat rejection remains at the existing level, as evidenced by the reduction in temperature rise.

However, in order to avoid incremental intake entrainment impacts due to the uprate, PEF proposes to increase the size of the new SCT and to run a portion of the facility in the recirculating mode (i.e., with the cold water return routed back to the intake canal rather than to the discharge canal). At the maximum expected condenser cooling water flow rate increase of 150,000 gpm, the size of the recirculating portion of the SCT thus needs to be eight cells (flow rate of 152,136 gpm).

In addition to adding the new cooling tower to remove the incremental heat required to be dissipated by the uprate project, PEF could potentially replace the existing modular cooling towers with an additional permanent HCT. Based on the relative design heat dissipation rates, approximately 11 additional cells equivalent to the existing permanent HCT cells would be required. Coupled with the six cells required to dissipate the incremental heat rejected due to the uprate project, this means a total of 17 cells would be required, assuming additional cells were not required for intake canal flow reduction. The break point for this is the six-cell flow rate of 114,102 gpm; at a condenser cooling water flow rate increase less than 114,102 gpm no additional recirculation for intake flow reduction is needed. If the condenser cooling water flow rate increase exceeds 114,102 gpm additional recirculating cells are required for intake flow reduction. In the worst case, at the maximum increase of 150,000 gpm, this would entail two additional recirculating cells. However, the other result of increasing the flow rate is that the discharge temperature is reduced. Because the HCT are designed solely to reduce the discharge temperature to not exceed a value of 96.5 °F on a rolling three-hour average, the reduced temperature rise results in the fact that less cooling is needed from the HCT. The resultant amount of reduction in HCT heat transfer is about 0.5 Billion Btu per hour, which is equivalent to about four cooling tower cells. Thus, while this case requires two extra cells for intake flow reduction, it decreases the number of helper cells required by four. In summary, the two cases are described in the following table:

Case	Minimum condenser cooling water flow increase (0 gpm)	Maximum condenser cooling water increase (150,000 gpm)
Required number of cells in recirculating mode	6	8
Required number of cells in helper mode	11	7
Total number of required cells	17	15

PEF may propose to install the new permanent SCT, between the intake and the discharge canal as shown in Figure 3.5.1-1, which will include a safety factor (of at least one cell) and consist of 18 cells arranged in a 9 by 2 configuration. Depending on the final amount of the increase in condenser cooling water, between six and eight cells will be operated full time in the recirculating mode, and from 12 to 10 respectively would be operated in the helper mode as required. Figure 3.5.1-1 provides a simplified water use diagram showing the expected division of flow for the latter case. The flow from eight cells is estimated to be 152,136 gpm, which is more than the potential maximum CR3 condenser cooling water flow rate increase of 150,000 gpm. Therefore, the CR3 Uprate Project should actually cause some slight reduction in entrainment relative to the existing conditions.

Through-screen velocity is anticipated to increase from 1.45 fps (max at MLW) to as much as 2.02 fps (max at MLW) with the CR3 Uprate Project. This is because the four existing cooling water pumps will be modified to deliver as much as 207,778 gpm each. This increased velocity could result in an increase in impingement mortality. The installation and operation of the proposed recirculating six to eight cells of the SCT will slightly reduce entrainment impacts due to the slightly reduced overall intake flow from Crystal Bay, and may also reduce impingement mortality by reducing the number of organisms available to be impinged.

As necessary PEF intends to request modification of the NPDES permit to authorize the operation of the new SCT and an increase in circulating water flow at CR3 from 680,000 gpm/923 MGD to as much as 830,000 gpm/1,195 MGD. Overall, the proposed CR3 Uprate Project will not increase flow to the intake canal from Crystal Bay and there will be no net increase in the thermal discharge at the NPDES POD. The CR3 Uprate Project will not have a negative impact to fisheries or the aquatic environment.



### 3.5.2 Domestic/Sanitary Wastewater

The CR3 Uprate Project will not require any increase in permanent staff; therefore, no changes will be made to the existing and permitted Domestic/Sanitary Wastewater system, which is described in Section 2.3.4.

### 3.5.3 Potable Water Systems

The CR3 Uprate Project will not require any increase in permanent staff; therefore, no changes will be made to the existing and permitted Potable Water system, which is described in Section 2.3.4.

### 3.5.4 Process Wastewater Systems

The process wastewaters are described in Section 2.3.4. They are not anticipated to change with the CR3 Uprate Project.

## 3.6 **Chemical and Biocide Waste**

The CR 1, 2, and 3 NPDES permit currently authorizes the use of Spectrus CT1300 to control biofouling for the CR3 service water system, which is presently completed subject to the timing and concentration limits specified in the NPDES permit (Appendix 10.4). The CR3 Uprate Project will cause no change in the use of Spectrus CT1300.

These processes will not change as a result of the CR3 Uprate Project.

## 3.7 **Solid and Hazardous Waste**

The CR3 Uprate Project is not expected to significantly increase solid and hazardous waste on site. During construction, solid and hazardous wastes are anticipated to increase and will be temporarily stored and prepared for offsite disposal in accordance with state, federal and NRC regulations. The CR3 Uprate Project will result in a small increase in the spent fuel discharge rate. These fuel assemblies will continue to be stored in the onsite NRC approved spent fuel storage facilities.

CREC generates wastes categorized as regulated waste, universal waste, hazardous waste, mixed waste, and radioactive waste. Whenever possible, wastes are recycled or minimized by chemical control management. All vendors used for handling, recycling, or disposal of wastes are approved

vendors by PEF. Quantities of wastes differ due to outage requirements and types/quantities of waste generally remain the same unless new processes are added or different maintenance tasks are required. PEF, the CR3 Hazardous Waste Coordinator and the CR3 Environmental Specialist determine the appropriate waste characterization, waste profiles, and waste disposal methods including land disposal or incineration while complying with state, federal and NRC regulations. Minimal quantities of wastes are stored on site in a segregated area, inventoried weekly, and managed by the Hazardous Waste Coordinator.

Very little opportunity exists for spills to pervious surfaces. However, a spill of this type would be managed in accordance with state and federal regulations. The CR3 site has a percolation pond system and approved groundwater monitoring plan with ground water monitoring wells located at various locations on site. The facility Spill Prevention and Countermeasure (SPCC) Plan and Best Management Practices (BMP) Plan help ensure pollution prevention at the CR3.

### **3.8 On-Site Drainage System**

The current onsite drainage system at CREC meets all applicable local, regional, state and federal requirements including those outlined by the National Pollution Discharge Eliminations System (NPDES) and 40 CFR 112. As detailed in the CR3 SPCC Plan, runoff controls, and contamination prevention for stormwater drains by fuel oil, lubricating oil, and mineral oil associated with machinery, transformers and scheduled shutdowns of the CR3, are in place (Progress Energy 2006). A diversionary structure provides drainage protection for all in-service step up transformers. In the occurrence of a large leak, oil will flow down through a rock-filled trench into a retention basin. Secondary containment is provided for all above ground storage tanks, and any rainwater which collects in secondary containments is procedurally monitored and evaluated for oily sheens prior to drainage. The storm drains located onsite are additionally safeguarded from contamination during oil unloading operations by personnel trained in proper operating procedures and the use of storm drain covers.

### **3.9 Materials Handling**

#### **3.9.1 Construction Materials and Equipment**

Construction material and equipment will be delivered to the CR3 site by the existing roadway, U.S. Highway 19. Equipment and component parts will be unloaded to various laydown and

assembly areas and moved around the site using portable cranes and trucks. Pollution control measures will be in place for the laydown areas and roads as necessary to control dust and runoff.

### 3.9.2 Roads

During normal plan operations, CREC averages approximately 1400 employees and 125 daily truck trips. During the uprate project, employee and construction traffic will vary between 2009 and 2012 and use U.S. Highway 19 to access the CR3 site.

### 3.10 References

Florida Department of Environmental Protection. 2004. Crystal River NPDES Permit FL0000159.

Golder Associates Inc. 2006. Crystal River Energy Complex Proposal for Information Collection NPDES Permit No. FL000159.

Progress Energy, 2006. Spill Prevention and Countermeasure Plan.

SWEC (Stone & Webster Engineering Corporation), 1985. Crystal River Units 1, 2 and 3. 316 Studies – Final Report.

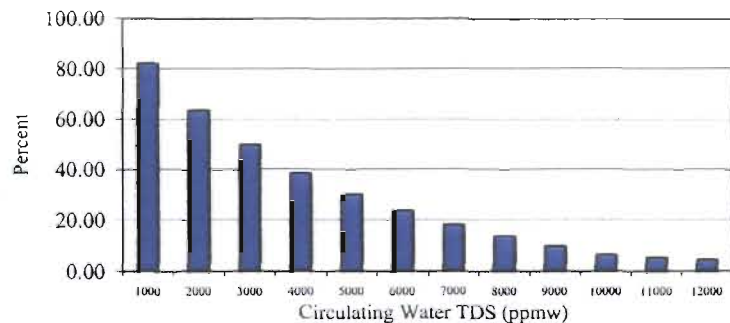
U. S. Nuclear Regulatory Commission, 2002. "NRC Approves Power Uprate for Crystal River 3." News release, Dated December 6. [Online] Available: <http://www.nrc.gov/reading-rm/doc-collection/news/2002/02-140.html>.

## **TABLES**

**TABLE 3.4.1-1**  
**Potential PM and PM<sub>10</sub> Emissions**

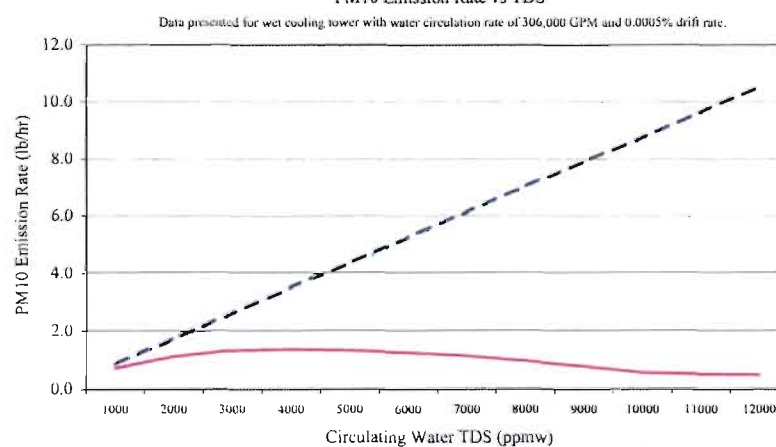
TDS (ppmw)	PM Emission Rate (lb/hr)	Percent of Emissions < or = PM10 %	PM10 Emissions (lb/hr)		Tower Circulation Rate (GPM)	Drift Rate %	Calculated PM10 % < or = PM10 %
1000	0.88	82.04	0.722		342,306	0.0005	82.04
2000	1.76	63.50	1.118				63.50
3000	2.64	50.00	1.320				50.00
4000	3.52	38.33	1.349	max			38.33
5000	4.40	29.97	1.319		Salt water density (lb/gal)		29.97
6000	5.28	23.59	1.246	swd	8.57		23.59
7000	6.16	18.20	1.121		64.2 lb per cu ft		18.20
8000	7.04	13.57	0.955				13.57
9000	7.92	9.65	0.764				9.65
10000	8.80	6.28	0.553				6.28
11000	9.68	5.11	0.495				5.11
12000	10.56	4.46	0.471				4.46
25307	22.27	1.07	0.238				1.07
29000	25.52	0.82	0.209				0.82
89600	78.85	0.22	0.173				0.22

**Percentage of Drift PM that Evaporates to PM10**



Source: Reisman, Joel and Gordon Frisbie, *Calculating Realistic PM10 Emissions from Cooling Towers*, Abstract No. 216, Greystone Environmental Consultants, Inc.

**PM10 Emission Rate vs TDS**



Reisman, Joel and Gordon Frisbie, *Calculating Realistic PM10 Emissions from Cooling Towers*, Abstract No. 216, Greystone Environmental Consultants, Inc.



**TABLE 3.4.1-2.  
Physical, Performance, and Annual Emissions Data for the HCT**

Parameter	Vendor (TBD)
<b><u>Physical Data</u></b>	
Number of Cells	18
Deck Dimensions, ft	
Length	50
Width	50
Height(Tower Height)	55
Stack Dimensions	
Height, ft	TBD
Stack Top Effective Inner Diameter, per cell, ft	TBD
Effective Diameter, all cells, ft	TBD
<b><u>Performance Data (per cell)</u></b>	
Discharge Velocity, ft/min	TBD
Circulating Water Flow Rate (CWFR), gal/min	342,306
Design hot water temperature, °F	103
Design Air Flow Rate per cell, acfm, (estimated)	TBD
Hours of operation	8,760
<b><u>Emission Data</u></b>	
Drift Rate <sup>a</sup> (DR), percent	0.0005
Total Dissolved Solids (TDS) Concentration <sup>b</sup> , average ppm	25,307
Solution Drift <sup>c</sup> (SD), lb/hr	880.1
PM Drift <sup>d</sup> , lb/hr	22.3
tons/year	97.6
PM <sub>10</sub> Drift <sup>e</sup>	
PM <sub>10</sub> Emissions, lb/hr	1.35
tons/year	5.9

<sup>a</sup> Drift rate is the percent of circulating water.

<sup>b</sup> A TDS of 25,307 Average Value from Historical Data (Ron Johnson email 12/13/05)

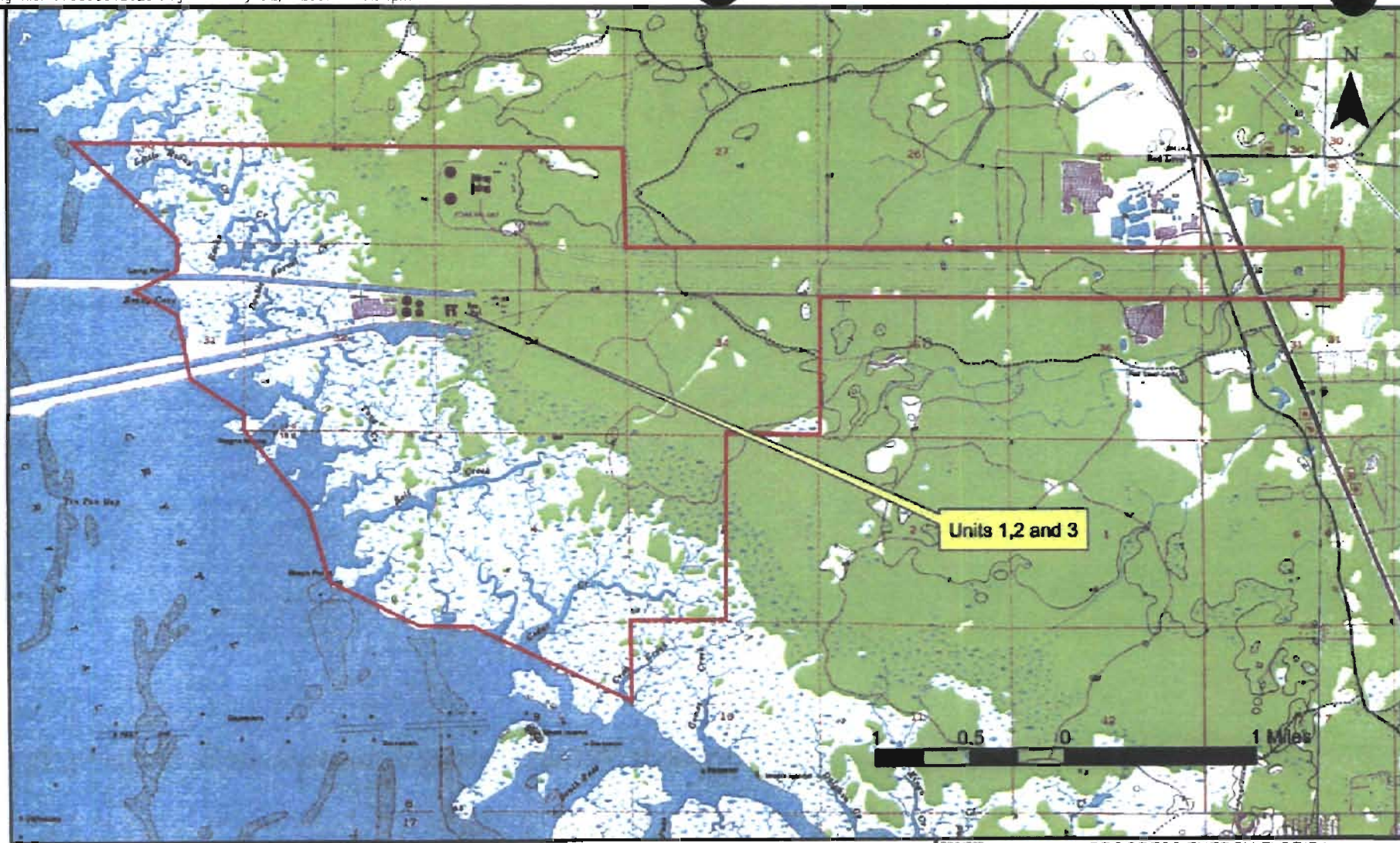
<sup>c</sup> Includes water and based on circulating water flow rate and drift rate  
(CWFR x DR x 8.57 lb/gal x 60 min/hr).


<sup>d</sup> PM calculated based on total dissolved solids and solution drift (TDS x SD).

<sup>e</sup> PM<sub>10</sub> based on Cooling Tower PM<sub>10</sub> emissions study see Attachment A.

Source: Progress Energy, 2007; Golder, 2007.

## **FIGURES**

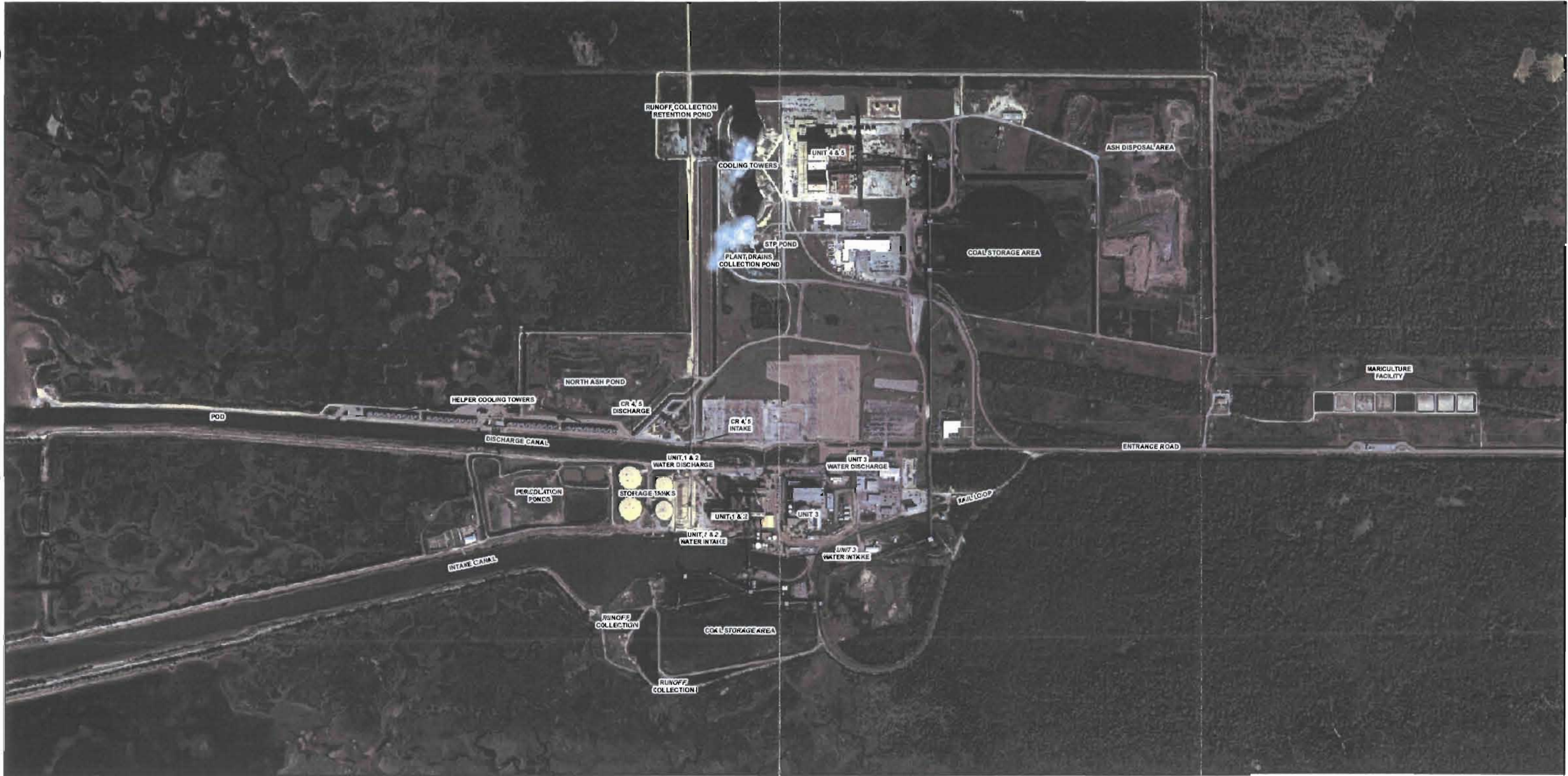


PROJECT	PROGRESS ENERGY-FLORIDA CRYSTAL RIVER UNIT 3 POWER UPRATE PROJECT CITRUS COUNTY, FLORIDA			
TITLE	CREC PROPERTY BOUNDARY			
 <b>Golder Associates</b> Tampa, Florida	PROJECT No.	073-89531	FILE No.	07389531B023
	DESIGN	MM	04/30/07	SCALE AS SHOWN
	CADD	MEF	04/30/07	REV. 0
	CHECK	MM	04/30/07	<b>FIGURE 3.2.1-1</b>
	REVIEW	MM	04/30/07	

## REFERENCES

- 1.) USGS 7.5 MINUTE QUADRANGLE RED LEVEL, FLORIDA

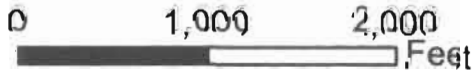




LEGEND

REFERENCE

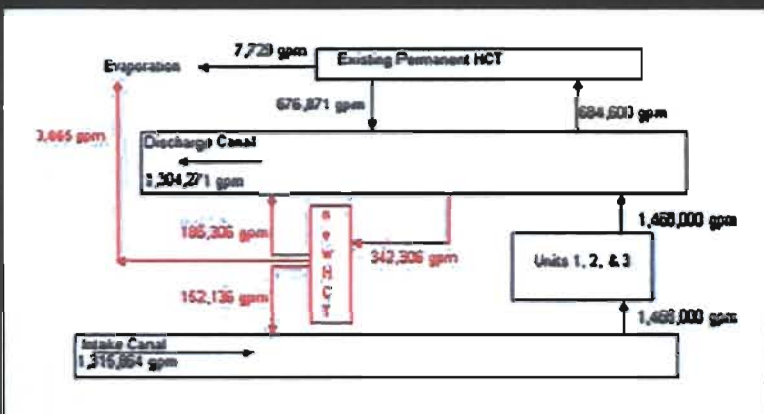
1. 2006 Southwest Florida Water Management District Aerials.



PROJECT	PROGRESS ENERGY FLORIDA, CRYSTAL RIVER NUCLEAR UNIT 3 UPRATE PROJECT			
TITLE	CRYSTAL RIVER NUCLEAR UNIT 3 UPRATE PROJECT			
 Golder Associates Fort Myers, Florida	PROJECT No.	073-89531	SCALE	AS SHOWN
	DESIGN	JJ	May 15, 2009	FIGURE 3.2.1-2
	GIS	JJ	April 30, 2009	
	CHECK	JS	April 30, 2009	
	REVIEW	JS	April 30, 2009	



New  
South  
Cooling  
Tower



PROJECT  
PROGRESS ENERGY-FLORIDA  
CRYSTAL RIVER UNIT 3 POWER  
UPGRADE PROJECT  
CITRUS COUNTY, FLORIDA

TITLE

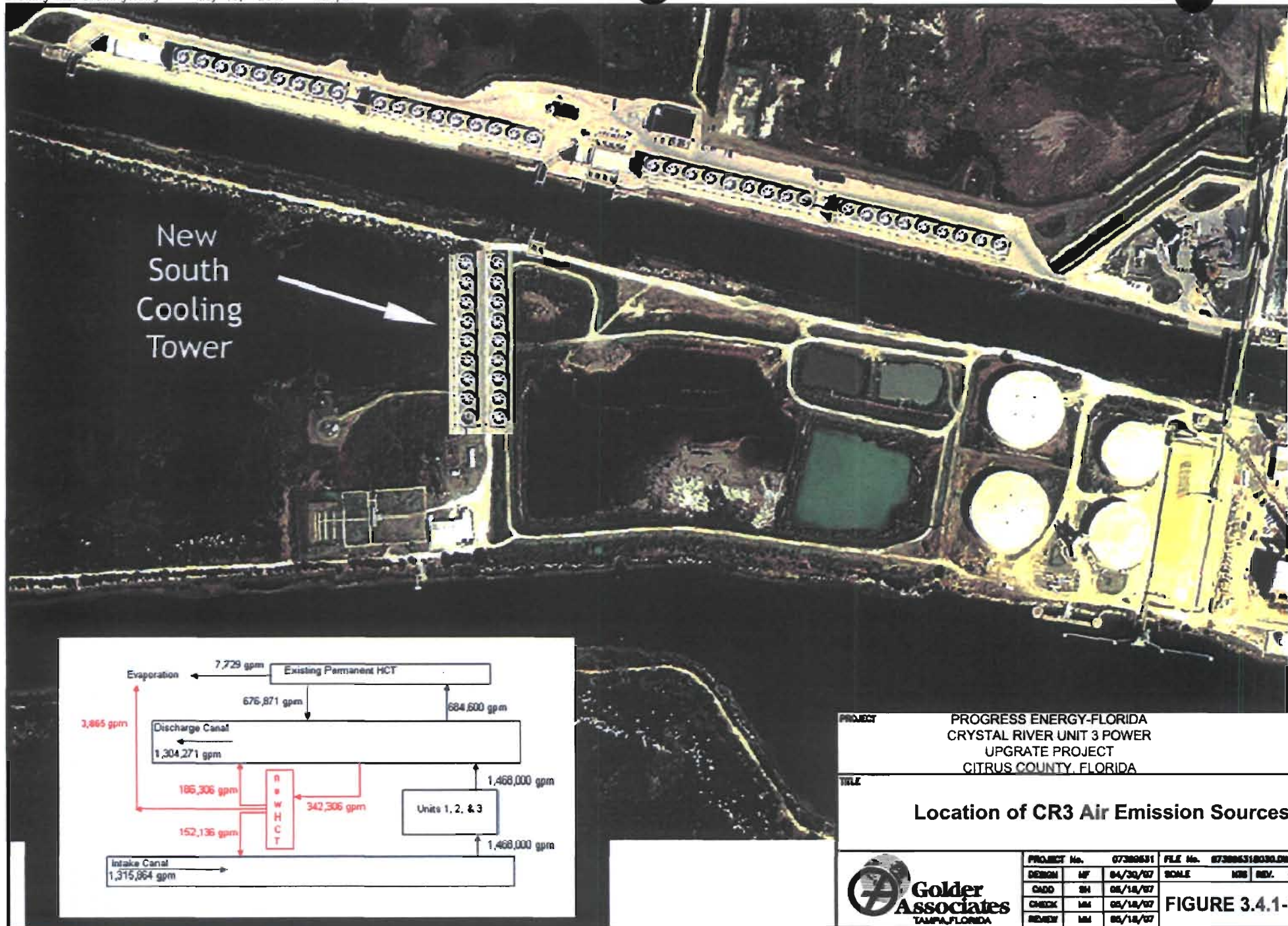
### CR3 UPRATE PROJECT SOUTH COOLING TOWER LAYOUT



PROJECT No.	07288631	FILE No.	07288631-0017.DWG
DESIGN	MF	DATE	04/30/07
CADD	SM	DATE	05/15/07
CHECK	MM	DATE	05/15/07
REVIEW	MM	DATE	05/15/07
		SCALE	NTH
		REV.	0


FIGURE 3.5.1-1



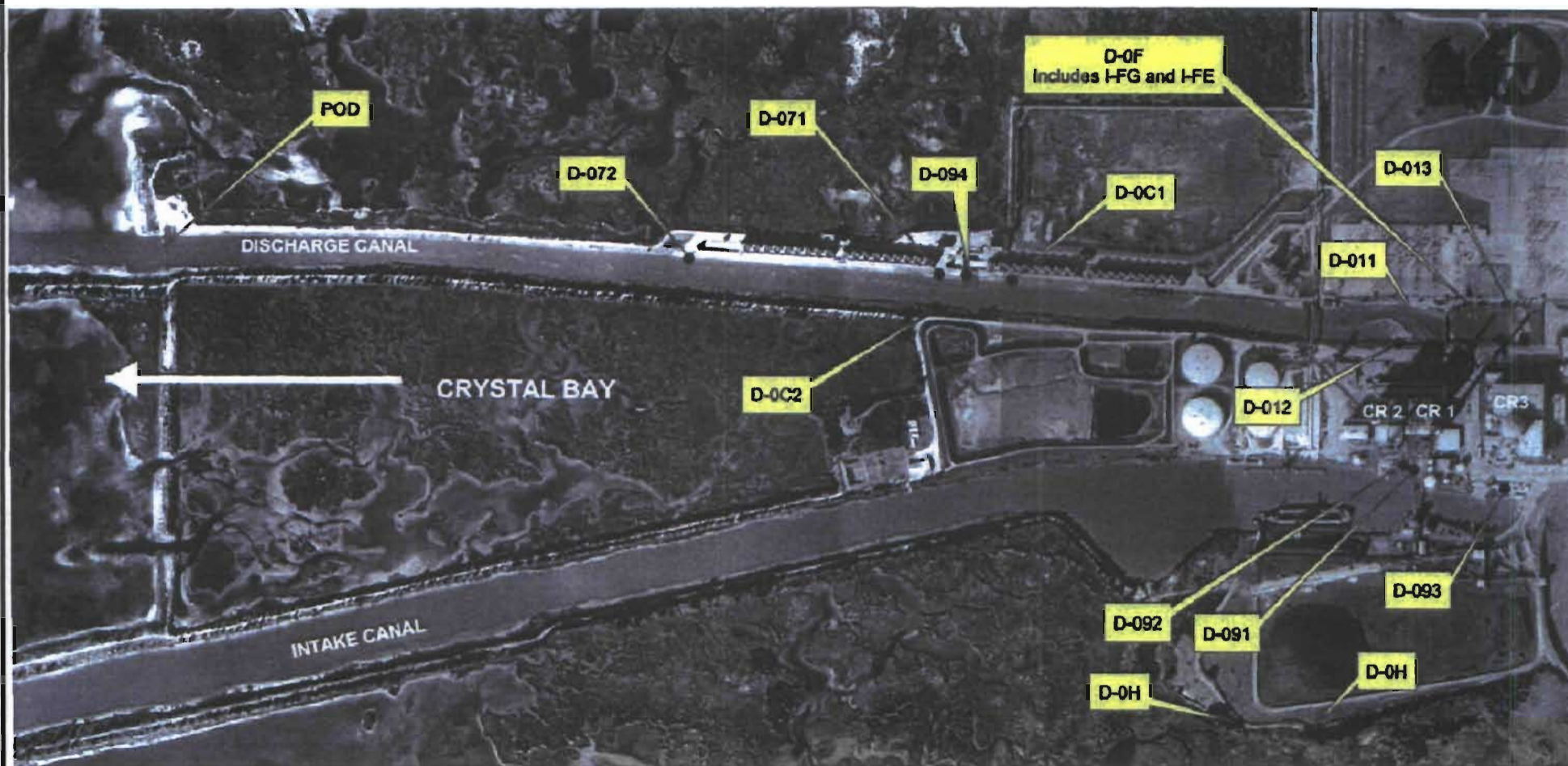


PROJECT  
 PROGRESS ENERGY-FLORIDA  
 CRYSTAL RIVER UNIT 3 POWER  
 UPGRADE PROJECT  
 CITRUS COUNTY, FLORIDA

TITLE  
 Location of CR3 Air Emission Sources


 <b>Golder Associates</b> TAMPA, FLORIDA	PROJECT No.	07300631	FILE No.	073006310030.DWG	
	DESIGN	MF	04/30/07	SCALE	NBS
	CADD	SH	05/18/07	REV.	
	CHECK	MM	05/18/07	FIGURE 3.4.1-	
	REVIEW	MM	05/18/07		





## REFERENCES

- 1.) NPDES DISCHARGE POINTS #FL0000159

PROJECT		PROGRESS ENERGY-FLORIDA CRYSTAL RIVER UNIT 3 POWER UPRATE PROJECT CITRUS COUNTY, FLORIDA			
TITLE		CR 1,2,3 NPDES DISCHARGE POINTS			
 Golder Associates Tampa, Florida		PROJECT No.	073-89531	FILE No.	07389531B024
		DESIGN	MM	04/30/07	SCALE AS SHOWN
		CADD	MEF	04/30/07	REV. 0
		CHECK	MM	04/30/07	FIGURE 3.5.4-1
		REVIEW	MM	04/30/07	

#### **4.0 ENVIRONMENTAL EFFECTS OF SITE PREPARATION AND PLANT AND ASSOCIATED FACILITIES CONSTRUCTION**

The purpose of this section is to describe the environmental effects of site preparation and construction of the proposed CR3 Uprate Project.

The CR3 Uprate Project will occur during two phases. The first phase (Phase I) will occur during a 2009 planned refueling outage and scheduled steam generator replacement. The improvement and retrofit of the low pressure turbines and electrical generator and replacement of the main steam reheaters will increase the efficiency of power production at CR3 and increase megawatt output by 40 MW.

During the second phase (Phase II), PEF will retrofit the high-pressure turbine, turbine/generator coolers and replace the circulating water pumps, condensate and feedwater booster pumps, and motors resulting in an additional 140 MW of power output.

As previously discussed, PEF will request authorization to support site disturbance of those areas that will be used to support construction activities related to the SGRP and subsequently the CR3 Uprate Project through a separate Environmental Resource Permit (ERP).

A new South Cooling Tower has been proposed to offset the increased circulating water rejected heat from the CR3 Uprate Project and to replace the existing modular HCT. Land, topography, soil, surface water and ecology impacts associated with the construction of the South Cooling Towers will be addressed during the submittal of an ERP (and other appropriate environmental permits), separate from the site certification process. Detailed design will be addressed as part of the NPDES renewal process in 2009.

#### **4.1 Land Impacts**

##### **4.1.1 General Construction Impacts**

The CR3 site includes the reactor building, turbine building, access/security building, auxiliary building, maintenance training facility, reactor head storage building and miscellaneous warehouses and other buildings and comprises approximately 26.86 acres of developed land within the CREC.

During the construction phases associated with the CR3 Uprate Project, a total of 17.24 acres will be utilized to support construction activities (Figure 4.1.1-1). Construction laydown and parking areas will be constructed at the existing site elevation.

Foundation installation and dewatering activities are not required. Fugitive dust generation is not anticipated and explosives will not be used during the demolition and construction phase of the CR3 Uprate Project.

Solid waste materials generated during construction will be disposed of in accordance with applicable rules and regulations. Construction and demolition wastes, such as scrap wood and metal, will be transferred to a specified storage area on the CR3 site where they will be separated for salvage and recycling. General waste materials (i.e., typical of municipal solid wastes) will be collected in appropriate waste collection containers for disposal at an approved offsite location. All hazardous wastes generated during construction activities will be properly stored, transported and disposed of in accordance with applicable regulations and internal procedures.

During construction, the construction labor force will use portable chemical toilets and/or permitted holding tanks. A licensed contractor will pump all sanitary sewage from the portable toilets and holding tanks as needed and will transport the waste to an approved offsite treatment facility.

Potable water for consumption during construction will be obtained from bottled potable water. Potable water for emergency eyewash and shower stations will be supplied from temporary potable water systems.

#### 4.1.2 Roads

Primary access to CR3 is provided via U.S. Highway 19, which is located east of the site. No new roads are proposed to connect with state roads.

#### 4.1.3 Flood Zones

The CR3 Uprate Project is located within Zone VE, an area potentially inundated by 100-year flooding with velocity hazard (wave action) (Figure 2.1.5-1). Construction activities associated with

the CR3 Uprate Project will not adversely impact site flood elevations for adjacent areas and will not cause any adverse flooding or related impacts to offsite property (Section 2.1.5).

#### 4.1.4 Topography and Soils

Grading and filling activities will not be required for the CR3 Uprate Project. Site topography will not be affected by construction-related activities. Slight changes in percolation rates in localized areas may occur following construction of laydown and parking areas associated with the SGRP; however, no changes in percolation rates are anticipated with the CR3 Uprate Project.

No effects on existing aesthetics or view shed due to changes in the topography of the plant are anticipated. Elevations of the land surface after construction will be similar to existing elevations; no significant changes in topography will be observable from offsite locations. Offsite groundwater levels will not be affected by the CR3 Uprate Project.

### 4.2 **Impact on Surface Water Bodies and Uses**

#### 4.2.1 Impact Assessment

Due to the existing nature of the CR3 site, surrounding surface waters will not be adversely affected by the CR3 Uprate Project. Equipment modification and retrofit activities will not impact wetlands and nearby surface waters.

#### 4.2.2 Measuring and Monitoring Program

There are no construction impacts to surface water bodies from the CR3 Uprate Project; therefore, no new measuring and monitoring programs are proposed.

### 4.3 **Groundwater Impacts**

#### 4.3.1 Impact Assessment

Due to the existing nature of the CR3 site, groundwater will not be adversely affected by the CR3 Uprate Project.

#### 4.3.2 Measuring and Monitoring Program

There are no construction impacts to groundwater from the CR3 Uprate Project; therefore, no new measuring and monitoring programs are proposed.

### 4.4 **Ecological Impacts**

#### 4.4.1 Impact Assessment

Due to the existing nature of the CREC and CR3 site, and limited amount of disturbance associated with the uprate project, no adverse impacts to threatened or endangered species are anticipated as a result of the CR3 Uprate Project.

#### 4.4.2 Measuring and Monitoring Programs

There are no impacts to aquatic/wetland systems or threatened and endangered species, therefore, no new measuring and monitoring programs are proposed.

### 4.5 **Air Impacts**

#### 4.5.1 Air Emissions

Construction activities will result in the generation of fugitive particulate matter (PM) emissions and vehicle exhaust emissions. Fugitive PM emissions will result primarily from vehicular travel over paved and unpaved roads from the existing site. Vehicular traffic will include heavy-equipment traffic and traffic due to construction workers entering and leaving the CREC Site. Construction personnel and equipment will enter the site exclusively via the U.S. Highway 19 and the existing entrance roadway. Exposed land areas may also generate fugitive dust due to wind erosion. Table 4.5.1-1 presents the estimated air emissions during construction.

Emissions of fugitive PM from these activities are difficult to quantify because of their variable nature. They can only be estimated since emissions are dependent upon a number of factors, including specific activities conducted, level of activity, meteorological conditions, and control measures utilized.

Both EPA and FDEP have promulgated AAQS for PM<sub>10</sub>. Fugitive PM<sub>10</sub> emissions may result from vehicles entering and leaving the CREC site and from wind erosion from open areas around the site. The areas subject to wind erosion will generally be small due to the nature of construction activities and control measures taken, such as seeding.

For PM<sub>10</sub>, the PSD significant emission rate is 15 TPY. The estimated PM<sub>10</sub> emissions are not cumulative since the construction activities are preformed in series. The estimated fugitive emissions are not expected to significantly affect air quality outside the CREC boundary, given their small magnitude compared to the PSD significant emission rate.

Combustion-related emissions will result from onsite construction equipment and onsite vehicle traffic. Construction equipment will consist of fork lifts, cranes, trucks, compressors, and/or electrical air compressors. This equipment, as well as onsite vehicular traffic, will produce emissions of PM<sub>10</sub>, NO<sub>x</sub>, SO<sub>2</sub>, CO, and VOC. Emissions estimates were based on EPA emission factors for non-road diesel engines, assumptions on vehicle miles traveled, and fuel consumption. These emission estimates are presented in Table 4.5.1-1. Emission levels of this magnitude will not cause significant impacts to air quality in the vicinity of the CREC site.

#### 4.5.2 Control Measures

A number of control measures will be implemented during the construction period in order to minimize air emissions and potential impacts. After grading, the lightly traveled areas will be either paved or vegetated to minimize fugitive PM and wind erosion. Heavily traveled unpaved construction laydown areas and unpaved roads may be stabilized with rock. Watering will be conducted on an as-needed basis to control fugitive dust from highly traveled areas. The entrance roads are paved, which minimizes dust emissions from vehicles entering the CREC Site.

#### 4.6 **Impact on Human Populations**

Construction projects can affect human populations by altering demographic patterns; by placing demands on infrastructure elements such as housing, transportation, and educational facilities; and by contributing noise to the environment. Due to the patterns of local employment, traffic patterns and daily commuting, the demographic impact of the CR3 Uprate Project is expected to be minimal.



Section 7.0 of this SCA provides analysis of the income, employment, tax revenue and service needs associated with the uprate project workforce. This section is limited to a discussion of workforce requirements and the minor impacts of project-related traffic, housing, education and noise.

#### 4.6.1 Construction Workforce

A traffic study was prepared to review the expected impact on the roadway transportation network during construction of the CR3 Uprate Project (See Appendix 10.6).

Construction is anticipated to commence in 2009 and conclude in the 2011. The majority of construction workers are expected to commute to the CR3 site from within a distance of up to 75 miles. Contractors will be responsible for hiring the construction workforce. During outage and construction activities, PEF will generally implement practices which stagger construction workers and/or stage truck trips in order to prevent congestion within the CREC. A more detailed discussion of the workforce, payrolls, and economic impacts of the workforce is found in Section 7.0.

#### 4.6.2 Construction Traffic

Peak CR3 construction employment is estimated to increase the total of onsite employees to approximately 2,950 workers in late 2009. The magnitude of the traffic impact will be directly related to the number of construction workers. A traffic impact study was completed to identify the impact of the CR3 Uprate Project to traffic operations.

Traffic volumes were projected for the peak construction period in 2009 by adding the trips generated as a result of the CR3 Uprate Project to the 2007 existing traffic volume using a linear 3.1 percent annual growth rate based on the annual average daily traffic volumes for U.S. Highway 19 for the previous five years (Figure 4.6.2-1).

Trips generated by the project in the A.M. peak hour are expected to be more than the P.M. peak hour. Therefore, the roadway capacity analysis was based on the A.M. peak hour trips. In the future 2009 construction scenario, the CR3 Uprate Project is anticipated to generate 969 new (temporary) trips to the roadway network in the A.M. peak hour (Table 4.6.2-1).

**Table 4.6.2-1**  
**Roadway Capacity Analysis Summary**

Road Name	From/To	Lanes	Peak Hour Service Volume LOS D	2009 Peak Hour Project Volume	Percent Impact
U.S. Highway 19/98	South of Powerline Street	4D	5,140	656	12.76%
	North of Powerline Street	4D	5,140	313	6.09%
West Power Line Road	West of U.S. Highway 19/98	2U	1,190	969	81.4%

(1) Level of Service D Capacity obtained from Table 4-6 of the Florida Department of Transportation 2002 Q/LOS Manual.

A four lane divided uninterrupted flow highway for a Level of Service (LOS) B has a peak hour two-way traffic volume of 2,800 vehicles (DOT, 2002 Quality/Level of Service Handbook). U.S. Highway 19/98 operates below the 2,800 two-way peak hour traffic volume established by FDOT for a Level of Service B four lane divided uninterrupted flow highway (Table 4.6.2-2).

**Table 4.6.2-2**  
**Two-Way Peak Hour Traffic Volumes Summary**

Time Period	Florida Dot Generalized Los B Two-Way Peak Hour Traffic Volume	2009 No-construction		2009 Construction	
		NB	SB	NB	SB
A.M. peak hour	2,800	919	687	1,575	1000
P.M. peak hour	2,800	1,092	902	1,268	1,024

NB = Northbound  
SB = Southbound

Traffic generated during the construction activities is considered a temporary condition. Additionally, the peak construction period includes construction activities associated with other activities that will be ongoing at the CREC. The capacity analyses demonstrate that the intersection is anticipated to perform at a LOS D in the A.M. peak hour and at a LOS B in the P.M. peak hour (Table 4.6.2-3). The sections of U.S. Highway 19/98 north and south of Powerline Street are expected to operate at or better than LOS B.

Table 4.6.2-3

## Intersection Capacity Analysis Summary

Intersection	Time Period	Existing 2007		No-Build 2009		Build 2009	
		LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)
U.S. Highway 19/ U.S. Highway 98 and West Power Line Road	A.M. peak hour	B	19.8	B	2.0	D	40.7
	P.M. peak hour	A	8.4	A	8.5	B	13.1

The CR3 Uprate Project represents less than a one percent impact to the LOS service volume for both U.S. Highway 19/98 and Powerline Street. Due to the temporary and fluctuating conditions expected in 2009, PEF intends to consider Travel Demand Management techniques (i.e., flexible work hours, staging of truck deliveries, etc.) to help facilitate peak operating conditions. Additionally, PEF will monitor the intersection at U.S. Highway 19/98 and Powerline Street and coordinate special events with the local public agencies, such as the Citrus County Sheriff's Department, to help ensure acceptable traffic operations as necessary.

#### 4.6.3 Housing

The number of employees will vary during the CR3 Uprate Project, with a total construction and permanent employment peak of 2,950 employees at CREC. Many of these 800 construction employees for CR3 Uprate will be employed for only a portion of the period due to the changing skill requirements of the CR3 Uprate Project. There is a significant labor pool of construction workers in the surrounding counties and metropolitan Tampa area, as a result, it is expected that few construction workers will be relocating to the area for the construction term. Most workers that do relocate will use the available lodging accommodations in Citrus County (approximately 2,259 licensed lodging units).

#### 4.6.4 Education

Because of the relatively short duration of employment, few construction workers are expected to relocate with their families. As a result, there will be little immigration of school-aged children

resulting from project construction. No significant adverse effects on local elementary, middle, or high school enrollment are anticipated.

#### 4.6.5 Construction Noise Impacts

The impacts of noise on human populations are dependent upon the proximity of institutional and residential land uses to construction activities and the type and extent of noise sources. The nearest locations that could potentially be impacted by noise (i.e., critical receptor) from the proposed facility construction area are located approximately three miles south of the power block. The location is Fort Island County Park in the city of Crystal River.

Construction of the CR3 Uprate Project will require demolition of the current steam turbine and erection of the new steam turbine and cooling system. The use of construction equipment, such as dump trucks, cranes, bulldozers, front-end loaders, air compressors, grinders, and welders will be required. These sources have maximum noise levels ranging from about 70 to 90 dBA (measured at a distance of 50 ft).

The evaluation of noise impacts from construction activities was performed using previous results from noise propagation computer programs to estimate noise levels (CADNA A). Noise source levels are entered as octave band sound power levels. The user can specify coordinates, either rectangular or polar. To determine noise impacts from the CR3 Uprate Project's construction activities, the receptor grid used for the modeling was 10 x 10 meters out to a distance of 4 kilometers. All noise sources are assumed to be point sources; line sources can be simulated by several point sources. Sound propagation is calculated by accounting for hemispherical spreading and three other user-identified attenuation options: atmospheric attenuation, path-specific attenuation, and barrier attenuation. Atmospheric attenuation is calculated using the data specified by the American National Standard Institute Method for the Calculation of the Absorption of Sound by the Atmosphere (ANSI, 1999). Path specific attenuation can be specified to account for the effects of vegetation, foliage, and wind shadow. Direction source characteristics and reflection can be simulated using path-specific attenuation. Giving the coordinates and height of the barrier can specify attenuation due to barriers. Barrier attenuation is calculated by assuming an infinitely long barrier perpendicular to the source-receptor path. Total and A-weighted SPLs (filtered to approximate human hearing) are calculated. Background noise levels can be incorporated into the program and are used to calculate overall SPLs.

The model was performed to predict the maximum noise levels produced by a combination of likely noise sources with and without background noise levels. A conservative estimate of the number and types of construction equipment was assumed to calculate construction noise levels.

Table 4.6.5-1 lists the major types of equipment expected to be used during the construction of the Project and their associated noise characteristics. For the purpose of the construction noise impact analyses, all of the equipment was conservatively assumed to be operating simultaneously at peak power. Mechanical and electrical installation activities may occur at night; however, these activities have minimal noise levels and are much less than the existing plant.

The noise levels resulting from these combinations of equipment were input as multiple sources to the model. Octave bands were estimated from *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliance* (EPA, 1971). It is unlikely that all the equipment would be operating simultaneously and continuously, and, therefore, this impact assessment is conservative. Background SPL values were incorporated into the model to calculate impacts at the locations identified in Section 2.3.8. Only the atmospheric attenuation option was enabled during the noise modeling runs.

The construction noise impacts at three plant property-line monitoring locations shown in Figure 4.6.5-1 are presented in Table 4.6.5-2. The  $L_{10}$  and  $L_{eq}$  are from background noise monitoring and the background with construction impacts are presented in the table. As shown in Table 4.6.5-2, the estimated  $L_{eq}$  noise levels during the construction of the Project are estimated to be less than 73 dBA. The predicted noise levels are not expected to adversely impact the sensitive receptors identified in the vicinity of the Project Area. The noise estimates are conservative and include only atmospheric attenuation. The actual or measured noise levels due to construction are expected to be lower than predicted. Elevated noise during initial start up is not accounted for in these predictions.

#### 4.7 Impacts on Landmarks and Sensitive Areas

Results of a search of the Florida Master Site File conducted for the CR3 Uprate Project indicates that within Citrus County, there are 174 known archaeological sites, eight known structures, and two recorded cemeteries. Activities related to the CR3 Uprate Project will not affect the cultural resources in the identified review area.

#### **4.8 Special Features**

There will be no unusual products, raw materials, solid waste disposal, incinerator effluents, or residues produced during the construction activities associated with the CR3 Uprate Project that will have influence on the environment or ecological systems of the CREC, or adjacent areas.

#### **4.9 Benefits of Construction**

The construction phase associated with the CR3 Uprate Project will contribute both short and long-term economic benefits to the surrounding region. Construction benefits will include construction employment that will average several hundred over the four year construction period. Construction wages will increase the demand for goods and services in the region. Direct purchases of construction materials will have both direct and indirect economic benefits. Construction activities will increase tax revenues to the county and state governments due to sales taxes from the purchase of equipment and material to support construction activities. This includes construction materials (e.g., concrete and steel for foundations), rental equipment (e.g., construction cranes, pumps), food services, and transportation services. These benefits are presented in detail in Section 7.0.

#### **4.10 Variances**

No variances from applicable regulatory standards due to the construction of the CR3 Uprate Project are being sought as part of this SCA.



#### **4.11 References**

Florida Department of Transportation 2002 Q/LOS Manual.

Trans Associates. Progress Energy CR3 Uprate Project, Traffic Impact Study, 2007.

## **TABLES**

**TABLE 4.4.1-1**  
**Estimated Air Emissions During Construction of CR3 Uprate Project**

Construction Activity	Type Operation	Amount	Units	Pollutant	Emissions	Units	Controls
Site Preparation							
Equipment	IC Engines	65,000 gallons/yr		PM <sub>10</sub>	0.20 tons/yr		EPA Non-Road Tier 3
				NO <sub>x</sub>	3.65 tons/yr		EPA Non-Road Tier 3
				SO <sub>2</sub>	0.22 tons/yr		EPA Non-Road Tier 3
				CO	3.52 tons/yr		EPA Non-Road Tier 3
				VOC	0.41 tons/yr		EPA Non-Road Tier 3
Open Areas	Wind Erosion	5 acres		PM <sub>10</sub>	0.6 tons/yr		Watering
Vehicle Traffic	Paved Roads	847,321 VMT		PM <sub>10</sub>	5.3 tons/yr		Watering as necessary
Installation	IC Engines	155,040 gallons/yr		PM <sub>10</sub>	0.48 tons/yr		EPA Non-Road Tier 3
				NO <sub>x</sub>	8.72 tons/yr		EPA Non-Road Tier 3
				SO <sub>2</sub>	0.53 tons/yr		EPA Non-Road Tier 3
				CO	8.39 tons/yr		EPA Non-Road Tier 3
				VOC	0.97 tons/yr		EPA Non-Road Tier 3

Note: VMT = vehicle miles traveled; acres based on open areas at any one time.

Sources: USEPA, 1992 Fugitive Dust Background and Technical Information Document for Best Available Control Measures;

Section 2.3.1.3.3, Wind Emissions from Continuously Active Piles.

USEPA, 2006; AP-42, Section 13.2.4 for Aggregate Handling and Storage Piles.

USEPA, 2001; AP-42, Section 11.12 Concrete Batching.

USEPA, 2006; AP-42, Section 13.2.2 Unpaved Roads.

USEPA, 2004; Exhaust and Crankcase Emissions Factors for Nonroad Engine Modeling-Compression Ignition.

TABLE 4.6.5-1

## Summary of Demolition and Construction Noise Sources Associated with Heavy Construction Activities

Source	Modeled Source Height <sup>a</sup> (m)	Sound Power Level (dB) for Octave Band Center Frequency (Hz)									Overall Sound Power Level	
		31.5	63	125	250	500	1K	2K	4K	8K	(dB)	(dBA)
Front End Loader 1	1.8	0.0	111.6	118.6	116.6	114.6	109.6	104.6	98.6	92.6	122.4	115.5
Front end Loader 2	1.8	0.0	111.6	118.6	116.6	114.6	109.6	104.6	98.6	92.6	122.4	115.5
Truck 1	1.8	0.0	0.0	118.6	116.1	113.1	109.6	106.1	102.1	0.0	121.7	115.3
Truck 2	1.8	0.0	0.0	118.6	116.1	113.1	109.6	106.1	102.1	0.0	121.7	115.3
Truck 3	1.8	0.0	0.0	118.6	116.1	113.1	109.6	106.1	102.1	0.0	121.7	115.3
Bulldozer 1	1.8	0.0	106.6	103.6	101.6	102.6	99.6	96.6	94.6	96.6	105.3	110.9
Bulldozer 2	1.8	0.0	106.6	103.6	101.6	102.6	99.6	96.6	94.6	96.6	105.3	110.9
Crane 1	1.8	0.0	111.6	118.6	116.6	114.6	109.6	104.6	98.6	92.6	122.4	115.5
Crane 2	1.8	0.0	111.6	118.6	116.6	114.6	109.6	104.6	98.6	92.6	122.4	115.5
Welder 1	1.8	0.0	102.6	110.6	105.6	98.6	98.6	93.6	88.6	84.6	103.6	112.7
Welder 2	1.8	0.0	102.6	110.6	105.6	98.6	98.6	93.6	88.6	84.6	103.6	112.7
Grinder 1	1.8	0.0	102.6	110.6	105.6	98.6	98.6	93.6	88.6	84.6	103.6	112.7
Grinder 2	1.8	0.0	102.6	110.6	105.6	98.6	98.6	93.6	88.6	84.6	103.6	112.7
Grinder 3	1.8	0.0	102.6	110.6	105.6	98.6	98.6	93.6	88.6	84.6	103.6	112.7

TABLE 4.6-5-2

## Baseline and Impacts of Construction

Baseline Site	Location	Time	Baseline Sound Levels (dBA)		Sound Levels with New Unit (dBA)		Increase (dBA)	
			L <sub>10</sub>	Leq	L <sub>10</sub>	Leq	L <sub>10</sub>	Leq
5	Northeast corner of fence line	Day	51	50	51	50	<1	<1
		Night	57	55	57	55	<1	<1
6	Intersection of Tallahassee and Powerline Rd	Day	56	53	56	53	<1	<1
		Night	74	73	74	73	<1	<1
7	Middle of Powerline Rd	Day	62	59	62	59	<1	<1
		Night	47	46	47	46	<1	<1

Source: Golder, 2007

## **FIGURES**






#### LEGEND

- SGRP Construction/Laydown/Parking Areas
- CR3 & Ancillary Facilities

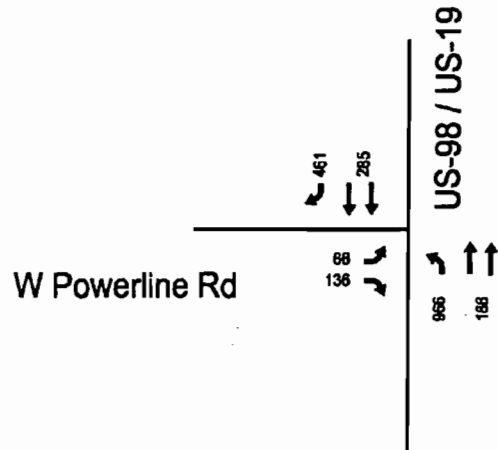
#### REFERENCE

1. 2006 Southwest Florida Water Management District Aerial.
2. Laydown Areas provided by Progress Energy.

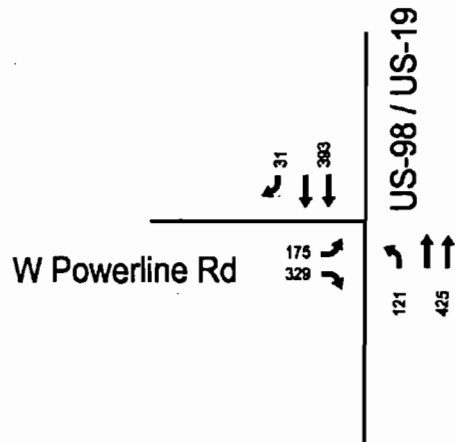


PROJECT			
PROGRESS ENERGY FLORIDA, CRYSTAL RIVER NUCLEAR UNIT 3 UPRATE PROJECT			
TITLE			
CRYSTAL RIVER UNIT 3 UPRATE CONSTRUCTION SITE PLAN			
 <b>Golder Associates</b> Tampa, Florida		PROJECT No. 073-89531	SCALE AS SHOWN
		DESIGN JG May 01, 2007	REV. 0
		GIS JG May 25, 2007	
		CHECK RG May 25, 2007	
		REVIEW MR May 25, 2007	
			<b>FIGURE</b> <b>4.1.1-1</b>

# AM PEAK HOUR



# PM PEAK HOUR



SCALE: N.T.S.



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PROJECT NO. GOLAS00-07199

PROJECT: CR3 UPRATE PROJECT

TITLE: CR3 2009 CONSTRUCTION TRAFFIC VOLUME

FIGURE

4.6.2-1

D.R. cad  
C.B. cad  
REV. \_\_\_\_\_





**Figure 4.6.5-1**  
**Construction Noise Map**  
**Progress Energy Florida**  
**Crystal River Unit 3 Upstate Project**

## 5.0 EFFECTS OF PLANT OPERATION

### 5.1 Effects of the Operation of the Heat Dissipation System

#### 5.1.1 Temperature Effect on Receiving Body of Water

As described in Section 3.5, the final condenser cooling water flow rate for CR3 has not been determined, however, the potential will range up to a maximum expected flow rate of 830,000 gpm from the current 680,000 gpm. The corresponding flow rate for CR 1, 2, and 3 will thus range up to 1,468,000 gpm (potential maximum). The use of the proposed new SCT will ensure that the heat rejection rate from the three units will be limited so as not to exceed the present maximum rate of 10.91 Billion Btu per hour at the POD. Because the temperature rise is proportional to the heat rejection rate, the full load temperature rise at the maximum expected flow rate, without the use of the existing HCT but using the recirculating portion of the new SCT, will be 13.79 °F.

Since the discharge temperature from CR 1,2 and 3 prior to use of the new SCT is estimated to range between the present value of up to 16.74° F, to a future value between 13.79 ° F and 16.74° F, there is not expected to be any measurable thermal impact due to change in combined flow discharge temperature. Also, because the total quantity of heat rejected via the discharge canal at the POD is not changing, the shape and extent of the thermal plume (the location and amount of acreage enclosed within each temperature isotherm) is not expected to change with the CR3 Uprate Project.

#### 5.1.2 Effects on Aquatic Life

PEF has been in the process of quantifying baseline aquatic impingement and entrainment impacts at the CREC in order to develop a Comprehensive Demonstration Study (CDS) for submittal to the FDEP in compliance with the federal Clean Water Act 316(b) rule. However, the U.S. Court of Appeals for the Second Circuit recently remanded most of the substantive portions of the USEPA's July 2004 316(b) Rule. PEF anticipates that EPA will re-promulgate the Phase II 316(b) regulations at some time in the future. In the interim, PEF intends to continue to evaluate impingement and entrainment impacts associated with the CR3 Uprate Project within the CREC existing monitoring program. This data will be used to evaluate impacts and identify measures to reduce aquatic impacts during the next CREC NPDES permit renewal (scheduled in late 2009).

The magnitude of any changes in overall facility effects on aquatic life due to the uprate project is expected to be small.

There are no expected changes in effects on aquatic organisms due to changes in the release of heat, because there is no change in the quantity of heat at the POD as measured in Btu per hour, and because the temperature rise associated with the release of heat will be the same as, or slightly reduced from, the current discharge temperatures.

As described in Section 3.5, the total quantity of water withdrawn from the Gulf of Mexico through the intake canal will not be increased by the uprate project; therefore, the total rate of entrainment should also not increase. In fact, since the amount of cooling water that will be recirculated by the six-cell portion of the new cooling towers (152,136 gpm) exceeds the potential increase in cooling water flow associated with the uprate project (150,000 gpm), the net inflow into the intake canal from the Gulf of Mexico is estimated to decrease slightly with the uprate project.

Impingement mortality is generally considered a function of both through-screen velocity and of total flow rate. Although the uprate may cause the through-screen velocity to increase by as much as 22 percent (from 1.65 fps maximum to 2.02 fps maximum), the actual concentration of impingeable organisms is more likely controlled by the velocity entering the intake canal, as that is the velocity those organisms must overcome to escape impingement. As described in Section 2.3.4, the existing intake canal velocity which corresponds with the maximum through-screen velocity (at MLW) is estimated to be about 1.3 fps. Since the uprate project will actually reduce the overall cooling water flow into the intake canal from 1,318,000 gpm to at most 1,315,684 gpm (1,468,000 gpm – 152,136 gpm), the maximum intake canal velocity would be expected to be reduced slightly, on the order of about 0.002 fps.

Based on the discussion above, PEF proposes to continue to evaluate the entrainment and impingement impacts associated with CREC ongoing facility operations as well as the impacts associated with the CR3 Urate Project. PEF intends to quantify aquatic impacts to offset impacts during the CREC NPDES renewal (scheduled for submittal in 2009) process. Pending the outcome of the ongoing studies, PEF will propose the best technology available for minimizing impacts. Based on current information, the proposal may include a physical barrier, diversion technology or expanded onsite restoration (i.e., expansion of the Mariculture Center).

### 5.1.3 Biological Effects of Modified Circulation

The CR3 uprate project is not expected to cause any significant modification to water circulation in the site vicinity. The existing condition includes the circulation patterns superimposed by the CREC on the ambient environment. As described in section 5.1.2 above, the magnitude of the change to the velocity entering the intake canal is estimated to be a reduction of approximately 0.002 fps. Changes of this magnitude are not measurable.

### 5.1.4 Effects of Offstream Cooling

Because the new SCT withdraws water from the discharge canal, it is withdrawing water that has already been screened and passed through a condenser. Therefore, that withdrawal of water will not cause any increase in impingement mortality or entrainment relative to the existing levels.

## 5.2 **Effects of Chemical and Biocide Discharges**

### 5.2.1 Industrial Wastewater Discharges

Compliance with applicable state and federal discharge regulations and water quality standards for industrial wastewaters, is presently being achieved through the implementation of the CR 1, 2, and 3 NPDES permit. The CR3 Uprate Project will not cause any changes in the quantity or characteristics of industrial wastewaters generated by the facility; therefore, no change in that compliance achievement status due to the uprate project is expected.

### 5.2.2 Cooling Tower Blowdown

The proposed new SCT associated with the CR3 Uprate Project will not generate any "blowdown". Additionally, the evaporation associated with the recirculating portion of the new SCT is not expected to exceed 1,718 gpm, an amount that will not significantly increase the TDS of the cooling water discharge. At this maximum expected evaporation rate, the change in TDS concentration assuming an existing value of 28,000 mg/L would only be about 37 mg/L or 0.1 percent. This effect is insignificant relative to the natural range of TDS of 7,000 mg/L (31,000 – 24,000) at the CREC site as shown on Figure 2.3.4-6.



The facility's existing NPDES Permit requires monitoring to demonstrate compliance with applicable state and federal regulations and water quality standards for industrial wastewaters, and will continue to do so after the CR3 Uprate Project.

### **5.3 Impacts on Water Supplies**

#### **5.3.1 Surface Water**

The CR3 Uprate Project will not cause any changes in hydrologic or water quality conditions due to diversion, interception, or additions to surface water flow.

#### **5.3.2 Groundwater**

The CR3 Uprate Project will not require any changes in the withdrawal rates of ground water by CREC. It will also not cause any change in the impacts of plant pollutants on ground water.

#### **5.3.3 Drinking Water**

There will be no quality, quantity, or hydrological changes due to the CR3 Uprate Project water use, either by withdrawal or discharge to a drinking water source. Therefore, the uprate will have no impacts on drinking water.

#### **5.3.4 Leachate and Runoff**

The CR3 Uprate Project includes no coal or materials storage areas, ash and wastewater ponds, or flue gas desulphurization storage areas or ponds. Therefore, the uprate will have no impacts on ground or surface water quality, or on terrestrial and aquatic environments, due to leachate or runoff from such facilities.

#### **5.3.5 Measurement Programs**

No such programs are applicable.

## **5.4 Solid/Hazardous Waste Disposal Impacts**

### **5.4.1 Solid Waste**

The uprate will have no impact to disposal of solid wastes on-site, or to directly affected off-site landfilling operations. The CR3 Uprate Project will result in a small increase in the spent fuel discharge rate. These fuel assemblies will continue to be stored in the onsite NRC approved spent fuel storage facilities.

### **5.4.2 Hazardous Wastes**

The uprate will have no impact on hazardous waste handling and/or disposal at CREC.

## **5.5 Sanitary and Other Waste Discharges**

The uprate will not result in any increase of on-site staff, so will not generate any additional domestic wastewater. It will not require any changes in configuration or operation of the existing extended aeration domestic wastewater treatment plant.

## **5.6 Air Quality Impacts**

This section presents a summary of the air quality requirements, air modeling methodology, and results of air quality impact analyses for the CR3 Uprate Project. Detailed information is contained in Appendix 10.1.5, Air Construction and PSD Application.

### **5.6.1 Impact Assessment**

Wet cooling towers such as the proposed SCT for the CREC site provide direct contact between cooling water and air passing through the tower. Cooling tower drift is created when a small amount of the cooling water becomes entrained in the air stream and carried out of the tower. PM emissions from cooling towers are related to the total dissolved solids (TDS) and amount of drift through the cooling tower. Drift eliminators will be used to reduce the amount of drift and secondarily reduce the amount of PM emissions.

#### 5.6.1.1 Regulatory Applicability

The permitting of the drift from the new SCT to be installed to maintain increasing thermal conditions at the CREC site requires an air construction permit and PSD approval. The new SCT for the CR Uprate Project will be a modification to an existing major air emissions source. The U.S. Environmental Protection Agency (EPA) has implemented regulations requiring PSD review for new or modified sources that increase air emissions above certain threshold amounts. That increase results from increased PM emissions from the new SCT.

EPA's PSD regulations are promulgated under Title 40 of the Code of Federal Regulations (CFR), Parts 51.166 and 52.21, and are implemented in Florida through the approved PSD program of the FDEP. FDEP has adopted PSD regulations codified in Rule 62-212.400, Florida Administrative Code (F.A.C.).

PSD applicability for the Project is summarized below.

Pollutant	Annual Emissions (TPY)	PSD Threshold (TPY)	PSD Review Required (Y/N)
PM	97.6	25	Y
PM <sub>10</sub>	5.9	15	N

A PSD review is required for particulate matter (PM) as total suspended particulate matter (TSP).

Citrus County has been designated as an attainment, maintenance or unclassifiable area for all criteria pollutants. The county is also classified as a PSD Class II area for PM<sub>10</sub>, SO<sub>2</sub>, and NO<sub>2</sub>. Therefore, the new source review will follow PSD regulations pertaining to such designations.

#### 5.6.1.2 Analysis Approach and Assumptions

Because PM, and not PM<sub>10</sub>, was the only pollutant that triggered PSD review in the form of drift from the SCT, an air quality impact analysis was not conducted.

#### 5.6.1.3 Additional Impact Analysis

In addition to air quality impact analyses, federal and State of Florida PSD regulations require analyses of the impairment to visibility and the impacts on soils and vegetation that would occur as a result of the proposed source [Rule 62-212.400]. These analyses are to be conducted

primarily for PSD Class I areas. Impacts as a result of general commercial, residential, industrial, and other growth associated with the source also must be addressed.

Because PM was the only pollutant that triggered PSD review, and not PM<sub>10</sub>, additional analysis of impacts due to the proposed Project on soils, vegetation, visibility, growth, and air quality related values (AQRVs) in the nearest PSD Class I areas were not necessary.

#### Impacts Due To Direct Growth

Construction of the project will occur during two phases, concurrent with the facility refueling outages in 2009 and 2011. It is anticipated that many of these construction personnel will be drawn from surrounding metropolitan areas and will commute to the job site. The workforce needed to operate the project, once completed, will essentially remain unchanged from current conditions. Finally, there are expected to be no air quality impacts due to associated industrial/commercial growth given the project's location. The existing infrastructure should be more than adequate to provide any support services that the project might require.

#### Impacts on Soils, Vegetation, Wildlife, and Visibility

Wet cooling towers provide direct contact between cooling water and air passing through the tower. Cooling tower drift is created when a small amount of the cooling water becomes entrained in the air stream and carried out of the tower. PM emissions from cooling towers are related to the total dissolved solids (TDS) and amount of drift through the cooling tower. Drift eliminators will be used to reduce the amount of drift and secondarily reduce the amount of PM emissions.

It should be noted that, although cooling towers will emit particulates in the form of salt, the overall contribution to the area from cooling towers will be minimal. The CREC is located approximately one mile from the Gulf of Mexico. It is expected that the natural contributions of salt deposition from wave action to this area will be substantially greater than that which will be emitted from the cooling towers.

## 5.6.2 Monitoring Programs

### 5.6.2.1 *Ambient Air Quality Monitoring*

In accordance with requirements of 40 CFR 52.21(m) and Rule 62-212.400(5)(f), F.A.C., any application for a PSD permit must contain an analysis of continuous ambient air quality data in the area affected by the proposed major stationary facility or major modification. For a new major facility, the affected pollutants are those that the facility would potentially emit in significant amounts. For a major modification, the pollutants are those for which the net emissions increase exceed the significant emission rates, as described above.

An exemption from the preconstruction ambient monitoring requirements is available if certain criteria are met. If the predicted increase in ambient concentrations, due to the proposed modification, is less than specified *de minimis* concentrations, then the modification can be exempted from the pre-construction air monitoring requirements for that pollutant per FDEP rule. The proposed Project will result in PSD review for only PM emissions and, as such, no preconstruction ambient monitoring is required.

### 5.6.2.2 *Air Emissions Monitoring*

Continuous emission monitoring (CEM) for the pollutant of concern (PM) is not technologically feasible for a project of this type. In lieu of air emissions monitoring, the permittee typically certifies that the cooling towers were constructed and installed to achieve the specified drift rate. This certified drift rate, in combination with monitoring of the circulating water flow rate, serve as a surrogate for demonstrating air emissions compliance.

## 5.7 **Noise Impacts**

### 5.7.1 Impacts

Sound propagation involves three principal components: a noise source, a person or a group of people, and the transmission path. While two of these components, the noise source and the transmission path, are easily quantified (i.e., direct measurements or through predictive calculations), the effects of noise to humans is the most difficult to determine due to the varying responses of humans to the same or similar noise patterns. The perception of sound (noise) by

humans is very subjective, and just like odors and taste, is very difficult to predict a response from one individual to another.

The noise predictions for the CR3 Uprate Project were developed using the CADNA A computer model. The noise impacts of the CR3 Uprate Project were evaluated using the sound power levels ( $L_w$ ) (Appendix 10.5.1) for the various operating equipment associated with the CR3 Uprate Project. The location of each noise source was based on its location in the computerized plot plan. The computerized drawing was imported into the CADNA A model for the noise analysis.

CADNA A is an environmental noise propagation computer program that was developed to assist with noise propagation calculations for major noise sources and projects. Noise sources are entered as octave band sound power levels,  $L_w$ . Locations of the noise sources, buildings, and receptors are input directly on the base map and can be edited throughout the modeling process. All noise sources are assumed to be a point, line, area or vertical area source, and can be specified by the user. Sound propagation is calculated by accounting for hemispherical spreading and three other user-identified attenuation options: atmospheric attenuation, path-specific attenuation, and barrier attenuation. Atmospheric attenuation is calculated using the data specified by the Calculation of the Absorption of Sound by the Atmosphere (ANSI, 1999). Path-specific attenuation can be specified to account for the effects of vegetation, foliage, and wind shadow. Directional source characteristics and reflection can be simulated using path-specific attenuation. Barrier attenuation is calculated by assuming an infinitely long barrier perpendicular to the source-receptor path. Total and A-weighted SPLs are calculated. Sources modeled included the cooling towers.

Table 5.7.1-1 presents the noise impacts of the CR3 Uprate Project. When predicted levels from cooling towers are combined with baseline noise levels there is no significant increase to the noise level at monitoring sites 5, 6, and 7. With the exception of Site 6 Night, the predicted noise levels of the baseline sites would be at or lower than Citrus County noise standards for residential land use of 60 dBA during the daytime and 55 dBA during the nighttime. The predicted noise levels are not expected to adversely impact the sensitive receptors identified in the vicinity of the Project Area.



Figure 5.7.1-1 shows the maximum predicted noise level compared with the  $L_{eq}$  baseline sound level observed during the nighttime at Site 6. This figure also shows a comparison of various noise sources and their respective sound levels.

Intermittent noise sources during routine startup, testing, and maintenance, and emergency conditions will include steam venting. Such activities would not normally occur simultaneously and would last for a short duration. The noise impacts of these conditions would not be expected to cause a nuisance.

## **5.8 Changes to Non-Aquatic Species Population**

### **5.8.1 Impacts**

No adverse impacts to non-aquatic species are anticipated during the operation of CR3 following completion of the CR3 Uprate Project. All of the CR3 facilities will be located primarily upon previously-impacted areas which does not provide suitable natural areas for wildlife. The existing CR3 site has been disturbed during prior construction of the existing CR3 facilities, including removal of vegetative communities, topographic grading, and hydrologic alteration. The CR3 facility does not provide critical habitat for wildlife; therefore the operation of CR3 is not anticipated to result in the reduction of any populations of non-aquatic species.

No adverse impacts to federal- or state-listed terrestrial plants or animals are expected during facility operations, due to the existing developed nature of the habitat within the site. No long term change in the populations of any threatened or endangered species is anticipated as a result of operation of CR3.

No changes in wildlife populations at the adjacent undeveloped areas are anticipated, including listed species. Noise and lighting impacts are minimal, and not anticipated to deter the continued use of the undeveloped forested areas within the vicinity by listed species of wildlife based upon evidence from existing power facilities in Florida.

### **5.8.2 Monitoring**

Because no significant impacts to non-aquatic species populations are anticipated, no monitoring program is proposed.

## 5.9 Other Plant Operation Effects

### 5.9.1 Operations Traffic

A traffic study was prepared to review the expected impact on the roadway transportation network during normal plant operations following the conclusion of the CR3 Uprate Project (Appendix 10.6).

For the purposes of the traffic study, it is anticipated that no increase in operations personnel will occur beyond the conclusion of the construction activities in 2011. The 2012 operations traffic volume assumes that no new trips are projected as compared to the 2007 existing conditions (Figure 5.9.1-1). The future 2012 build-out scenario is anticipated to be completed with no new additional employees (Table 5.9.1-1).

**TABLE 5.9.1-1**  
**Roadway Capacity Analysis Summary**

Road Name	From/To	Lanes	Peak Hour Service Volume LOS D	2012 Peak Hour Project Volume	Percent Impact
U.S. Highway 19/98	South of Powerline Street	4D	5,140	0	0.0%
	North of Powerline Street	4D	5,140	0	0.0%
West Powerline Street	West of U.S. Highway 19/98	2U	1,190	0	0.0%

(1) Level of Service D Capacity obtained from Table 4-6 of the Florida Department of Transportation 2002 Q/LOS Manual.

The total build-out condition represents a total of 1,400 permanent employees. Results of the 2012 scenario capacity analyses demonstrate that the intersection is anticipated to perform at a Level of Service C in the A.M. peak hour and at a LOS B in the P.M. peak hour. The sections of U.S. Highway 19/98 north and south of Power Line Road are expected to operate at or better the LOS B for the build-out condition. The proposed uprate project does not represent any additional trips at build-out and all roadway LOS conditions are expected to be maintained at the completion of the proposed project. (Table 5.9.1-2).

**TABLE 5.9.1-2**  
**Intersection Capacity Analysis Summary**

Intersection	Time Period	Existing 2007		Build 2012	
		LOS	Delay (sec)	LOS	Delay (sec)
U.S. Highway 19/98 and West Powerline Street	A.M. Peak Hour	B	19.8	C	20.4
	P.M. Peak Hour	A	8.4	B	10.0

### 5.9.2 Effect of Train Operations

As indicated in Section 5.9.1, it is expected that trains will continue to be used during normal CREC site operations and will not be impacted or increased by the CR3 Uprate Project.

### 5.10 Archaeological Sites

No sites of historic or archaeological significance will be impacted due to the operation of CR3. No sites listed, or eligible for listing in the *National Register of Historic Places*, are located in close proximity to the site. No direct or indirect impacts are anticipated from any operation aspect of the CR3 Uprate Project.

### 5.11 Resources Committed

There are no major irreversible and irretrievable commitments of national, State, and local resources due to the CR3 Uprate Project.

### 5.12 Variances

No variances from any applicable standards of any State, regional or local government agency are being requested as part of this application.

### **5.13 References**

Level of Service D Capacity obtained from Table 4-6 of the Florida Department of Transportation  
2002 Q/LOS Manual.

## **FIGURES**

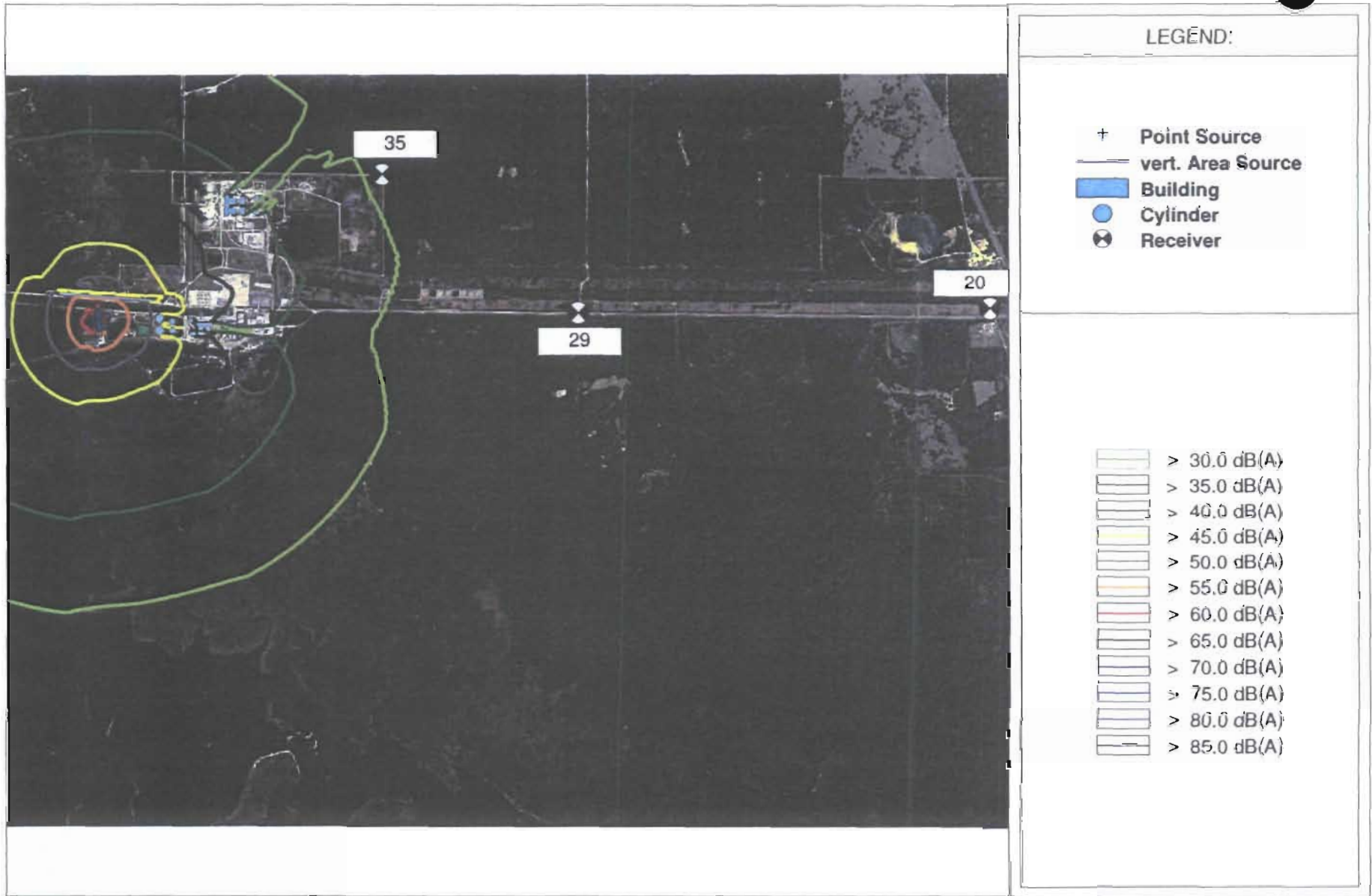
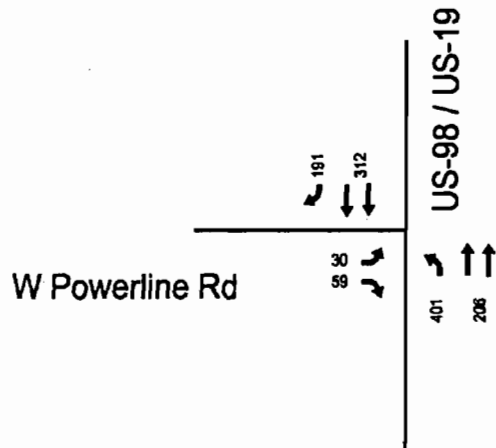


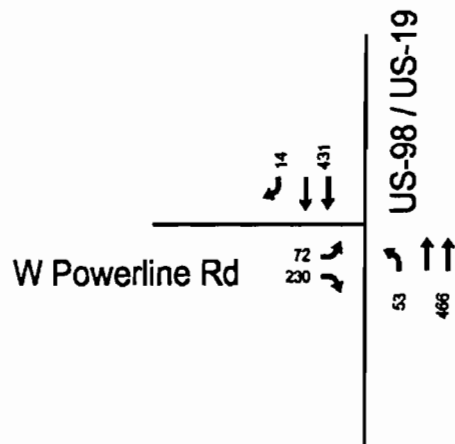
Figure 5.7.1-1  
Operations Noise Map  
Progress Energy Florida  
Crystal River Unit 3 Uprate Project



# AM PEAK HOUR



# PM PEAK HOUR



SCALE: N.T.S.



Transportation Solutions for Today and Tomorrow  
Park Tower Suite 1140 / 400 North Tampa Street  
Tampa, Florida 33602 / (813) 386-3030

PROJECT NO. GOLAS00-07199

PROJECT: CR3 UPRATE PROJECT

TITLE: 2012 Build Traffic Volumes

FIGURE

5.9.1-1

D.B. cad  
C.B. cad  
REV. \_\_\_\_\_

## **6.0 TRANSMISSION LINES AND OTHER LINEAR FACILITIES**

CR3 generates electric power at 22 kV which is fed through an isolated phase bus to the unit main transformers where it is stepped up to 500 kV transmission voltage and delivered to the 500 kV substation. The 500 kV substation is a ring bus. The 230 kV substation is connected to the existing Progress Energy Florida transmission network by five lines which leave the site on three independent rights-of-way and terminate in three separate substations. The 500 kV substation is connected to the existing PEF transmission network by two full capacity lines (each line is physically capable of handling full output of Units 3 and 5 generation) which leave the site in independent rights-of-way and terminate in separate substations.

No new off-site electrical transmission facilities or other associated facilities are required for the CR3 Uprate Project.

## **7.0 ECONOMIC AND SOCIAL EFFECTS OF PLANT CONSTRUCTION AND OPERATION**

The purpose of this section is to identify the economic and social effects of construction and operation of the CR3 Uprate Project and quantify the project's benefits and costs in the area surrounding the CR3 site as well as to the Citrus County economy and to the state of Florida. The CREC, being the largest power-producing facility in the state of Florida, currently provides power to over 1.6 million customers in Florida.

Socioeconomic effects are either direct or indirect. Direct effects are those that are the direct result of the construction or operation of the CR3 Uprate Project. Indirect effects are costs and benefits that affect people and business interests near the project who, because of their relative proximity to the CR3 site, may experience changes in their local socioeconomic environment, such as increased spending due to project construction and operation. Some of these effects are estimated through economic studies that rely on generally accepted assumptions to assess the relative values of expected costs and benefits.

This section is divided into two parts. Section 7.1 addresses both the direct and indirect socioeconomic benefits of the project and consists of an analysis of the construction and operational expenditures. Section 7.2 addresses the temporary and long-term indirect costs involving the construction and operation of the CR3 Uprate Project as well as the construction and operational use of private and public services in the vicinity of the site and in Citrus and the surrounding counties. All cost and benefit values are based on 2006 dollar values.

### **7.1 Socioeconomic Benefits**

#### **7.1.1 Direct Socioeconomic Benefits**

The CR3 Uprate Project will have two direct economic benefits to the local economy, local communities, and the surrounding area: construction employment opportunities and increased public revenue. Employment opportunities will be associated with the construction-related needs of the CR3 Uprate Project. Increased public revenue will result from the anticipated property tax changes from the facility improvements and additions.

### 7.1.1.1 Project Economic Profile

PEF currently employs approximately 700 permanent and long-term contract staff at the CR3 site during normal operations. During refueling outages, which are scheduled for 2009 and 2011, approximately 800 additional employees (i.e., craft and technical staff) are anticipated. Construction of the CR3 Uprate Project will take place in two phases. The first phase (Phase I) will occur in the fall of 2009 and the second phase (Phase II) will occur in the fall of 2011. Construction activities associated with the CR3 Uprate Project will occur concurrent with these refueling outages and will result in an additional 650 construction workers in 2009 and 580 construction workers in 2011. It is anticipated that during peak construction activities (in late 2009 and 2011) the total workforce at the CREC site could total up to 2,950 employees (in 2009) and 2,080 employees (in 2011) during completion of both the SGRP and CR3 Uprate Project (Table 7-1).

TABLE 7-1 CREC EMPLOYEE DATA (Permanent and Temporary)							
	2007	2008	2009	2010	2011	2012	2013
<b>Existing project Information</b>							
CREC	1400	1400	1400	1400	1400	1400	1400
CR3 Refueling Outages <sup>1</sup>	800		800		800		800
Clean Air Project Construction <sup>2</sup>	600	600	600				
CR 4 and 5 Trucks <sup>3</sup>	125	125	125	285	285	285	285
CR 1 or 2 Outage <sup>4</sup>	350			300	40	350	100
CR 4 or 5 Outage <sup>4</sup>	20	350			100	50	100
Steam Generator Replacement Project <sup>5</sup>			800				
<b>CR3 Uprate Project Information</b>							
<b>Uprate Project</b>	<b>305</b>	<b>400</b>	<b>650</b>	<b>405</b>	<b>580</b>		

1. Employees anticipated onsite during 4 quarter only.
2. Construction employees associated with Clean Air Project (Icon, 2006).
3. Truck trips associated with operation of the CR 4 and 5.
4. Outage scheduled during 1<sup>st</sup> or 2<sup>nd</sup> quarter – and does not occur with CR3 outage.
5. Construction employees associated with Steam Generator Replacement Project during 3rd and 4<sup>th</sup> quarter only.

The additional labor demands associated with construction activities will not create labor shortages. Due to the proximity of the CR3 Uprate Project to the Tampa metropolitan area labor market, which includes Citrus County, the labor demand is expected to be met by labor in Citrus County, the Tampa metropolitan area and nearby counties. Population and housing impacts will be minimal because construction employees are anticipated to currently reside in the area and the potential for migration into the area during construction is anticipated to be modest. The existing communities have sufficient resources to accommodate the expected modest increase in employment, wages, and sales.

The proposed construction activities will require skilled labor for the anticipated installation and equipment modifications; therefore, construction workers could be paid higher wages than the local market pays. This increase in wages will also benefit the surrounding area by using workers within local labor unions that, in turn pay taxes and purchase goods and services within the community. Ongoing operation of the plant will not require additional staff; therefore, the existing workforce of approximately 600 employees will continue following the completion of the CR3 Uprate Project.

The total cost for the CR3 Uprate Project is \$250 million for the installation and equipment upgrade requirements at the CR3 facility. These costs are split between the two construction phases: Phase I has an estimated \$100 million and Phase II has an estimated at \$150 million in project costs. The major costs associated with this construction project include major equipment and materials (about \$200 million) and labor (about \$20 million) over the four-year construction period. The remaining costs of \$30 million for development of the project are associated with engineering, licensing, contingencies, and other miscellaneous costs.

PEF is a private enterprise that provides a service to the public; however, a measurable benefit is accrued through payments received for services rendered. Therefore, financing costs for facility upgrades and modifications are met through cost recovery as a result of electric bill payments made by the consumers.

#### *7.1.1.2 Fiscal Impacts*

The net economic impact of a project on its host government and local communities, for the life of the project, is the difference between the total operating revenue and operating costs. Operating revenues consist of *ad valorem* tax revenue, franchise fees, occupational licenses, building permits, utility taxes, state revenue proceeds, charges for county services, etc, paid by project owners to

various governmental agencies. Operating costs include costs for services such as financial and administrative expenses, emergency and disaster relief, legislative and executive expenses, and comprehensive planning incurred by governmental agencies. The county government also earns capital revenues and pays capital expenses. Capital revenues are based on impact fees and capital expenses are costs related to purchases for roads, fire rescue, law enforcement, etc.

The CREC is the largest power-producing facility in the state of Florida and is located entirely within Citrus County. Therefore, annual property taxes are paid to one local government or municipality; Citrus County. Citrus County then distributes these funds to the Board of County Commissioners, the Citrus County Hospital Board, the Citrus County School Board, SWFWMD, the Homosassa Special Water District, the Mosquito Control District, and the county's municipalities to fund their respective operating budgets (Citrus County Tax Collector's website).

For the past four years (2002 through 2005), property taxes from CREC to Citrus County have averaged at \$8,764,210 per year, which has represented a 6.7 percent of Citrus County's total property tax revenue. Table 7-2 presents the total property taxes received by the County, property taxes paid by PEF and the estimated percent of total provided by PEF for the past four years.

**TABLE 7-2**

<b>Year</b>	<b>Citrus County Total Tax Revenue<sup>1</sup></b>	<b>Progress Energy Property Tax Payment<sup>2</sup></b>	<b>Citrus County Percent of Revenues</b>
2002	\$109,976,197	\$10,314,467	9.4
2003	\$118,857,916	\$8,130,644	6.8
2004	\$134,797,365	\$8,044,270	6.0
2005	\$157,764,712	\$8,567,459	5.4

**Source:**

1. Waldemar, 2007.
2. Citrus County Property Appraiser's Database

The total net economic benefit to Citrus County is based on current tax rates for each taxing authority, as determined for the state of Florida and Citrus County and an estimated property and onsite facility value. As tax rates, property values, and facility values change for each taxing authority over the life of the project, revenues will change accordingly. Following the CR3 Uprate Project, property tax revenues for the overall CREC facility is estimated to increase to approximately



\$10 to 12 million subsequent to construction and commercial operation. This will result in a substantial economic benefit to the County.

Because CR3 and CREC are largely self-sufficient, public utilities or services (i.e., water, wastewater, and transportation links) which are generally provided to property owners by Citrus County will not be required. The *ad valorem* revenue that will accrue to the water management district during the next 20 years of operation period will be used for a wide variety of purposes including environmentally sensitive land acquisition programs and land stewardship of these properties. Payments made to the School Board are applied to operations as well as capital expenditures for new or upgraded facilities.

In addition to local government fiscal benefits and sales tax benefits will accrue to the state of Florida. It is estimated that sales tax revenue will accrue during construction and operation. These taxes will be placed in the state's general fund and will be available for use as deemed appropriate by the state.

#### *7.1.1.3 Economic Impacts*

Among the primary direct benefits of plant construction and operation will be the increase in job opportunities for Citrus County and adjacent areas. It is anticipated that construction employment will peak to 650 workers during peak construction-related activities, over the four-year construction period. With the completion of the CR3 Uprate Project in 2012, the CR3 Uprate Project will not result in any new employment positions at the CREC. PEF is currently hiring to meet company needs, but these new hires are not anticipated to be permanently located at the CREC. Therefore, payroll for CR3 employees is estimated to average \$5 million per year during construction and is estimated to remain at approximately \$50 M per year during full operations thereafter.

#### 7.1.2 Indirect Economic Benefits

The proposed project will have several indirect, economic benefits to the local economy, the local communities, and the surrounding area. These benefits include equipment and material purchases and rentals; secondary employment opportunities; increased demand of goods and services; and increased spending power.

It is anticipated that various construction materials such as concrete, fill material, lumber, and miscellaneous buildings materials will be purchased from local suppliers on a competitive basis, as would miscellaneous tools, office supplies, automotive parts, hardware, first aid and safety supplies, fuels, and lubricants. Site contractors could also obtain construction equipment and vehicle rentals from local sources when available in the area. While the large, hardware items to be installed at the facility will be custom-made pieces imported from outside the U.S. based on manufacturing availability, the majority of the construction-related materials and equipment items (as previously mentioned) would provide a substantial benefit to the local businesses and service providers. Additionally, indirect jobs could be created in the county and surrounding areas by expenditures for materials and supplies such as paint, lumber, hardware, office supplies and the like required for construction-related activities as well as ongoing operation and maintenance.

It is anticipated that majority of the construction wages paid by contractors for construction-related activities will be spent within Citrus County and the surrounding area. The wages earned in the area could create additional demands for goods and services as the workers spend some of their earnings within the community. As this money is spent, it will create a ripple effect within the area, thereby generating economic activity, including additional jobs and earnings to meet the additional demands. It is possible that the construction workers could be transient workers that could place a strain on the community, in the short run. For example, some construction workers will utilize community services (e.g., roads, schools, and health services) and will not be paying individual property tax. The estimated earnings will result in indirect or secondary benefits to the community, which will benefit other companies whose payrolls could increase from the construction project.

#### 7.1.3 Other Economic Benefits

The major expenditures for the CR3 Uprate Project will be the delivery of the custom-made, large equipment and machinery to be installed at the facility. These costs not only include the cost of the commodity but the cost of transportation to the site. Based on the large-scale needs, deliveries to the project site could use the existing CSX Transportation rail line that abuts the PEF property. The existing rail spur is located just south of the West Powerline Street, which is the access road to the facility. Routine equipment and materials required for construction and general operation will be delivered to the site using the existing West Powerline Street access road, after general improvements planned to enhance traffic flow and safety considerations during construction and operation are completed.

The increase of electrical generation resources at the CREC will result in an economic benefit to consumers and the community by providing cleaner energy while reducing total fuel costs. The new technology will reduce fuel costs, and therefore, will provide a savings to customers that will result in more than \$2.6 billion through 2036. In addition, the increase of gross output from CR3 Uprate Project will allow PEF to service an additional 110,700 households.

#### 7.1.4 Social Benefits

##### 7.1.4.1 *Recreational and Environmental Benefits*

Construction and operation of the uprated facility will not cause a significant impact on the recreational and environmental value of the area. The potential disturbance during construction-related activities will be insignificant to non-existent at the closest receptor since majority of the construction activities will take place within the existing structure. Related activities that will be outside of the existing structure will consist of lay-down area for equipment and materials, construction worker parking, and deliver of construction-related equipment and materials. To prevent construction-related impacts upon the environment, the following actions will be implemented:

- Construction-related activities will be kept on property currently owned by PEF;
- Ground disturbances will be minimized;
- Stormwater management systems will be maintained for areas outside the existing facility;
- Upward light spill and glare will be minimized with outdoor lighting plans that incorporate lighting standards and fixtures; and
- Washdown of equipment and materials will be conducted to prevent the transfer of materials and dust onto roadways when leaving the property.

#### 7.1.5 Summary of Benefits

Impacts to the economy associated with the construction and operation of the CR3 Uprate Project are expected to be positive. Labor demands associated with the construction and operation of the uprated facility are not expected to create labor shortages. Additionally, construction expenditures for

CR3 Uprate Project materials, equipment, and workers will boost the economic activity and income

in Citrus County and the surrounding communities. Population and housing impacts associated with the CR3 Uprate Project will be slight due to minimal migration into the area.

Construction activities will increase tax revenues to the county and state governments due to sales taxes, property taxes, and the purchase and rental of equipment and material to support construction activities. Upon completion of the CR3 Uprate Project, Citrus County and its taxing authorities are expected to receive millions of dollars in tax revenues.

Temporary transportation impacts are expected to be related primarily to increased traffic associated with the daily commute of construction workers and deliveries to and from the CR3 site. Construction worker traffic will vary during the two construction phases in 2009 and 2011. The level of service will temporarily decline on local roadway segments and intersections during morning and afternoon peak hours during peak construction in late 2009. Upon completion of the CR3 Uprate Project, transportation impacts on area roads will be negligible and effects from train deliveries will return to its previous activity. As presented in Subsection 5.9.1, truck traffic and automobile traffic from operations and maintenance workers should not impact other traffic using roadways nor should they impact levels of service on local roadways.

Overall land use impacts from the construction and operation of the CR3 Uprate Project are expected to be minor due to the remote location of the proposed project, the buffers to adjacent properties, and since the majority of the construction activities will be taking place within the existing building. No direct land use impacts are anticipated in association with the CR3 Uprate Project. Visual impacts from the construction and operation of the CR3 Uprate Project will be minimal and localized. No sites of historic or cultural significance are located on the CR3 site; therefore, cultural and historical resources will not be affected by the CR3 Uprate Project.

Overall, socioeconomic impacts associated with the proposed project in general will be favorable. Although the local community may experience some temporary impacts during peak construction periods, overall economic impacts will be positive.

## 7.2 Socioeconomic Costs

### 7.2.1 Temporary External Costs

The CR3 Uprate Project will require highly trained and skilled workers to meet the anticipated peak construction worker demand of 650 employees. With ample labor supply existing within the surrounding area, it is anticipated that many workers will be hired within the region. As is typical with shorter construction projects, it is not anticipated that workers will relocate to the immediate area and alter the demands on public facilities and services.

During the construction periods, peak activities are anticipated to take place during regularly scheduled refueling outages. Minimal to no impacts are anticipated to traffic, air and noise conditions within the surrounding areas, as discussed in Sections 4.5.5 and 4.5.2, respectively. In addition, the majority of the construction-related activities will be conducted within the existing buildings and therefore, not create impacts to the natural resources surrounding the project site.

### 7.2.2 Long-term External Costs

The proposed project's external cost impacts will be minimal and localized. The CR3 Uprate Project will consist of system modifications to accommodate nuclear fuel enrichment, resulting in increased generation capacity from the company's lowest cost fuel source. The modifications will occur within existing buildings located on the CREC property. These system modification will improve the operation of CR3 and will not cause any impairment to recreational values, result in any deterioration of aesthetic and scenic values, or restrict access to areas of scenic values. The CR3 Uprate Project also will not displace any persons or result in any significant costs to local government.

Since there will not be an increase in operational workforce, no changes are anticipated from the direct and indirect impacts upon the local services (e.g., schools, police). The uprated facility will result in modifications to the existing property value that will in turn increase the *ad valorem* revenue. This long-term costs paid to Citrus County will be significantly greater than the minimal cost for services associated with CREC. Overall, the project will have a long-term economic benefit for Citrus County and the surrounding communities.

### 7.3 References

Progress Energy. 2006. Applicant's Environmental Report, Operating License Renewal Stage Crystal River Unit 3.

Citrus County Tax Collector's Office. [Online] Available: <http://www.tc.citrus.fl.us/millage.htm>, (accessed April 26, 2007).

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Janice Waldemar, Assistant Finance Director. 2007. Citrus County Tax Collector's Office.

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Progress Energy. April 2007. Personal Communication, April 2007.

U.S. Department of Labor. 2007. Davis-Bacon Wage Determination. [Online] Available: [www.gpo.gov/davisbacon/](http://www.gpo.gov/davisbacon/) (accessed April 2007).



## **8.0 SITE AND DESIGN ALTERNATIVES**

This optional chapter is not being submitted as part of this SCA because an Environmental Impact Statement required by the National Environmental Policy Act is not required for the CR3 Uprate Project.

## **9.0 COORDINATION**

State, regional, and local agencies were contacted to provide input to the CR3 Uprate Project. The contacts included agency meetings and discussions, as well as meetings with several public organizations. The following is a list of meetings that were held to support the CR3 Uprate Project:

### **9.1 Citrus County**

May 11, 2007: Crystal River, Florida

Introduction of CR3 Uprate Project to Citrus County Planning and Zoning staff (Gary Maidhoff and Tina Gilson).

May 24, 2007: Crystal River, Florida

Discussion of CR3 Uprate Project traffic study methodology with Citrus County staff (Cynthia Jones and Heather Urwiller).

### **9.2 Florida Department Environmental Protection**

March 15, 2007: Tallahassee, Florida

Introduction of CR3 Uprate Project to FDEP PPSA Siting Team (Mike Halpin, Cindy Maulkey and Scott Gorland).

May 3, 2007: Tampa, Florida

Introduction of CR3 Uprate and SGRP projects to FDEP Southwest District staff (Mike Halpin, Bill Kutash, Yanisa Angulo, Al Gagne, Susan Pelz, Dennis Pearson and Mara Nasca).

May 9, 2007: Tallahassee, Florida

Introduction of CR3 Uprate Project to FDOT staff (Ms. Sandra Whitmire and Sheauching Yu).

May 9, 2007: Tallahassee, Florida

Introduction of CR3 Uprate project to FDEP NPDES staff (Mike Halpin, Marc Harris, Allen Hubbard, David Whiting, Nia Wellendorf, Edward Smith, Bala Nori and Cindy Malkey).



## Division of Air Resource Management – Scanning Submission

Facility ID \_\_\_\_\_

Project # \_\_\_\_\_

Permit Type \_\_\_\_\_

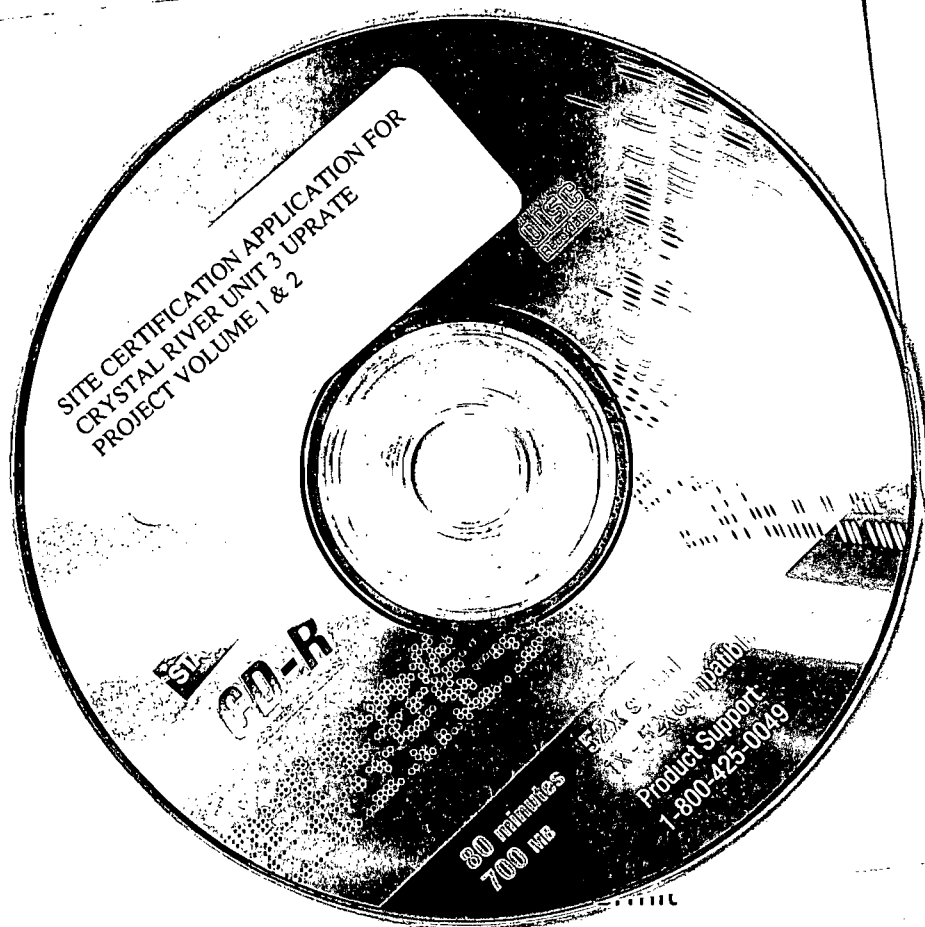
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COMMENTS:

SCANNING NOTES: