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United States Nuclear Regulatory Commission
Protecting People and the Environment

NUREG-1941, Vol. 2

Draft Environmental Impact Statement for Combined Licenses (COLs) for Levy Nuclear Plant Units 1 and 2

Draft Report for Comment

U.S. Nuclear Regulatory Commission
Office of New Reactors
Washington, DC 20555-0001

U.S. Army Corps of Engineers
U.S. Army Engineer District, Jacksonville
Jacksonville, FL 32232-0019

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Abstract

This environmental impact statement (EIS) has been prepared in response to an application submitted to the U.S. Nuclear Regulatory Commission (NRC) by Progress Energy Florida, Inc. (PEF) for combined construction permits and operating licenses (combined licenses or COLs). The proposed actions related to the PEF application are (1) NRC issuance of COLs for two new power reactor units at the Levy Nuclear Plant (LNP) site in Levy County, Florida, and (2) U.S. Army Corps of Engineers (USACE) issuance of a permit to perform certain construction activities on the site. The USACE is participating in preparing this EIS as a cooperating agency and participates collaboratively on the review team (which comprises NRC staff, contractor staff, and USACE staff).

This EIS includes the review team's analysis that considers and weighs the environmental impacts of constructing and operating two new nuclear units at the LNP site and at alternative sites, and mitigation measures available for reducing or avoiding adverse impacts.

The Federal Water Pollution Control Act (Clean Water Act) requires that the USACE apply the criteria set forth in the 404(b)(1) Guidelines in evaluating projects that propose to discharge dredged or fill material into waters of the United States. The USACE must also determine through its Public Interest Review (PIR) whether the proposed project is contrary to the public interest. The USACE permit decision, including its evaluation under the 404 Guidelines and the PIR, will be documented in the USACE Record of Decision, which will be issued following the issuance of the Final EIS. After considering the environmental aspects of the proposed action, the NRC staff's preliminary recommendation to the Commission is that the COLs be issued as proposed. This recommendation is based on (1) the application, including the Environmental Report (ER), submitted by PEF; (2) consultation with Federal, State, Tribal, and local agencies; (3) the review team's independent review; (4) the consideration of public scoping comments; and (5) the assessments summarized in this EIS, including the potential mitigation measures identified in the ER and this EIS.

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Executive Summary

By letter dated July 28, 2008, the U.S. Nuclear Regulatory Commission (NRC or the Commission) received an application from Progress Energy Florida, Inc. (PEF) for combined construction permits and operating licenses (combined licenses or COLs) for Levy Nuclear Plant (LNP) Units 1 and 2 located in southern Levy County, Florida. The review team's evaluation is based on the October 2009 revision to the application, responses to requests for additional information, and supplemental letters.

The proposed actions related to the LNP Units 1 and 2 application are (1) NRC issuance of COLs for construction and operation of two new nuclear units at the LNP site, and (2) U.S. Army Corps of Engineers (USACE) issuance of a permit pursuant to Section 404 of the Federal Water Pollution Control Act, (Clean Water Act) and Section 10 of the Rivers and Harbors Act to perform certain construction activities on the site. The USACE is participating with the NRC in preparing this environmental impact statement (EIS) as a cooperating agency and participates collaboratively on the review team, which consists of NRC staff, contractor staff, and USACE staff. The reactor specified in the application is Revision 17 to the Westinghouse Electric Company, LCC AP1000 certified design.

Section 102 of the National Environmental Policy Act of 1969, as amended (NEPA) directs that an EIS be prepared for major Federal actions that significantly affect the quality of the human environment. The NRC has implemented Section 102 of NEPA in Title 10 of the Code of Federal Regulations (CFR) Part 51. Further, in 10 CFR 51.20, the NRC has determined that the issuance of a COL under 10 CFR Part 52 is an action that requires an EIS.

The purpose of PEF's requested NRC action – issuance of the COLs – is to obtain licenses to construct and operate two new nuclear units. These licenses are necessary but not sufficient for construction and operation of the units. A COL applicant must also obtain and maintain permits from other Federal, State, Tribal, and local agencies and permitting authorities. Therefore, the purpose of the NRC's environmental review of the PEF application is to determine if two nuclear units of the proposed design can be constructed and operated at the LNP site without unacceptable adverse impacts on the human environment. The purpose of PEF's requested USACE action is to obtain a permit to perform regulated activities that would affect waters of the United States.

Upon acceptance of the PEF application, NRC began the environmental review process described in 10 CFR Part 51 by publishing in the *Federal Register* a Notice of Intent to prepare an EIS and conduct scoping. On December 4, 2008, the NRC held two public meetings in Crystal River, Florida, to obtain public input on the scope of the environmental review. The staff reviewed the oral testimony and written comments received during the scoping process and contacted Federal, State, Tribal, regional, and local agencies to solicit comments.

To gather information and to become familiar with the sites and their environs, the NRC and its contractors visited the Dixie, Putnam, and Highlands alternative sites in October 2008. In December 2008, the review team visited the LNP site and Crystal River alternative site. During the December 2008 site visit, the review team also conducted a site audit and met with PEF staff, public officials, and members of the public.

Included in this EIS are (1) the results of the NRC staff's analyses, which consider and weigh the environmental effects of the proposed action; (2) potential mitigation measures for reducing or avoiding adverse effects; (3) the environmental impacts of alternatives to the proposed action; and (4) the NRC staff's preliminary recommendation regarding the proposed action.

To guide its assessment of the environmental impacts of a proposed action or alternative actions, the NRC has established a standard of significance for impacts based on Council on Environmental Quality guidance found in 40 CFR 1508.27. Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, provides the following definitions of the three significance levels – SMALL, MODERATE, and LARGE:

> SMALL – Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

> MODERATE – Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

> LARGE – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

In preparing this EIS, the review team reviewed the application, including the Environmental Report (ER) submitted by PEF; consulted with Federal, State, Tribal, and local agencies; and followed the guidance set forth in NRC's NUREG-1555, *Environmental Standard Review Plan – Standard Review Plans for Environmental Reviews for Nuclear Power Plants*. In addition, the NRC staff considered the public comments related to the environmental review received during the scoping process. Comments within the scope of the environmental review are included in Appendix D of this EIS.

The NRC staff's preliminary recommendation to the Commission related to the environmental aspects of the proposed action is that the COLs be issued as requested. This recommendation is based on (1) the application, including the ER submitted by PEF; (2) consultation with other Federal, State, Tribal, and local agencies; (3) the staff's independent review; (4) the staff's consideration of public scoping comments; and (5) the assessments summarized in this EIS, including the potential mitigation measures identified in the ER and this EIS. The USACE will issue its Record of Decision based, in part, on this EIS.

A 75-day comment period will begin on the date of publication of the U.S. Environmental Protection Agency Notice of Availability of the filing of the draft EIS to allow members of the public and agencies to comment on the results of the environmental review. During this period, the NRC and USACE staff will conduct a public meeting near the LNP site to describe the results of the environmental review and accept public comments. All comments received during the comment period will be addressed in the final EIS.

The NRC staff's evaluation of the site safety and emergency preparedness aspects of the proposed action will be addressed in the NRC's Safety Evaluation Report anticipated to be published in 2011.

Abbreviations/Acronyms

7Q10	the lowest average flow over a period of 7 consecutive days that occurs once every 10 years, on average
μS	micro Siemens
AADT	annual average daily traffic
ac	acre(s)
ACHP	Advisory Counsel of Historic Preservation
ADAMS	Agencywide Documents Access and Management System
ADM	average daily membership
ADT	average daily traffic
AEA	Atomic Energy Act of 1954
AFUDC	allowance for funds used during construction
ALARA	as low as reasonably achievable
a.m.	ante meridian
AO	archaeological occurence
AP1000	Westinghouse Electric Company, LLC AP1000 pressurized water reactor
APE	Area of Potential Effect
APT	Aquifer Performance Testing
AQCR	Air Quality Control Region
AQI	Air Quality Index
ASLB	Atomic Safety and Licensing Board
BA	biological assessment
BACT	Best Available Control Technologies
BDS	blowdown system
BEA	Bureau of Economic Analysis
BEBR	Bureau of Economic Business Research
BEIR	Biological Effects of Ionizing Radiation
bgs	below ground surface
BLS	U.S. Bureau of Labor Statistics
BMP	best management practice
BP	Before Present
Bq	Becquerel(s)
BRA	Biological Research Associates
BRC	Bureau of Radiation Control (of the State of Florida Department of Health)
Btu	British thermal unit(s)
°C	degree(s) Celsius
CAA	Clean Air Act
CDC	U.S. Centers for Disease Control and Prevention
CDF	core damage frequency

CEQ	Council on Environmental Quality
CESQG	conditionally exempt small quantity generator
CFBC	Cross Florida Barge Canal
cfm	cubic feet per minute
CFR	Code of Federal Regulations
cfs	cubic feet per second
CGP	Construction General Permit
CH2M Hill	CH2M Hill Nuclear Business Group
CHARTS	(Florida's) Community Health Assessment Resource Tool Set
Ci	curie(s)
cm	centimeter(s)
cm^3	cubic centimeter(s)
cm/s	centimeter(s) per second
CO	carbon monoxide
CO_2	carbon dioxide
COD	chemical oxygen demand
COL	combined construction permit and operating license or combined license
CORMIX	Cornell Mixing Zone Expert System
Corps	U.S. Army Corps of Engineers
CP	construction permit
CPUE	catch per unit effort
CPI	Consumer Price Index
CR	County Road
CRDC	Crystal River Discharge Canal
CREC	Crystal River Energy Complex
CWA	Clean Water Act (aka Federal Water Pollution Control Act)
CWIS	cooling-water intake structure
CWS	circulating-water system
d	day(s)
DA	Department of Army
dB	decibel(s)
dBA	decibel(s) (acoustic)
DBA	Design Basis Accident
DCD	Design Control Document
DHS	(Florida) Department of Human Services
DO	dissolved oxygen
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
D/Q	deposition values or factors
DSM	demand-side management
DTS	demineralized water-treatment system
DWRM2	District-Wide Regulation Model, Version 2
E&SCP	Erosion and Sediment Control Plan

EA	environmental assessment
EAB	exclusion area boundary
EDG	emergency diesel generator
EFH	essential fish habitat
EIA	Energy Information Administration or Economic Impact Area
EIS	environmental impact statement
ELF	extremely low frequency
EMF	electromagnetic field
EMS	emergency management services
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
EPU	Extended Power Uprate
EPZ	emergency planning zone
ER	Environmental Report
ERP	Environmental Resource Permit
ESA	U.S. Endangered Species Act of 1973, as amended
ESO	Environmental Support Organization
ESP	early site permit
ESRP	Environmental Standard Review Plan
ESWEMS	Essential Service Water Emergency Makeup System
ESWS	Essential Service Water System
°F	degree(s) Fahrenheit
FAA	Federal Aviation Administration
FAC	Florida Administrative Code
FAS	Floridan Aquifer System
FDA	U.S. Food and Drug Administration
FDACS	Florida Department of Agriculture and Consumer Service
FDCA	Florida Department of Community Affairs
FDEP	Florida Department of Environmental Protection
FDOE	Florida Department of Education
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FES	Final Environmental Statement
FERC	Federal Energy Regulatory Commission
FFWCC	Florida Fish and Wildlife Conservation Commission
FGT	Florida Gas Transmission Company
FIRM	Flood Insurance Rate Maps
FLUCFCS	Florida Land Use, Cover and Forms Classification System
FMP	fishery managemen plan
FNAI	Florida Natural Areas Inventory
fps	foot (feet) per second
FPSC	Florida Public Service Commission
FR	Federal Register
FRCC	Florida Reliability Coordinating Council

FS	Florida Statutes
FSAR	Final Safety Analysis Report
FSER	Final Safety Evaluation Report
ft	foot/feet
ft^2	square foot/feet
ft^3	cubic foot/feet
FTE	full-time equivalent (employee)
FVCOM	Finite Volume Community Ocean Model
FWDS	Fire Water Distribution System
FWPCA	Federal Water Pollution Control Act (aka Clean Water Act)
FWRI	Fish and Wildlife Research Institute
FWS	U.S. Fish and Wildlife Service
g	gram(s)
gal	gallon(s) (3)
GBq	gigabecquerel
GCC	global climate change
GCN	Greatest Conservation Need
GCRP	U.S. Global Change Research Program
GEIS	Generic Environmental Impact Statement
GHG	greenhouse gas
GI-LLI	gastrointestinal lower large intestine
GIS	geographic information system
gpd	gallon(s) per day
gph	gallon(s) per hour
gpm	gallon(s) per minute
gps	gallon(s) per second
GW(e)	gigawatt(s) electric
GWh	gigawatthour(s)
ha	hectare(s)
HAPC	Habitat Areas of Particular Concern
HAZMAT	hazardous material
HBS	historic basin storage
HDPE	high-density polyethylene
HLW	high-level waste
hr	hour(s)
hr/yr	hour(s) per year
HVAC	heating, ventilation, and air conditioning
Hz	hertz
I	Interstate
IAEA	International Atomic Energy Agency
IAQCR	Interstate Air Quality Control Region
IBA	Important Bird Area

ICRP	International Council on Radiological Protection
IEA	International Energy Agency
IGCC	integrated gasification combined cycle
in.	inch(es)
in./s	inch(es) per second
INEEL	Idaho National Engineering and Environmental Laboratory
IRP	integrated resource planning
IRWST	in-containment refueling water storage tank
K-8	kindergarten through 8th grade
K–12	kindergarten through 12th grade
kcfs	thousand cubic feet per second
kg	kilogram(s)
KH	Kimley-Horn
kHz	kilo Hertz
km	kilometer(s)
km^2	square kilometer(s)
kV	kilovolt(s)
kVA	kilovolt-ampere(s)
kW	kilowatt(s)
kWh	kilowatt-hour(s)
kW(e)	Kilowatt electric
L	liter(s)
L/hr	liter(s) per hour
L/m	liter(s) per minute
lb	pound(s)
LC50	the concentration that is lethal to 50 percent of the sample population
LCFS	the transmission-line corridor from the proposed LNP to Central Florida South substation
LCR	the transmission-line corridor from the proposed LNP to the CREC 500-kV switchyard
Ld	daytime average noise levels
Ldn	day-night average noise level
LEDPA	least environmentally damaging practicable aternative
LLW	low-level waste
Ln	nighttime average noise levels
LNP	Levy Nuclear Plant
LNG	liquefied natural gas
LOAEL	Lowest Observed Adverse Effect Level
LOCA	loss-of-coolant accident
LOS	level of service
LPC	the transmission-line corridor from the proposed LNP to the proposed Citrus substation
Lpm	liter(s) per minute
LPZ	low population zone

LWA	limited work authorization
LWR	light water reactor
m	meter(s)
m^2	square meter(s)
m^3	cubic meter(s)
mA	milliampere
MACCS(2)	Melcor Accident Consequence Code System
MBq	megabecquerel(s)
MBTA	Migratory Bird Treaty Act
µg	microgram(s)
mg	milligram(s)
MCL	maximum contaminant level
MEI	maximally exposed individual
MFL	minimum flows and levels
Mgd	million gallons per day
mG	milliGauss
mGy	milliGray(s)
MHW	mean high water
mi	mile(s)
mi^2	square mile(s)
MIT	Massachusetts Institute of Technology
ml	milliliter(s)
MLU	Multi-Layer Unsteady state (model)
MMBtu	a thousand thousand British thermal units
mo	month
MOU	Memorandum of Understanding
mph	mile(s) per hour
mR	milliroentgen
mrad	millirad
mrem	millirem
MSA	Metropolitan Statistical Area
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSGP	Multi-Sector Generic Permit
msl	mean sea level
mSv	millisievert(s)
MSW	municipal solid waste
MT	metric ton(nes)
MTU	metric ton(nes) uranium
MW	megawatt(s); also monitoring well
MW(e)	megawatt(s) electric
MWh	megawatt-hour(s)
MW(t)	megawatt(s) thermal
MWd	megawatt-day(s)

N_2	nitrogen
NA	not applicable or data not available
NAAQS	National Ambient Air Quality Standards
NAGPRA	National American Graves Protection and Repatriation Act
NAVD88	Northern American Vertical Datum of 1988
NCRP	National Council on Radiation Protection and Measurements
NCI	National Cancer Institute
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act of 1969, as amended
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No Observed Adverse Effect Level
NOx	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NUREG	U.S. Nuclear Regulatory Commission technical document
NWR	National Wildlife Refuge
OCA	Owner-Controlled Area
ODCM	Offsite Dose Calculation Manual
OECD	Organization for Economic Cooperation
OFW	Outstanding Florida Water(s)
OMHD	Office of Minority Health & Health Disparities
OSHA	Occupational Safety and Health Administration
OWR	Old Withlacoochee River
oz	ounce(s)
PAM	primary amoebic meningoencephalitis
PARS	Publicly Available Records System
PCB	polychlorinated biphenyl
pCi	picocuries
PCR	polymer chain reaction
PEF	Progress Energy Florida, Inc.
PEST	Model-Independent Parameter Estimation (code)
PIR	Public Interest Review
PK	preschool
p.m.	post meridian
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 microns or less

PMF	probable maximum flood
ppm	parts per million
PMP	probable maximum precipitation
PNNL	Pacific Northwest National Laboratory
ppm	part(s) per million
PPSA	Power Plant Siting Act
ppt	part(s) per thousandPPSA
PRA	probabilistic risk assessment
PSD	Prevention of Significant Deterioration
pss	practical salinity scale
psu	practical salinity unit
PWS	potable water system
R	roentgen(s)
RAI	Request for Additional Information
RCRA	Resource Conservation and Recovery Act of 1976, as amended
RCS	reactor coolant system
rem	roentgen equivalent man (a special unit of radiation dose)
REMP	radiological environmental monitoring program
RFAI	Reservoir Fish Assemblage Index
RIMS	Regional Input-Output Modeling System
RLE	Required Local Effort
RM	river mile
ROD	Record of Decision
ROI	region of influence or region of interest
ROW	Rights-of-way(s)
RV	recreational vehicle
Ryr	reactor-year
RWS	raw water system
μS	microsievert(s)
s or sec	second(s)
SACTI	Seasonal/Annual Cooling Tower Impact (prediction code)
SAMA	severe accident mitigation alternatives
SAMDA	severe accident mitigation design alternatives
SAR	Safety Analysis Report
SAS	surficial aquifer system
SCA	Site Certification Application
SCL	straight carpace length
SCR	selective catalytic reduction
SDS	sanitary drainage system
SER	Safety Evaluation Report
SERC	Southeastern Electric Reliability Council
SFWMD	South Florida Water Management District
SG	steam generator

SHGW	seasonal high groundwater
SHPO	State Historic Preservation Office or Officer
SHWL	seasonal high-water level
SJRWMD	St. Johns River Waste Management District
SMZ	Streamside Management Zone
SO_2	sulfur dioxide
SOx	sulfur oxides
SPCC	spill prevention, control, and countermeasures
SQG	small quantity generator
SR	State Route
SRWMD	Suwannee River Water Management District
SSC	structures, systems, or components
SU	Standard Unit
Sv	sievert(s)
SWA	Small Wild Area
SWAPP	Source Water Assessment and Protection Program
SWFWMD	Southwest Florida Water Management District
SWPPP	stormwater pollution prevention plan
SWS	service-water system
T	ton(s)
Tarmac	Tarmac America, LLC
TBD	to be determined
TBq	terabecquerel(s)
T&E	threatened and endangered
TCP	traditional cultural property
TDS	total dissolved solids
TEDE	total effective dose equivalent
TIGER	Topologically Integrated Geographic Encoding and Referencing
TMDL	Total Maximum Daily Load
TN	total nitrogen
TP	total phosphorus
TRAGIS	Transportation Routing Analysis Geographical Information System
TRU	transuranic (elements)
TSS	total suspended solids
μm	micrometer(s) or micron(s)
U-235	uranium-235
U-238	uranium-238
U_3O_8	triuranium octoxide (“yellowcake”)
UF_6	uranium hexafluoride
UFA	Upper Floridan Aquifer
UHS	ultimate heat sink
UMAM	Uniform Mitigation Assessment Methodology
UMTRI	University of Michigan Transportation Research Institute

UO_2	uranium dioxide
US	U.S. Highway
U.S.	United States
USACE	U.S. Army Corps of Engineers (or Corps)
USC	United States Code
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
VOC	volatile organic compound
Westinghouse	Westinghouse Electric Company, LLC
WHO	World Health Organization
WIC	(Citrus County) Women-Infant-Children (Program)
WMA	Wildlife Management Area
WRB	wastewater-retention basin
WTE	waste-to-energy (plant)
WWS	wastewaster system
χ/Q	atmospheric dispersion factor(s); annual average normalized air concentration value(s)
XOQDOQ	computer program for the meteorological evaluation of routine effluent releases at nuclear power plants
yd	yard(s)
yd^3	cubic yard(s)
yr	year(s)

9.0 Environmental Impacts of Alternatives

This chapter describes alternatives to the proposed U.S. Nuclear Regulatory Commission (NRC) action for combined construction permits and operating licenses (COLs) and the U.S. Army Corps of Engineers' (USACE's) action for a Department of the Army (DA) Individual Permit and discusses the environmental impacts of those alternatives. Section 9.1 discusses the no-action alternative. Section 9.2 addresses alternative energy sources. Section 9.3 reviews Progress Energy Florida, Inc.'s (PEF's) region of interest (ROI) and its alternative site-selection process, and summarizes and compares the environmental impacts for the proposed and alternative sites. Section 9.4 examines system design alternatives. Section 9.5 lists the references cited in this chapter.

The need to compare the proposed action with alternatives arises from the requirement in Section 102(2)(c)(iii) of the National Environmental Policy Act of 1969, as amended (NEPA) (42 USC 4321) that environmental impact statements (EISs) include an analysis of alternatives to the proposed action. The NRC implements this comparison through its regulations in Title 10 of the Code of Federal Regulations (CFR) Part 51 and its Environmental Standard Review Plan (ESRP) (NRC 2000). The environmental impacts of the alternatives are evaluated using the NRC's three-level standard of significance – SMALL, MODERATE, or LARGE – developed using Council on Environmental Quality (CEQ) guidelines (40 CFR 1508.27) and set forth in the footnotes to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B. The issues evaluated in this chapter are the same as those addressed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999)[a] with the additional issue of environmental justice. Although NUREG-1437 was developed for NRC's review of renewal of nuclear power plant operating licenses, it provides useful information for this review and is referenced throughout this chapter.

As part of the evaluation of permit applications subject to Section 404 of the Federal Water Pollution Control Act, as amended (also referred to as the Clean Water Act) (33 USC 1251 et seq.), the USACE is required by regulation to apply the criteria set forth in the Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material (Guidelines) (33 USC 1344; 40 CFR Part 230). The Guidelines establish criteria that must be met for the proposed activities to be permitted pursuant to Section 404, and stipulate that no discharge of dredged or fill material into waters of the United States (including jurisdictional wetlands) shall be permitted if there is a practicable alternative that would have less adverse impact on the aquatic environment, as long as the alternative does not have other significant adverse environmental consequences. The Guidelines state that an alternative is practicable if it is available and

(a) NUREG-1437 was originally issued in 1996. Addendum 1 to NUREG-1437 was issued in 1999. Hereafter, all references to NUREG-1437 include NUREG-1437 and its Addendum 1.

capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes. If it is otherwise a practicable alternative, an area not presently owned by the applicant that could reasonably be obtained, used, expanded, or managed to fulfill the basic purpose of the proposed activity may be considered.

Where the activity associated with a discharge is proposed for a special aquatic site, such as wetlands (as defined in 40 CFR Part 230, Subpart E), and does not require access or proximity to or siting within these types of areas to fulfill its basic project purpose (i.e., the project is not "water dependent"), practicable alternatives that avoid special aquatic sites are presumed to be available, unless clearly demonstrated otherwise. See Section 1.3 for the USACE's determination of the basic purpose and overall purpose to be used for the USACE's alternatives analysis for this project.

Even if an applicant's preferred alternative is determined to be the least environmentally damaging practicable alternative (LEDPA) that meets the project's purpose, the USACE must determine whether the LEDPA is in the public interest. USACE's Public Interest Review, described at 33 CFR 320.4, directs the USACE to consider several factors in a balancing process. A permit will not be issued for a practicable alternative that is not the LEDPA, nor will a permit be issued for an activity that is determined to be contrary to the public interest. In considering both the LEDPA and the Public Interest Review, the USACE must consider compliance with other applicable substantive laws such as the Endangered Species Act of 1973, as amended (ESA) (16 USC 1531 et seq.), and the National Historic Preservation Act of 1966, as amended (NHPA) (16 USC470 et seq.), as well as consult with other Federal agencies. USACE also must follow procedural laws such as NEPA and other applicable laws described in 33 CFR 320.3.

Since the USACE is a cooperating agency with the NRC in this environmental review and for development of this EIS; the USACE and the NRC have provided information to the maximum extent practicable in this EIS that the USACE will use in its evaluation of the project, including the evaluation of alternatives. While the USACE concurs as part of the review team with the qualitative designation of impact levels for terrestrial or aquatic resource areas for this EIS; in so far as waters of the United States are concerned, the USACE must conduct a quantitative comparison of impacts on waters of the United States as part of the LEDPA analysis. By written submittal dated December 14, 2009 PEF provided to the USACE additional information in regard to the LEDPA analysis for this project, titled "Levy Nuclear Units 1 and 2 (LNP) Section 404(b)(1) Alternatives Analysis" (PEF 2009d). The USACE reviewed the additional information and in letters dated March 5, 2010 (Moser 2010) and June 17, 2010 (USACE 2010c), provided written comments to PEF in regard to the analysis. PEF responded to the USACE's comments by written submittal dated June 30, 2010 (PEF 2010).

The USACE's evaluation of this project will not be completed until it receives public feedback in the form of public comments on this draft EIS, and subsequent issuance of a final EIS. The

USACE's Record of Decision, which will document its evaluation and whether a Department of the Army (DA) permit will be issued for this project, will reference the information provided by this EIS and present any additional information required by the USACE to support its permit decision.

9.1 No-Action Alternative

For purposes of an application for a COL, the no-action alternative refers to a scenario in which the NRC would deny the COLs requested by PEF, which would result in the proposed units not being built. Likewise, the USACE could also take no action or deny the DA Individual Permit request. Upon such a denial by the NRC or the USACE, the construction and operation of two new nuclear units at the Levy Nuclear Plant (LNP) site in accordance with 10 CFR Part 52 would not occur and the predicted environmental impacts associated with the project would not occur. Some preconstruction impacts associated with activities not within the NRC's definition of *construction* at 10 CFR 50.10(a) and 51.4 may occur nonetheless. If no other power plants were to be built in lieu of the proposed project or other strategy implemented to take its place, the benefits of the additional electrical capacity and electricity generation to be provided by the project would not occur. If no additional measures (e.g., conservation, importing power, restarting retired power plants, and/or extending the life of existing power plants) were implemented to realize the amount of electrical capacity that would otherwise be required for power in PEF's ROI (see Section 9.3.1), then the need for baseload power, discussed in Chapter 8, would not be met. Therefore, the purpose and need of this project would not be satisfied if the no-action alternative was chosen and the need for power was not met by other means.

If other generation sources were installed, either at another site or using a different energy source, the environmental impacts associated with these other sources would eventually occur. As discussed in Chapter 8, there is a demonstrated need for power. It is reasonable to assume that other options to meet the need for power would be pursued. This needed power may be provided and supported through several alternatives that are discussed in Sections 9.2 and 9.3.

9.2 Energy Alternatives

The purpose and need for the proposed project identified in Section 1.3 is to provide additional baseload electrical generation capacity for use in PEF's current markets. This section examines the potential environmental impacts associated with alternatives to construction of a new baseload nuclear generating facility. Section 9.2.1 discusses energy alternatives not requiring new generating capacity. Section 9.2.2 discusses energy alternatives requiring new generating capacity. Other alternatives are discussed in Section 9.2.3. A combination of alternatives is discussed in Section 9.2.4. Section 9.2.5 compares the environmental impacts from new nuclear, coal-fired, and natural-gas-fired generating units and a combination of energy sources at the LNP site.

For analysis of energy alternatives, PEF assumed a bounding target value of 2200-MW(e) electrical output (PEF 2009a). The review team (composed of NRC staff, its contractor staff, and USACE staff) also used this level of output in its analysis of energy alternatives.

9.2.1 Alternatives Not Requiring New Generating Capacity

Four alternatives to the proposed action that do not require PEF to construct new generating capacity are as follows:

- Purchase the needed electric power from other suppliers.
- Extend the operating life of existing power plants.
- Reactivate retired power plants.
- Implement conservation or demand-side management programs.

If power to replace the capacity of the proposed new nuclear units was to be purchased from sources within the United States or from a foreign country, the generating technology likely would be one of those described in NUREG-1437 (e.g., coal, natural gas, or nuclear) (NRC 1996). The environmental impacts of other technologies described in the GEIS for license renewal (NUREG-1437) are representative of the impacts associated with the construction and operation of new generating units at the LNP site. The environmental impacts of coal-fired and natural-gas-fired plants are discussed in Sections 9.2.2.1 and 9.2.2.2.

Under the purchased power alternative, the environmental impacts of power production would still occur, but they would occur elsewhere in the region, nation, or in another country. If the purchased power alternative was to be implemented, the most significant environmental unknown would be whether new transmission-line corridors would be required. The construction of new transmission lines could have both environmental and aesthetic consequences, particularly if new transmission-line corridors were needed. The review team concludes that the local environmental impacts from purchased power would be SMALL when existing transmission-line corridors are used and could range from SMALL to LARGE if acquisition of new corridors is required. The overall environmental impacts of power generation would depend on the generation technology and location of the generation site and, therefore, are unknown. However, as discussed in Section 9.2.5, the review team concluded that from an environmental perspective, none of the viable energy alternatives would be clearly preferable to construction of a new baseload nuclear power-generation plant located within PEF's ROI.

Nuclear power facilities are initially licensed by the NRC for a period of 40 years. Operating licenses issued by the NRC can be renewed for up to 20 years, and NRC regulations do not preclude multiple renewals. PEF currently operates an 838-MW(e) nuclear power plant at the Crystal River Energy Complex (CREC, an energy facility also owned by PEF); the nuclear plant – CREC Unit 3 – came online in 1977. The CREC also includes two coal-fired plants that came online in the 1960s (CREC Units 1 and 2) and two coal-fired plants that came online in the 1980s (CREC Units 4 and 5). The future power-generation plans of PEF for CREC Unit 3 include 37-MW(e) and 129-MW(e) uprates in 2009 and 2011, respectively (PEF 2009a), although the 2009 date has slipped since the Environmental Report (ER) was submitted.

The environmental impacts of continued operation of a nuclear power plant are significantly less than construction of a new plant. However, solely extending the service life of the CREC nuclear plant without construction of the proposed LNP would not fulfill PEF's Ten-Year Site Plan (PEF 2009a) or meet the need for power discussed in Chapter 8. Extending the service life of the CREC nuclear plant and constructing the proposed LNP are both part of PEF's future baseload generation capacity. Therefore, extending the service life of the CREC nuclear plant alone is not a feasible alternative to the proposed LNP.

Older, existing fossil-fueled plants nearing the end of their useful lives, predominately coal- and natural-gas-fired plants, are likely to need refurbishing to extend plant life for an extensive period (the proposed action assumes a minimum operating period of 40 years) and meet applicable environmental requirements. Currently, there are no deactivated power plants with the potential for future operation, although PEF has two oil-fired power plants scheduled for retirement that may be available for service life extension (Bartow, 444 MW[e], in Pinellas County; and Suwannee River, 129 MW[e], in Suwannee County). In addition, the Florida Department of Environmental Protection (FDEP) Conditions of Certification (FDEP 2010a) states that PEF will retire its two oldest coal-fired units, which came online at CREC in the 1960s, by December 31, 2020 if LNP Units 1 and 2 are licensed, built, and begin commercial operation (FDEP 2010a). Given both the costs of refurbishment and the environmental impacts of operating such facilities, the review team concludes that extending the life of older, existing generating plants or reactivating retired plants would not be a reasonable alternative to the proposed action.

Improved energy efficiency and demand-side management (DSM) strategies can potentially cost less than construction of new generation and provide a hedge against market, fuel, and environmental risks. PEF already offers many conservation and DSM programs to its customers to reduce peak electricity demands and daily power consumption. PEF's DSM Plan consists of seven residential programs, eight commercial programs, and one research and development program (PEF 2009b). Since 1981, PEF's energy-efficiency programs have saved more than 10 billion kilowatt hours of electricity (PEF 2009a). As noted in Section 8.2.1.5, PEF proposes adding 512 MW of DSM capacity to its portfolio by 2016, but additional capacity would still be needed to meet the need for baseload power. DSM programs are very successful in reducing peak load, but they cannot supply 2200 MW(e) of baseload power. The Florida Public

Service Commission stated that DSM available today or in the foreseeable future cannot provide enough baseload capacity to avoid the need for the addition of proposed LNP Units 1 and 2 (FPSC 2008).

The need for power discussion in Chapter 8 takes account of conservation and DSM programs. The review team concluded in Chapter 8 that there is a justified need for power in the PEF service territory even with the implementation of conservation and DSM programs.

Based on the preceding discussion, the review team concludes that the options of purchasing electric power from other suppliers, reactivating retired power plants, extending the operating life of existing power plants, and conservation and DSM programs are not reasonable alternatives to providing new baseload power-generation capacity.

9.2.2 Alternatives Requiring New Generating Capacity

Consistent with the NRC's evaluation of alternatives to operating license renewal for nuclear power plants, a reasonable set of energy alternatives to the building and operation of two new nuclear units at the LNP site should be limited to analysis of discrete power-generation sources, a combination of sources, and those power-generation technologies that are technically reasonable and commercially viable (NRC 1996). The current mix of baseload power-generation options in Florida is one indicator of the feasible choices for power-generation technology within the state. The electricity produced in Florida in 2007 came mainly from coal (31.3 percent), natural gas (29.1 percent), oil (14.8 percent), and nuclear energy (13.9 percent) (NWF 2008). The other 10.9 percent of the generation mix would have come from other sources not specified in the reference.

This section discusses the environmental impacts of energy alternatives to the proposed action that would require PEF to construct new generating capacity. The three primary energy sources for generating electric power in the United States are coal, natural gas, and nuclear energy (DOE/EIA 2010b). Coal-fired plants are the primary source of baseload generation in the United States (DOE/EIA 2009a). Natural-gas combined-cycle power-generation plants are often used as intermediate generation sources, but they are also used as baseload generation sources (SSI 2010). Each year, the Energy Information Administration (EIA), a component of the U.S. Department of Energy (DOE), issues an annual energy outlook. In its *Updated Annual Energy Outlook 2009* (DOE/EIA 2009b), EIA's reference case projects that total electric generating capacity additions between 2007 and 2030 will use the following fuels in the approximate percentages: natural gas (55 percent), renewable (27 percent), coal (14 percent), and nuclear (5 percent) (DOE/EIA 2009b). The EIA projection includes baseload, intermittent, and peaking units and is based on the assumption that providers of new generating capacity would seek to minimize cost while meeting applicable environmental requirements.

The discussion in Section 9.2.2 is limited to a reasonable range of the individual energy alternatives that appear to be viable for new baseload generation: coal-fired and natural-gas combined-cycle generation. The impacts discussed in Section 9.2.2 are estimates based on present technology. Section 9.2.3 addresses alternative generation technologies that have demonstrated commercial acceptance but may be limited in application, total capacity, or technical feasibility when based on the need to supply reliable, baseload capacity.

The review team assumed that (1) new generation capacity would be located at the LNP site for the coal- and natural-gas-fired alternatives, (2) the cooling approach planned for proposed Units 1 and 2 (Section 3.2.2.2) would be used for plant cooling, and (3) four new 500-kV electric power transmission lines would be needed to serve a new coal- or natural-gas-fired plant sited at the LNP site, consistent with the LNP proposal.

9.2.2.1 Coal-Fired Power Generation

For the coal-fired generation alternative, the review team assumed construction of four pulverized coal-fired units, each with a total net capacity of 550 MW(e). The team's estimates of coal consumption, coal combustion technology, air emissions, and waste products are based on the U.S. Environmental Protection Agency (EPA) AP-42 *Compilation of Air Pollutant Emission Factors – Bituminous and Subbituminous Coal Combustion* (EPA 1998). The review team also assumed that four additional 500-kV transmission-line corridors would be acquired, as discussed in Section 2.2.2. The plant was assumed to have an operating life of 40 years. These assumptions are consistent with PEF's COL application.

The review team also considered and integrated gasification combined cycle (IGCC) coal-fired plants. IGCC is an emerging technology for generating electricity with coal that combines modern coal gasification technology with both gas turbine and steam turbine power generation. The technology is cleaner than conventional pulverized coal plants because major pollutants can be removed from the gas stream before combustion. The IGCC alternative also generates less solid waste than the pulverized-coal-fired alternative. The largest solid waste stream produced by IGCC installations is slag, a black, glassy, sand-like material that is potentially a marketable byproduct. The other large-volume byproduct produced by IGCC plants is sulfur, which is extracted during the gasification process and can be marketed rather than placed in a landfill. IGCC units do not produce ash or scrubber wastes. In spite of the preceding advantages, the review team concludes that, at present, a new IGCC plant is not a reasonable alternative to a 2200-MW(e) nuclear power-generation facility for the following reasons: (1) IGCC plants are more expensive than comparable pulverized coal plants (DOE/NETL 2007), (2) the two existing IGCC plants in the United States have considerably smaller capacity, approximately 250 MW(e) each, than the proposed 2200-MW(e) nuclear plant, (3) system reliability of existing IGCC plants has been lower than pulverized coal plants, and (4) a lack of overall plant performance warranties for IGCC plants has hindered commercial financing (NPCC 2005). For these reasons, IGCC plants are not considered further in this EIS.

Therefore, for the coal-fired alternative, the review team assumed that coal and limestone (calcium carbonate) would be delivered to the plant by barge. The review team estimates that the plant would consume 6,552,000 T/yr of pulverized bituminous coal with an ash content of approximately 9 percent (EPA 1998). Slaked lime or limestone, used in the flue gas scrubbing process for control of sulfur dioxide (SO_2) emissions, is injected as slurry into the hot effluent combustion gases to remove entrained SO_2. The limestone-based scrubbing solution reacts with SO_2 to form calcium sulfite or calcium sulfate, which precipitates and is removed from the process as sludge for dewatering and then sold to industry for use in the manufacture of wallboard or other industrial products. The review team estimates that approximately 450,000 T/yr of limestone would be used for flue gas desulfurization, generating approximately 700,000 T/yr of scrubber sludge.

Air Quality

The impacts on air quality from coal-fired generation would vary considerably from those of nuclear generation because of emissions of SO_2, nitrogen oxides (NO_x), carbon monoxide (CO), particulate matter (PM), volatile organic compounds (VOCs), and hazardous air pollutants such as mercury and lead. The review team estimates that a 2200-MW(e) coal-fired plant would also have unregulated carbon dioxide (CO_2) emissions of 18.7 million tons per year (T/yr) that could affect climate change (EPA 1998).

The coal-fired plant emissions were determined based on factors contained in the U.S. Environmental Protection Agency (EPA) (AP-42) Compilation of Air Pollutant Emission Factors (EPA 1998). It is noted that estimates of emissions are based on “as fired” and controlled conditions using both combustion and post-combustion technologies to reduce criteria pollutants. Emissions estimates are not necessarily representative of what would be permitted.

The review team assumed a plant design that would minimize air emissions through a combination of boiler and combustion technology as well as post-combustion pollutant removal, and would maintain local and regional attainment status for the criteria pollutants listed below. A final air permit would likely require applicable Best Available Control Technologies. The review team’s estimates of the emissions from the coal-fired generation alternative are approximately as follows[(a)]:

- SO_2 = 7469 T/yr
- NO_x = 1638 T/yr

(a) Based on 6,552,000 T/yr of bituminous coal and controlled using overfire air in combination with low-NO_x burners and selective catalytic reduction, limestone-based flue gas desulfurization, and conventional particulate capture technology (EPA 1998).

- CO = 1638 T/yr
- PM = 147 T/yr
- PM_{10} = 34 T/yr.

PM_{10} is particulate matter with an aerodynamic diameter equal to or less than 10 microns (40 CFR 50.6).

The acid rain requirements of the Clean Air Act, as amended (42 USC 7401 et seq.) capped the nation's SO_2 emissions from power plants. PEF would need to obtain sufficient pollution credits either from a set-aside pool or purchases on the open market to cover annual emissions from the plant.

A new coal-fired power-generation plant at the LNP site would need a Prevention of Significant Deterioration (PSD) Permit and an operating permit under the Clean Air Act. The plant would need to comply with the new source performance standards for such plants in 40 CFR Part 60, Subpart Da. The standards establish emission limits for PM and opacity (40 CFR 60.42Da), SO_2 (40 CFR 60.43Da), NO_x (40 CFR 60.44Da), and mercury (40 CFR 60.45Da).

The review team assumes that fugitive dust emissions from construction activities would be mitigated using best management practices (BMPs), similar to mitigation discussed in Chapter 4 for proposed LNP Units 1 and 2. Such emissions would be temporary.

The EPA has various regulatory requirements for visibility protection in 40 CFR Part 51, Subpart P, including a specific requirement for review of any new major stationary source in an area designated as in attainment or unclassified for criteria pollutants under the Clean Air Act (40 CFR 51.307(a)). The entire State of Florida is designated as in attainment or unclassified for all criteria pollutants (EPA 2006). National Ambient Air Quality Standards (NAAQSs) for criteria pollutants are in 40 CFR Part 50. Section 169A of the Clean Air Act establishes a national goal of preventing future impairment of visibility and remedying existing impairment in mandatory Class I Federal areas when impairment is from air pollution caused by human activities. In addition, EPA regulations provide that for each mandatory Class I Federal area located within a State, the State must establish goals that provide for reasonable progress toward achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility on the most-impaired days over the period of the implementation plan and make sure there is no degradation in visibility for the least-impaired days over the same period (40 CFR 51.308(d)(1)). If a new coal-fired power-generation station was located close to a mandatory Class I area, additional requirements for air-pollution control could be imposed. There are three mandatory Class I Federal areas in Florida:

- Chassahowitzka Wilderness Area – 13 mi south of the LNP site
- St. Marks Wilderness Area – 119 mi northwest of the LNP site
- Everglades National Park – 282 mi southeast of the LNP site.

The GEIS for license renewal considers global warming from unregulated CO_2 emissions and acid rain from emissions of sulfur oxides (SO_x) and NO_x as potential impacts (NRC 1996). Adverse human health effects, such as cancer and emphysema, have been associated with the byproducts of coal combustion. Overall, the review team concludes that air quality impacts from new coal-fired power generation at the LNP site would be MODERATE. The impacts would be clearly noticeable, but would not destabilize air quality.

Waste Management

As the NRC has described in NUREG-1437 (NRC 1996) and verified during its preparation of the operating license renewal supplemental EIS analysis, coal combustion generates waste in the form of ash, and equipment for controlling air pollution generates additional ash, spent selective catalytic reduction catalyst, and scrubber sludge. The review team estimates that the coal-fired plants would generate approximately 590,000 tons of ash per year (DOE/EIA 2009a). Significant quantities of the fly ash may be recycled for use in commodity products such as concrete, thus reducing the total landfill volume.

In May 2000, the EPA issued a "Notice of Regulatory Determination on Wastes from the Combustion of Fossil Fuels" (65 FR 32214). The EPA concluded that some form of national regulation is warranted to address coal-combustion waste products because of health concerns. Accordingly, the EPA announced its intention to issue regulations for disposal of coal-combustion waste under Subtitle D of the Resource Conservation and Recovery Act of 1976, as amended (RCRA) (42 USC 6901, et seq.). As of November 2009, the EPA is continuing to study the appropriate form of regulation for coal-combustion waste products.

Waste impacts on groundwater and surface water could extend beyond the operating life of the plant if leachate runoff from the waste-storage area occurs. Disposal of the waste could noticeably affect land use (because of the acreage needed for waste) and groundwater quality, but with appropriate management and monitoring, it would not destabilize any resources. After closure of the waste site and revegetation, the land could be available for some other uses. Construction-related debris would be generated during plant construction activities, and would be disposed of in approved landfills.

For the reasons stated above, the review team concludes that the impacts from waste generated at a coal-fired plant would be MODERATE. The impacts would be clearly noticeable, but would not destabilize any important resource.

Human Health

Coal-fired power generation introduces worker risks from coal and limestone mining, worker and public risk from coal and lime/limestone transportation, worker and public risk from disposal of coal-combustion waste, and worker and public risk from inhalation of stack emissions. In addition, the discharges of uranium and thorium from coal-fired plants can potentially produce radiological doses in excess of those arising from nuclear power plant operations (Gabbard 1993).

Regulatory agencies, including the EPA and State agencies, base air emission standards and requirements on human health impacts. These agencies also impose site-specific emission limits as needed to protect human health. Given the regulatory oversight exercised by the EPA and State agencies, the review team concludes that the human health impacts from radiological doses and inhaled toxins and particulates generated from coal-fired generation would be SMALL.

Other Impacts

Based on the GEIS (NRC 1996), at least 1700 ac of land would need to be converted to industrial use on the LNP site for the powerblock, infrastructure and support facilities, coal and limestone storage and handling, and landfill disposal of ash and scrubber sludge. Additional land would be needed for four new transmission-line corridors. Land-use changes would occur in an undetermined offsite coal-mining area to supply coal for the plant. In NUREG-1437 (NRC 1996), the staff estimated that approximately 22,000 ac would be needed for coal mining and waste disposal to support a 1000-MW(e) coal-fired plant over its operating life (48,000 ac for a 2200 MW[e] plant) (NRC 1996). Based on the amount of land affected for the site, mining, and waste disposal, the review team concludes that land-use impacts would be MODERATE.

The amount of water used and the impacts on water use and quality from constructing and operating a coal-fired plant at the LNP site would be comparable to those associated with a new nuclear plant. The new facility would use closed-cycle cooling. Water consumption due to evaporative cooling would also be comparable to that of a new nuclear facility. All discharges would be regulated by the Florida Department of Natural Resources through a National Pollution Discharge Elimination System (NPDES) permit. Indirectly, water quality could be affected by acids and mercury from air emissions. However, these emissions are regulated to minimize impacts. In NUREG-1437, the NRC staff determined that some erosion and sedimentation would likely occur during construction of new facilities (NRC 1996). These impacts would be similar to those for a new nuclear plant. Overall, the review team concludes that the water-use and water-quality impacts would be SMALL.

The coal-fired power-generation alternative would introduce ecological impacts from construction and new incremental impacts from operations. The impacts would be similar to those of the proposed action at the LNP site and along the transmission-line corridors. The impacts could include terrestrial and aquatic functional loss, habitat fragmentation and/or loss, reduced productivity, and a local reduction in biological diversity. The impacts could occur at the LNP site and at the sites used for coal and limestone mining. Construction and maintenance of new transmission-line corridors and lines would have ecological impacts. Stack emissions and disposal of waste products could affect aquatic and terrestrial resources. Additional impacts on threatened and endangered species could result from ash disposal and mining activities if the locations of such activities overlap with habitat for such protected species. Overall, the review team concludes that the ecological impacts would be MODERATE, primarily because of potential impacts associated with disposal of ash and the large area of land affected by mining activities.

The review team considered the effects of global climate change on a coal-fired plant at the LNP site, including sea-level rise, changes in precipitation rates, frequency of severe weather events, and changes in the distribution of species. The review team concluded that the impacts of global climate change on a coal-fired plant would be comparable to impacts on a new nuclear facility.

Socioeconomic impacts would result from the peak workforce of approximately 2000 construction workers and the approximately 250 workers needed to operate the coal-fired facility (PEF 2009a). The construction workers are predominantly temporary; however, it is expected that demands on housing and public services during construction would noticeably affect the surrounding areas. Overall, the review team concludes that these impacts would be SMALL, resulting from the mitigating influence of the site's proximity to the surrounding population area and the relatively small number of workers needed to operate the plant. PEF would pay significant property taxes to Levy County. Considering the population and economic condition of the county, the review team concludes that the taxes would have a LARGE beneficial impact on the county.

The four coal-fired powerblock units would be as much as 200 ft tall and visible offsite during daylight hours. The stacks and associated emissions would likely be visible in daylight hours for distances greater than 10 mi. Cooling towers and associated plumes also would have aesthetic impacts. The powerblock units and associated stacks would also be visible at night because of outside lighting. Visual impacts at night could be mitigated by reduced use of lighting and enhanced use of down-facing lighting, provided the lighting meets Federal Aviation Administration requirements, and appropriate use of shielding. The new transmission lines would have a larger aesthetic impact, but would be consistent with the proposed project. Overall, the review team concludes that the aesthetic impacts associated with new coal-fired power generation at the LNP site would be MODERATE, and the aesthetic impacts of the transmission lines would also be MODERATE, consistent with the proposed project.

Coal-fired power generation would introduce mechanical sources of noise that would likely be audible offsite. Sources contributing to the noise produced by plant operation are classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations. Intermittent sources include the equipment related to coal handling, solid-waste disposal, transportation related to coal and lime/limestone delivery, use of outside loudspeakers, and the commuting of plant employees. The impacts of noise on residents in the vicinity of the facility are considered MODERATE.

As discussed in Section 2.6.2, there are no environmental pathways by which the identified minority or low-income populations within the 50-mi radius surrounding the proposed LNP site (region) that would be likely to suffer disproportionately high and adverse environmental impacts. Therefore, environmental impacts on minority and low-income populations associated with a coal-fired plant at the LNP site would be SMALL.

The historic and cultural resource impacts for a new coal-fired plant located at the LNP site would be similar to the impacts for a new nuclear plant, as discussed in Sections 4.6 and 5.6. A cultural resources inventory would likely be needed for any onsite property that has not been previously surveyed. Other lands that would be acquired to support the plant would also likely need an inventory of field cultural resources, identification and recording of existing historic and archaeological resources, and possible mitigation of the adverse effects from ground-disturbing actions. The studies would likely be needed for all areas of potential disturbance at the plant site, any offsite affected areas, such as mining and waste-disposal sites, and along associated corridors where new construction would occur (e.g., roads and transmission-line corridors). The review team concludes that the historic and cultural resource impacts would be SMALL.

The construction and operational impacts of a 2200-MW(e) coal-fired power-generation plant at the LNP site are summarized in Table 9-1.

9.2.2.2 Natural-Gas-Fired Power Generation

For the natural-gas alternative, the review team assumed construction and operation of a natural-gas-fired plant at the LNP site. The review team assumed that the plant would use combined-cycle combustion turbines, which is consistent with PEF's ER (PEF 2009a). The review team assumed four units with a net capacity of 550-MW(e) per unit. The team's estimates of natural-gas consumption, gas-combustion technology, air emissions, and waste products are based on EPA AP-42, *Compilation of Air Pollutant Emission Factors – Stationary Gas Turbines* (EPA 2000). The review team also assumed the construction of four additional transmission-line corridors, as discussed in Chapter 3. The natural-gas-fired plant is assumed to have an operating life of 40 years. The review team estimated that the natural-gas-fired plant would use approximately 114 billion standard cubic feet of gas per year (EPA 2000).

1 **Table 9-1**. Summary of Environmental Impacts of Coal-Fired Power Generation at the LNP Site

Impact Category	Impact	Comment
Land Use	MODERATE	At least 1700 ac would be needed for powerblock; coal-handling, storage, and transportation facilities; infrastructure facilities; and cooling-water facilities. Additional land would be needed for new transmission-line corridors. Coal mining (offsite) and waste-disposal activities would require an additional 48,000 ac.
Air Quality	MODERATE	SO_2 – 7469 T/yr NO_x – 1638 T/yr CO – 1638 T/yr PM – 147 T/yr PM_{10} – 34 T/yr CO_2 – 18.7 million T/yr Small amounts of hazardous air pollutants. Global warming and acid rain are also of concern.
Water Use and Quality	SMALL	Impacts would be comparable to the impacts for a new nuclear power plant located at the LNP site.
Ecology	MODERATE	Impacts could include terrestrial and aquatic functional loss, habitat fragmentation and/or loss, reduced productivity, and a local reduction in biological diversity. Impacts could occur at the LNP site and vicinity and at the sites used for coal and limestone mining. Disposal of ash could affect the terrestrial and aquatic environments. Additional impacts on threatened and endangered species could result from ash disposal and mining activities. Permanent impact on wetlands within the project footprint would occur.
Waste Management	MODERATE	Total volume of combustion wastes would exceed 1 million T/yr (590,000 T/yr ash and 700,000 T/yr scrubber sludge).
Socioeconomics	LARGE Beneficial to MODERATE Adverse	Positive socioeconomic impacts would result due to the need for approximately 250 people to operate the plant, plus several hundred coal-mining jobs (offsite). The local property tax base would benefit, mainly during operations. Depending on where the workforce lives, the construction-related impacts (e.g., noise, traffic) would be noticeable or minor. Impacts during operation likely would be smaller than during construction. The plant and new transmission-line corridors would have aesthetic impacts.
Human Health	SMALL	Regulatory controls and oversight are assumed to be protective of human health.

Table 9-1. (contd)

Impact Category	Impact	Comment
Historic and Cultural Resources	SMALL	Any potential impacts could likely be effectively managed. Most of the facility and infrastructure would be built on ground previously disturbed by pine plantations. Impacts may also be associated with new transmission-line corridors.
Environmental Justice	SMALL	Based on analysis of census data, no disproportionately high or adverse impacts on minority or low-income populations would be anticipated.

Air Quality

Natural gas is a relatively clean-burning fuel. When compared with a coal-fired plant, a natural-gas-fired plant would release similar types of emissions, but in lower quantities. The associated emissions estimates were estimated based on factors contained in the EPA Compilation of Air Pollutant Emission Factors (EPA 2000) except where noted. These assumptions are consistent with the application submitted by PEF. It is noted that emissions estimates are based on “as fired” and controlled conditions and are not representative of what would likely be permitted.

A new natural-gas-fired power-generation plant would likely need a PSD Permit and an operating permit under the Clean Air Act. A new natural-gas-fired, combined-cycle plant would also be subject to the new source performance standards specified in 40 CFR Part 60, Subparts Da and GG. These regulations establish emission limits for particulates, opacity, SO_2, and NO_x.

The EPA has various regulatory requirements for visibility protection in 40 CFR Part 51, Subpart P, including a specific requirement for review of any new major stationary source in areas designated as in attainment or unclassified under the Clean Air Act. The entire State of Florida is designated as in attainment or unclassified for all criteria pollutants (EPA 2006).

Section 169A of the Clean Air Act establishes a national goal of preventing future impairment of visibility and remedying existing impairment in mandatory Class I Federal areas when impairment is from air pollution caused by human activities. In addition, the EPA regulations provide that for each mandatory Class I Federal area located within a State, the State regulatory agencies must establish goals that provide for reasonable progress toward achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for the most impaired days over the period of the implementation plan and make sure there is no degradation in visibility for the least-impaired days over the same period (40 CFR 51.308(d)(1)). If a new natural-gas-fired power plant was located close to a mandatory

Class I area, additional air-pollution control requirements could be imposed. There are three mandatory Class I Federal areas in Florida:

- Chassahowitzka Wilderness Area – 13 mi south of the LNP site
- St. Marks Wilderness Area – 119 mi northwest of the LNP site
- Everglades National Park – 282 mi southeast of the LNP site.

A natural-gas-fired plant equipped with appropriate combustion and post-combustion pollution-control technology would have approximately the following emissions[(a)]:

- SO_2 – 32 T/yr
- NO_x – 564 T/yr
- CO – 214 T/yr
- PM – 108 T/yr[(b)]
- PM_{10} – 108 T/yr.

Based on data from previous NRC EIS documents, the review team determined that these emissions estimates are reasonable. The review team estimates that a natural-gas-fired power plant would also have unregulated CO_2 emissions of 6.3 million T/yr that could affect climate change (EPA 1998).

The combustion turbine portion of the combined-cycle plant would be subject to EPA's National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines (40 CFR Part 63) if the site is a major source of hazardous air pollutants. Major sources have the potential to emit 10 T/yr or more of any single hazardous air pollutant or 25 T/yr or more of any combination of hazardous air pollutants (40 CFR 63.6085(b)).

The review team assumes that fugitive dust emissions from construction activities would be mitigated using BMPs, similar to mitigation discussed in Chapter 4 for proposed LNP Units 1 and 2. Such emissions would be temporary.

The impacts of emissions from a natural-gas-fired power-generation plant would be clearly noticeable, but would not be sufficient to destabilize air resources. Overall, the review team concludes that air quality impacts resulting from construction and operation of new natural-gas-fired power generation at the LNP site would be SMALL to MODERATE.

(a) Emissions based on 114 MMBtu/yr and control technology, including lean-premix combustion, and catalytic control for NO_x at a 90-percent reduction rate and CO at a 75-percent reduction rate.
(b) Filterable particulate matter considered for analysis.

Waste Management

In NUREG-1437, the NRC staff concluded that waste generation from natural-gas-fired technology would be minimal (NRC 1996). The only significant waste generated at a natural-gas-fired power plant would be spent selective catalytic reduction catalyst (SCR), which is used to control NO_x emissions. The spent catalyst would be regenerated or disposed of offsite. Other than spent SCR catalyst, waste generation at an operating natural-gas-fired plant would be largely limited to typical operations and maintenance waste. Construction-related debris would be generated during construction activities. Overall, the review team concludes that waste impacts from natural-gas-fired power generation would be SMALL.

Human Health

Natural-gas-fired power generation introduces public risk from inhalation of gaseous emissions. The risk may be attributable to NO_x emissions that contribute to ozone formation, which in turn contributes to health risk. Regulatory agencies, including the EPA and State agencies, base air emission standards and requirements on human health impacts. These agencies also impose site-specific emission limits as needed to protect human health. Given the regulatory oversight exercised by the EPA and State agencies, the review team concludes that the human health impacts from natural-gas-fired power generation would be SMALL.

Other Impacts

The natural-gas-fired power-generating plant would require at least 110 ac for the powerblock and support facilities for 2200 MW(e). Construction of a natural-gas pipeline from the LNP site to the closest natural-gas distribution line would require approximately 10 ac. Thus, the total land-use commitment, not including natural gas wells and collection stations, would be at least 120 ac (NRC 1996). Consistent with the proposed project, additional land would be needed for four new transmission-line corridors as well. A small amount of additional land would also be required for natural-gas wells and collection stations. Due to the proximity of the LNP site to existing natural-gas infrastructure, these impacts would be minimized. Overall, the review team concludes that the land-use impacts from new natural-gas-fired power generation would be MODERATE due mainly to the transmission-line corridor impacts.

The amount of water used and the impacts on water use and quality from constructing and operating a natural-gas-fired plant at the LNP site would be comparable to the impacts associated with building and operating a new nuclear facility. The impacts on water quality from sedimentation during construction of a natural-gas-fired plant were characterized in NUREG-1437 as SMALL (NRC 1996). The NRC staff also noted in NUREG-1437 that the impacts on water quality from operations would be similar to, or less than, the impacts from other power-generating technologies (NRC 1996). Overall, the review team concludes that impacts on water use and quality would be SMALL.

A natural-gas-fired plant at the LNP site would have fewer ecological impacts than a new nuclear facility because less land would be affected. Constructing a new underground gas pipeline to the site would result in permanent loss of some terrestrial and aquatic function as well as conversion and fragmentation of habitat; however, because the distance to connect to natural-gas distribution systems would be minimal, no important ecological attributes would be noticeably altered. Impacts on threatened and endangered species would be similar to the impacts from a new nuclear facility located at the LNP site. Overall, the review team concludes that ecological impacts would be SMALL.

The review team considered the effects of global climate change on a natural-gas-fired plant at the LNP site, including sea-level rise, changes in precipitation rates, frequency of severe weather events, and changes in the distribution of species. The team concluded that the impacts of global climate change on a natural-gas-fired plant would be comparable to impacts on a new nuclear facility.

Socioeconomic impacts would result from the approximately 1200 construction workers (NRC 1996) and 150 workers needed to operate the natural-gas-fired facility (PEF 2009a), demands on housing and public services during construction, and the loss of jobs after construction. Overall, the review team concludes that these impacts would be SMALL because of the mitigating influence of the site's proximity to the surrounding population area and the relatively small number of workers needed to construct and operate the plant in comparison to nuclear and coal-fired generation alternatives. PEF would pay property taxes to Levy County. Considering the population and economic condition of the county, the review team concludes that the taxes would have a LARGE beneficial impact on the county.

The turbine buildings, four exhaust stacks (each approximately 200 ft high) and associated emissions, and the gas pipeline compressors would be visible during daylight hours from offsite. Noise and light from the plant would be detectable offsite. The new transmission lines would have an aesthetic impact. Overall, the review team concludes that the aesthetic impacts associated with new natural-gas-fired power generation at the LNP site would be SMALL, but the impact along new transmission lines would be MODERATE, similar to the proposed project.

Historic and cultural resource impacts for a new natural-gas-fired plant located at the LNP site would be similar to the impacts for a new nuclear plant, as discussed in Sections 4.6 and 5.6. A cultural resources inventory would likely be needed for any onsite property that has not been previously surveyed. Other lands (if any) that are acquired to support the plant would also likely need an inventory of field cultural resources, identification and recording of existing historic and archaeological resources, and possible mitigation of the adverse effect from ground-disturbing actions. The studies would likely be needed for all areas of potential disturbance at the plant site, any offsite affected areas, such as gas wells, collection stations, and waste-disposal sites, and along associated corridors where new construction would occur (e.g., roads and a new pipeline). The review team concludes that the historic and cultural resource impacts associated with new natural-gas-fired power generation at the LNP site would be SMALL.

As described in Section 2.6.2, there are no environmental pathways by which the identified minority or low-income populations within the region would be likely to suffer disproportionately high and adverse environmental impacts. Therefore, environmental impacts on minority and low-income populations associated with a natural-gas-fired plant at the LNP site would be SMALL.

The impacts of natural-gas-fired power generation at the LNP site are summarized in Table 9-2.

Table 9-2. Summary of Environmental Impacts of Natural-Gas-Fired Power Generation

Impact Category	Impact	Comment
Land Use	MODERATE	At least 120 ac would be needed for powerblock, cooling towers, and support systems, and connection to a natural-gas pipeline. Additional land would be needed for transmission-line corridors, infrastructure, and other facilities.
Air Quality	SMALL to MODERATE	SO_2 – 32 T/yr NO_x – 564 T/yr CO – 214 T/yr PM – 108 T/yr PM_{10} – 108 T/yr CO_2 – 6.3 million T/yr Some hazardous air pollutants
Water Use and Quality	SMALL	Impacts would be comparable to the impacts for a new nuclear power plant located at the LNP site.
Ecology	SMALL	Constructing a new underground gas pipeline to the site would result in permanent loss of some terrestrial and aquatic function as well as conversion and fragmentation of habitat. Impacts on threatened and endangered species would be similar to the impacts from new nuclear generating units. Most impacts from pipeline construction would be temporary. Permanent impact on wetlands within the project footprint would occur.
Waste Management	SMALL	The only significant waste would be from spent selective catalytic reduction catalyst used for control of emissions of NO_x.
Socioeconomics	LARGE Beneficial to MODERATE Adverse	Construction and operations workforces would be relatively small. Addition to property tax base, while smaller than for a nuclear or coal-fired plant, might still be quite noticeable. Construction-related impacts would be noticeable. Impacts during operation would be minor because of the small workforce involved. The plant and new transmission lines would have aesthetic impacts.

Table 9-2. (contd)

Impact Category	Impact	Comment
Human Health	SMALL	Regulatory controls and oversight would be protective of human health.
Historic and Cultural Resources	SMALL	Most of the facility and infrastructure would be built on ground previously disturbed by pine plantations. Impacts may also be associated with new transmission-line corridors.
Environmental Justice	SMALL	No disproportionately high or adverse impacts on minority or low-income populations would be anticipated based on analysis of census data.

9.2.3 Other Alternatives

This section discusses other energy alternatives, the review team's conclusions about the feasibility of each alternative, and the review team's basis for its conclusions. New nuclear units at the LNP site would be baseload generation units. Any feasible alternative to the new units would need to generate baseload power. In evaluating other energy technologies, PEF used the technologies discussed in the GEIS for license renewal (NRC 1996). The review team reviewed the information submitted by PEF in its ER and also conducted an independent review. The review team determined that the other energy alternatives are not reasonable alternatives to two new nuclear units that would provide baseload power. Also, the Florida Public Service Commission stated that renewable generation available today or in the foreseeable future cannot provide enough baseload capacity to avoid the need for the addition of proposed LNP Units 1 and 2 (FPSC 2008).

The review team has not assigned significance levels to the environmental impacts associated with the alternatives discussed in this section because, as noted above, the generation alternatives are not feasible for providing 2200 MW(e) of baseload power. In addition, some of the generation alternatives would have to be installed at a location other than the LNP site, and any attempt to assign significance levels would require the staff's speculation about the unknown site.

9.2.3.1 Oil-Fired Power Generation

The EIA's reference case in its *Updated Annual Energy Outlook* 2009 projects that oil-fired power plants would not account for any new electric power-generation capacity in the United States through the year 2030 (DOE/EIA 2009b). Oil-fired generation is more expensive than nuclear, natural-gas-fired, or coal-fired generation options. In addition, future increases in oil prices are expected to make oil-fired generation increasingly more expensive. The high cost of oil has resulted in a decline in its use for electricity generation. In Section 8.3.11 of NUREG-1437, the staff estimated that construction of a 1000-MW(e) oil-fired plant would require about 120 ac of land (NRC 1996). Operation of an oil-fired power plant would have air emissions that would be similar to those of a comparably sized coal-fired plant (NRC 1996).

For the aforementioned economic and environmental reasons, the review team concludes that an oil-fired power plant would not be a reasonable alternative to construction of a 2200-MW(e) nuclear power-generation facility that would be operated as a baseload plant within PEF's ROI.

9.2.3.2 Wind Power

The LNP site is in a wind power Class 1 region (average wind speeds lower than 5.6 m/s) (DOE 2005). Class 1 regions have the lowest potential for generation of wind energy and are unsuitable for wind-energy development (DOE 2005). Wind turbines typically operate at a 25- to 40-percent capacity factor compared to 90 to 95 percent for a baseload plant such as a nuclear plant (AWEA 1998). The world's largest operating wind farm, the Horse Hollow Wind Energy Center in Texas, is 735 MW (TSECO 2008a), but most are well under 200 MW. A utility-scale wind power-generation plant in open, flat terrain would generally require about 60 ac/MW of installed capacity, although much of this land could be used for other compatible purposes such as farming or ranching (AWEA 2007). With modern wind turbine designs, more than 1000 wind turbines would be required to produce the 2200 MW(e) of the proposed nuclear units.

For the reasons cited above, the review team concludes that a wind-energy facility at the LNP site or elsewhere within PEF's ROI would not currently be a reasonable alternative to construction of a 2200-MW(e) nuclear power-generation facility that would be operated as a baseload plant.

9.2.3.3 Solar Power

Solar technologies use energy and light from the sun to provide heating and cooling, light, hot water, and electricity for consumers. Solar energy can be converted to electricity using solar thermal technologies or photovoltaics. Solar thermal technologies use concentrating devices to create temperatures suitable for power production. Concentrating thermal technologies are currently less costly than photovoltaics for bulk power production. They can also be provided with energy storage or auxiliary boilers to allow operation during periods when the sun is not shining (NPCC 2006). The largest operational solar thermal plant is the 310-MW(e) Solar Energy Generating System located on approximately 1500 ac in the Mojave Desert in southern California (NextEra 2009).

Solar insolation has a low energy density relative to other common energy sources. Consequently, a large total acreage is needed to gather an appreciable amount of energy. Typical solar-to-electric power plants require 5 to 10 ac for every megawatt of generating capacity (TSECO 2008b). For PEF's target capacity of 2200 MW(e) for LNP Units 1 and 2, land requirements would be approximately 11,000 to 22,000 ac. Solar thermal electric technologies also typically require considerable water supplies.

For the preceding reasons, the review team concludes that a solar-energy facility at or in the vicinity of the LNP site would not currently be a reasonable alternative to construction of a 2200-MW(e) nuclear power-generation facility that would be operated as a baseload plant.

9.2.3.4 Hydropower

The EIA's reference case in its *Updated Annual Energy Outlook* 2009 projects that U.S. electricity production from hydropower plants will remain essentially stable through the year 2030 (DOE/EIA 2009b). In NUREG-1437, the NRC staff estimated that land requirements for hydroelectric power are approximately 1 million ac per 1000 MW(e) (NRC 1996). For the target capacity of 2200 MW(e) for proposed LNP Units 1 and 2, land requirements would thus be 2.2 million ac.

Because of the extremely low amount of undeveloped hydropower resource in Florida and the large land-use and related environmental and ecological resource impacts associated with siting hydroelectric facilities large enough to produce 2200 MW(e), the review team concludes that local hydropower is not a feasible alternative to construction of a new nuclear power-generation facility operated as a baseload plant at the proposed site.

9.2.3.5 Geothermal Energy

Geothermal energy has an average capacity factor of 90 percent and can be used for baseload power where available. However, geothermal technology is not widely used as baseload power generation because of the limited geographical availability of the resource and immature status of the technology (NRC 1996). Geothermal plants are most likely to be sited in the western continental United States, Alaska, and Hawaii, where hydrothermal reservoirs are prevalent (DOE 2008b). Geothermal systems have a relatively small footprint and minimal emissions (MIT 2006). Florida has high-temperature geothermal resources that are suitable for space heating applications, but not for baseload power generation (DOE 2010). A recent study led by the Massachusetts Institute of Technology concluded that a $300 to $400 million investment over 15 years would be needed to make early-generation enhanced geothermal system power plant installations competitive in the evolving U.S. electricity supply markets (MIT 2006).

For these reasons, the review team concludes that a geothermal energy facility at the LNP site or elsewhere in PEF's ROI would not currently be a reasonable alternative to construction of a 2200-MW(e) nuclear power-generation facility operated as a baseload plant.

9.2.3.6 Wood Waste

In NUREG-1437, the NRC staff determined that a wood-burning facility can provide baseload power and operate with an average annual capacity factor of around 70 to 80 percent and with 20- to 25-percent efficiency (NRC 1996). The fuels required are variable and site-specific. A significant impediment to the use of wood waste to generate electricity is the high cost of fuel delivery and high construction cost per megawatt of generating capacity. The larger wood-waste power plants are only 40 to 50 MW(e) in size. Estimates in NUREG-1437 suggest that the overall level of construction impacts per megawatt of installed capacity would be approximately the same as that for a coal-fired plant, although facilities using wood waste for fuel would be built at smaller scales (NRC 1996). Similar to coal-fired plants, wood-waste plants require large areas for fuel storage and processing and involve the same type of combustion equipment.

Because of uncertainties associated with obtaining sufficient wood and wood waste to fuel a baseload power plant, the ecological impacts of large-scale timber cutting (e.g., soil erosion and loss of wildlife habitat), and the relatively small size of wood power-generation plants, the review team concludes that wood waste would not be a reasonable alternative to a 2200-MW(e) nuclear power-generation facility operated as a baseload plant.

9.2.3.7 Municipal Solid Waste

Municipal solid-waste combustors incinerate waste and can use the resultant heat to produce steam, hot water, or electricity. The combustion process reduces the volume of waste and the need for new solid-waste landfills. Mass-burning technologies are most commonly used in the United States. This group of technologies processes raw municipal solid waste with little or no sizing, shredding, or separation before combustion. More than one-fifth of the U.S. municipal solid-waste incinerators use refuse-derived fuel. In contrast to mass burning – where the municipal solid waste is introduced “as is” into the combustion chamber – refuse-derived fuel facilities are equipped to recover recyclables (e.g., metals, cans, and glass) followed by shredding the combustible fraction into fluff for incineration (EPA 2008).

In NUREG-1437, the staff determined that the initial capital cost for municipal solid-waste plants is greater than for comparable steam-turbine technology at wood-waste facilities because of the need for specialized waste-separation and waste-handling equipment for municipal solid waste (NRC 1996).

Municipal solid-waste combustors generate SO_2 and NO_x emissions and an ash residue that is buried in landfills. The ash residue is composed of bottom ash and fly ash. Bottom ash refers to the portion of the unburned waste that falls to the bottom of the grate or furnace. Fly ash represents the small particles that rise from the furnace during the combustion process. Fly ash is generally removed from flue gases using fabric filters and/or scrubbers (EPA 2009a).

Currently, approximately 87 waste-to-energy plants are operating in the United States (EPA 2009a). These plants generate approximately 2500 MW(e), or an average of approximately 29 MW(e) per plant (EPA 2009a). Given the small average output of existing plants, the review team concludes that generating electricity from municipal solid waste would not be a reasonable alternative to a 2200-MW(e) nuclear power-generation facility operated as a baseload plant within PEF's ROI.

9.2.3.8 Other Biomass-Derived Fuels

In addition to wood and municipal solid-waste fuel, several other biomass-derived fuels are available for fueling electric generators, including burning crops, converting crops to a liquid fuel such as ethanol, and gasifying crops (including wood waste). EIA estimates that wind and biomass will be the largest sources of renewable electricity generation among the non-hydropower renewable fuels through 2030 (DOE/EIA 2009b). However, in NUREG-1437, the NRC staff determined that none of these technologies has progressed to the point of being competitive on a large scale or of being reliable enough to replace a large baseload power-generating plant (NRC 1996). The major operating waste from biomass plants would be the fly ash and bottom ash that results from the combustion of the carbonaceous fuels.

Co-firing biomass with coal is possible when low-cost biomass resources are available. Co-firing is the most economic option for the near future to introduce new biomass power generation. These projects require small capital investments per unit of power-generation capacity. Co-firing systems range in size from 1 to 30 MW(e) of biopower capacity (DOE 2008a).

The review team concludes that given the relatively small average output of biomass power-generation facilities, biomass-derived fuels do not offer a reasonable alternative to a 2200-MW(e) nuclear power-generation facility operated as a baseload plant within PEF's ROI.

9.2.3.9 Fuel Cells

Fuel cells work without combustion and its associated environmental side effects. Power is produced electrochemically by passing a hydrogen-rich fuel over an anode, air over a cathode, and then separating the two by an electrolyte. The only byproducts are heat, water, and CO_2. Hydrogen fuel can come from a variety of hydrocarbon resources by subjecting them to steam under pressure. Natural gas is typically used as the source of hydrogen.

Phosphoric acid fuel cells are generally considered first-generation technology. Higher-temperature, second-generation fuel cells achieve higher fuel-to-electricity and thermal efficiencies. The higher temperatures contribute to improved efficiencies and give the second-generation fuel cells the capability to generate steam for cogeneration and combined-cycle operations.

During the past three decades, significant efforts have been made to develop more practical and affordable fuel cell designs for stationary power applications, but progress has been slow.

The cost of fuel cell power systems must be reduced before they can be competitive with conventional technologies (DOE 2008c).

The review team concludes that, at the present time, fuel cells are not economically or technologically competitive with other alternatives for baseload electricity generation. Future gains in cost competitiveness for fuel cells compared to other fuels are speculative.

For the preceding reasons, the staff concludes that a fuel cell energy facility located at or in the vicinity of the proposed site would not currently be a reasonable alternative to construction of a 2200-MW(e) nuclear power-generation facility operated as a baseload plant.

9.2.4 Combination of Alternatives

Individual alternatives to the construction of two new nuclear units at the LNP site might not be sufficient on their own to generate PEF's target value of 2200 MW(e) because of the limited availability of the resource or lack of cost-effective opportunities. Nevertheless, it is conceivable that a combination of alternatives might be cost effective. There are many possible combinations of alternatives. It would not be reasonable to examine every possible combination of alternatives in an EIS. Doing so would be counter to CEQ guidance that an EIS should be analytic rather than encyclopedic, should be kept concise, and should be no longer than absolutely necessary to comply with NEPA and CEQ regulations (40 CFR 1502.2(a), (b)). Given that PEF's objective is for a new baseload generation facility, a fossil-fuel energy source, most likely natural gas or coal, would need to be a significant contributor to any reasonable alternative energy combination.

Section 9.2.2.2 assumes the construction of four 550-MW(e) natural-gas-fired, combined-cycle power-generating units at the LNP site using closed-cycle cooling with cooling towers. For a combined alternatives option, the review team assessed the environmental impacts of an assumed combination of three 550-MW(e) natural-gas-fired, combined-cycle power-generating units at the LNP site using closed-cycle cooling with cooling towers, and the following contributions from within PEF's ROI: 200 MW(e) from conservation and DSM programs beyond what is currently planned, 150 MW(e) from solar, 100 MW(e) from wind, and 100 MW(e) from biomass sources, including municipal solid waste. Solar and wind energy would need to be combined with an energy-storage mechanism, such as compressed air energy storage, to be baseload resources. The review team believes that the preceding contributions are reasonable and representative for PEF's ROI. The contributions reflect the review team's analysis in Sections 9.2.2 and 9.2.3.

The review team considered the effects of global climate change on a combination of alternatives at the LNP site, including sea-level rise, changes in precipitation rates, frequency of severe weather events, and changes in the distribution of species. Global climate change could have an impact on some of the alternative generation sources (solar, wind, and biomass) considered in the combination of alternatives. For example, increased cloud cover could affect solar-power generation and biomass production, and severe weather events could affect wind-power generation. The review team concluded, however, that the impacts of global climate change on the gas-fired component of the combination of alternatives would be comparable to impacts on a new nuclear facility. A summary of the review team's characterizations of the environmental impacts associated with the construction and operation of the preceding assumed combination of alternatives is provided in Table 9-3.

Table 9-3. Summary of Environmental Impacts of a Combination of Power Sources

Impact Category	Impact	Comment
Land Use	MODERATE	A natural-gas-fired plant would have land-use impacts for the powerblock, new transmission-line corridors, cooling towers, and support systems, and connection to a natural-gas pipeline. Solar, wind, and biomass facilities and associated transmission lines would also have land-use impacts because of the large footprints required for these facilities.
Air Quality	SMALL to MODERATE	Emissions from the natural-gas-fired plant would be approximately: SO_2 – 24 T/yr NO_x – 423 T/yr CO – 161 T/yr PM – 81 T/yr PM_{10} – 81 T/yr CO_2 – 4.7 million T/yr Some hazardous air pollutants. Biomass would also have some emissions.
Water Use and Quality	SMALL	Impacts would be comparable to the impacts for a new nuclear power plant located at the proposed site.
Ecology	SMALL to MODERATE	Wind-energy facilities could result in increased avian and bat mortality. Permanent impact on wetlands within the project footprint would occur.
Waste Management	SMALL to MODERATE	The only significant waste would be from spent selective catalytic reduction catalyst used for control of NO_x emissions and ash from biomass and municipal solid waste.
Socioeconomics	LARGE Beneficial To MODERATE Adverse	Construction and operations workforces would be relatively small. Addition to property tax base, while smaller than for a nuclear or coal-fired plant, might still be quite noticeable. Construction-related impacts would be noticeable. Impacts during operation would be minor because of the small workforce involved. The power plants and new transmission lines would have aesthetic impacts.

Table 9-3. (contd)

Impact Category	Impact	Comment
Human Health	SMALL	Regulatory controls and oversight would be protective of human health.
Historic and Cultural Resources	SMALL	Most of the facilities and infrastructure at the LNP site would likely be built on ground previously disturbed by pine plantations. Impacts may also be associated with new transmission-line corridors.
Environmental Justice	SMALL	Some impacts on housing availability and prices during construction may occur, as might beneficial impacts from property tax revenues.

9.2.5 Summary Comparison of Alternatives

Table 9-4 contains a summary of the review team's environmental impact characterizations for constructing and operating new nuclear, coal-fired, and natural-gas-fired power-generating units, and a combination of alternatives at the LNP site. The combination of alternatives shown in Table 9-4 assumes siting of three natural-gas-fired, combined-cycle units at the LNP site and siting of other alternative power-generating units within PEF's ROI. The significance levels used in the comparison table for the nuclear category originate from Chapters 4 and 5, construction and preconstruction as well as operational impacts.

Table 9-4. Summary of Environmental Impacts of Construction and Operation of New Nuclear, Coal-Fired, and Natural-Gas-Fired Power-Generating Units, and a Combination of Alternatives

Impact Category	Nuclear	Coal	Natural Gas	Combination of Alternatives
Land Use	MODERATE	MODERATE	MODERATE	MODERATE
Air Quality	SMALL	MODERATE	SMALL to MODERATE	SMALL to MODERATE
Water Use and Quality	SMALL	SMALL	SMALL	SMALL
Ecology	SMALL to MODERATE	MODERATE	SMALL	SMALL to MODERATE
Waste Management	SMALL	MODERATE	SMALL	SMALL to MODERATE

Table 9-4. (contd)

Impact Category	Nuclear	Coal	Natural Gas	Combination of Alternatives
Socioeconomics	LARGE Beneficial to MODERATE Adverse	LARGE Beneficial to MODERATE Adverse	LARGE Beneficial to MODERATE Adverse	LARGE Beneficial to MODERATE Adverse
Human Health	SMALL	SMALL	SMALL	SMALL
Historic and Cultural Resources	SMALL	SMALL	SMALL	SMALL
Environmental Justice	SMALL	SMALL	SMALL	SMALL

The review team reviewed the available information on the environmental impacts of power-generation alternatives compared to the construction of new nuclear units at the LNP site. Based on this review, the review team concludes that, from an environmental perspective, none of the viable energy alternatives is environmentally preferable to construction of a new baseload nuclear power-generation plant at the LNP site.

Because of current concerns related to greenhouse gas emissions, it is appropriate to specifically discuss the differences among the alternative energy sources regarding CO_2 emissions. The CO_2 emissions for the proposed action and energy-generation alternatives are discussed in Sections 5.7.1, 9.2.2.1, and 9.2.2.2. Table 9-5 summarizes the CO_2 emission estimates for a 40-year period for the alternatives considered by the review team to be viable for baseload power generation. These estimates are limited to the emissions from power generation and do not include CO_2 emissions for workforce transportation, construction fuel cycle, or decommissioning.

Table 9-5. Comparison of Carbon Dioxide Emissions for Energy Alternatives

Generation Type	Years	CO_2 Emissions (MT)
Nuclear Power[a]	40	22,500
Coal-Fired Generation[b]	40	678,000,000
Natural-Gas-Fired Generation[c]	40	229,000,000
Combination of Alternatives[d]	40	171,000,000

(a) From ER (PEF 2009a)
(b) From Section 9.2.2.1
(c) From Section 9.2.2.2
(d) From Section 9.2.4 (assuming only natural-gas generation has significant CO_2 emissions)

Among the viable energy-generation alternatives, the CO_2 emissions for nuclear power are a small fraction of the emissions of the other viable energy-generation alternatives. Adding the transportation emissions for the nuclear plant workforce and fuel-cycle emissions, would increase the emissions for plant operation over a 40-year period to about 40,000,000 MT (Appendix I). This number is still significantly lower than the emissions for any of the other baseload generation alternatives.

The CO_2 emissions associated with generation alternatives such as wind, solar, and hydropower would be associated with workforce transportation, construction, and decommissioning of the facilities. Because these power-generation alternatives do not involve combustion, the review team considers the emissions to be minor and concludes that the emissions would have a minimal cumulative impact. Other energy-generation alternatives involving combustion of oil, wood waste, municipal solid waste, or biomass-derived fuels would have CO_2 emissions from combustion as well as from workforce transportation, plant construction, and plant decommissioning. It is likely that the CO_2 emissions from the combustion process for these alternatives would dominate the other CO_2 emissions associated with the generation alternative. It is also likely that the CO_2 emissions from these alternatives would be the same order of magnitude as the emissions for the fossil-fuel alternatives. However, because the review team determined that these alternatives do not meet the need for baseload power generation, the review team has not evaluated the CO_2 emissions quantitatively.

As discussed in Chapter 8, the review team concludes that the need for additional baseload power generation has been demonstrated. Also, as discussed earlier in this chapter, the review team concludes that the viable alternatives to the proposed action all would involve the use of fossil fuels (coal or natural gas). Consequently, the review team concludes that the proposed action results in the lowest level of emissions of greenhouse gases among the viable alternatives.

9.3 Alternative Sites

This section discusses PEF's alternative site-selection process for possible siting of a new nuclear power plant. It provides the review team's description of the alternative sites selected and the building and operational impacts of locating two new units at each alternative site. Finally, the construction and operational impacts of the proposed and alternative sites are compared.

9.3.1 Alternative Sites Selection Process

NRC EISs prepared in conjunction with a COL application are to analyze alternatives to the proposed action (10 CFR 51.71(d)). This section discusses PEF's process for selecting its proposed and alternative sites and the review team's evaluation of the process. PEF's site-selection process was based on guidance in the following documents (PEF 2009a): the NRC's ESRP (NRC 2000), Regulatory Guide 4.2 (NRC 1976), Regulatory Guide 4.7 (NRC 1998), and the Electric Power Research Institute's (EPRI) Siting Guide (EPRI 2002). In evaluating sites, PEF assumed that a twin-unit Westinghouse Electric Company, LLC (Westinghouse) AP1000 pressurized water reactor would be built and operated (PEF 2009a).

NRC's site-selection process guidance calls for identification of an ROI, followed by successive screenings to identify candidate areas, potential sites, candidate sites, and the proposed site (NRC 2000). Candidate areas are those areas within an ROI that remain after areas unsuitable for nuclear power plant construction or operation have been excluded. Potential sites are those sites within candidate areas that meet minimum size and other siting criteria. Candidate sites are chosen from potential sites using a defined site-selection methodology and are those that would be expected to be granted construction permits or COLs. Candidate sites include both the proposed site and alternative sites.

9.3.1.1 Selection of Region of Interest

The ROI is the geographic area considered by an applicant in searching for candidate areas and potential sites for a new nuclear power plant. The ROI is typically the state in which the proposed site is located or the relevant service area for the proposed plant (NRC 2000). PEF selected as its ROI the land area included in the PEF service territory and all or parts of the Florida counties surrounding PEF's service territory, including Bay, Calhoun, Jackson, Suwannee, Columbia, Union, Bradford, Alachua, Clay, Putnam, Flagler, Volusia, Seminole, Brevard, Indian River, Okeechobee, St. Lucie, Glades, Highlands, DeSoto, Hardee, Manatee, Pasco, Polk, and Hillsborough (see Figure 8-1) (PEF 2009a). PEF expanded the ROI around the periphery of its service territory to provide additional flexibility and to make sure it would not overlook any viable sites within a reasonable distance of the service territory. PEF's service territory is further discussed in Section 8.1.

9.3.1.2 Selection of Candidate Areas

Candidate areas are one or more areas within the applicant's ROI that remain after unsuitable areas for a new nuclear power plant (e.g., due to high population, lack of water, fault lines, or distance to transmission lines) have been removed from consideration (NRC 2000). PEF systematically reviewed candidate areas within the ROI using the ESRP guidance (NRC 2000) and the EPRI Siting Guide (EPRI 2002) as the basis for its selections. The following broad criteria were applied in screening for candidate areas within the ROI: population density, availability of cooling-water sources, dedicated Federal and State land uses, and regional ecological features (e.g., threatened or endangered species habitats) (PEF 2009a, d). Areas were removed from consideration if they did not meet the required characteristics (e.g., population density no more than 300 persons/mi^2, no Federal or State parks). Nine areas that met the required characteristics were designated candidate areas and were plotted on a map of Florida. The following nine candidate areas were identified by PEF (PEF 2009a):

- Western Panhandle along the Gulf Coast/St. Joseph Bay (Bay and Gulf Counties)
- Apalachicola and Chipola River basin areas (Calhoun, Gulf, and Liberty Counties)
- Ochlockonee River basin along borders of Liberty, Franklin, Leon, and Wakulla Counties
- Gulf Coast along Taylor and Dixie, Levy, Citrus, and Hernando Counties
- Tampa Bay area/Manatee River south of Tampa/St. Petersburg area (Hillsborough and Manatee Counties)
- Suwannee River Basin (Dixie, Levy, Gilchrist, and Lafayette Counties)
- Kissimmee River near Lake Okeechobee (Highlands, Okeechobee and Glades Counties)
- St. Johns River Basin (Seminole, Volusia, and Putnam Counties)
- Atlantic Coastal areas (numerous locations between Flagler County to the north, and Indian River County to the south).

9.3.1.3 Selection of Potential Sites

Potential sites are those sites within a candidate area that have been identified by an applicant for preliminary assessment in establishing candidate sites (NRC 2000). Within the nine candidate areas, PEF used aerial photographs and other geographic information to identify potential sites for its planned new nuclear units.

In the first phase of the potential site-selection process, PEF used the following considerations to identify a number of general siting areas within the candidate areas (PEF 2009g):

- at least one potential site for each major water source
- proximity to transmission/load centers
- avoidance of high-population areas in the area
- consideration of ecologically sensitive and special designation areas, both along the coast and river corridors (e.g., Outstanding Florida Waters as defined by the FDEP(2009a)
- proximity to transportation (e.g., railroad lines, barge terminals)
- diversity of potential sites within the ROI (coastal and inland waterways)
- areas particularly compatible with PEF’s business objectives.

PEF then searched within the general siting areas to identify potential sites, using the following factors:

- flexibility to optimize site layout and design to minimize costs and to avoid or mitigate environmental impacts
- minimization of the number of land parcels contained within the site
- optimization of site engineering factors (e.g., topography, foundation conditions, grading requirements).

Finally, the following criteria were applied in locating potential sites (PEF 2009a):

- distance to existing transmission-load centers in the Orlando and Tampa/St. Petersburg areas was minimized to the extent possible.
- distance from towns, villages, and developed areas was maximized.
- distance from industrial areas identifiable from the aerial photographs and topographic maps (e.g., airports, industrial complexes) was maximized.
- when possible, land near existing water-supply sources (rivers, lakes, and coastal areas) was identified.
- the optimal topography was assumed to be a relatively flat area above the 100-year floodplain for construction of the plant, adjacent to streams with surrounding topography showing some relief.
- vehicle transportation access to the potential sites was qualitatively evaluated. Land areas around major highways were avoided, but those within a reasonable distance of State highways were considered.
- potential sites were generally 6000 ac in size, although some sites as small as 2000 ac were considered (PEF 2009a). PEF selected 20 potential sites for new nuclear units based mainly on the availability of sufficient land for two AP1000 reactors and the availability of sufficient cooling water for the units. As shown in Figure 9-1, the 20 potential sites are located in the following counties: Calhoun, Liberty (two sites), Gilchrist, Putnam (three sites), Volusia, Seminole, Highlands and Glades, Manatee, Hillsborough, Citrus, Levy (three sites), Dixie, Lafayette, Taylor, and Gulf (PEF 2009a).

9.3.1.4 Selection of Candidate Sites

Candidate sites are those potential sites within the ROI that are considered in the comparative evaluation of sites to be among the best that can reasonably be found for the siting of a nuclear power plant (NRC 2000).

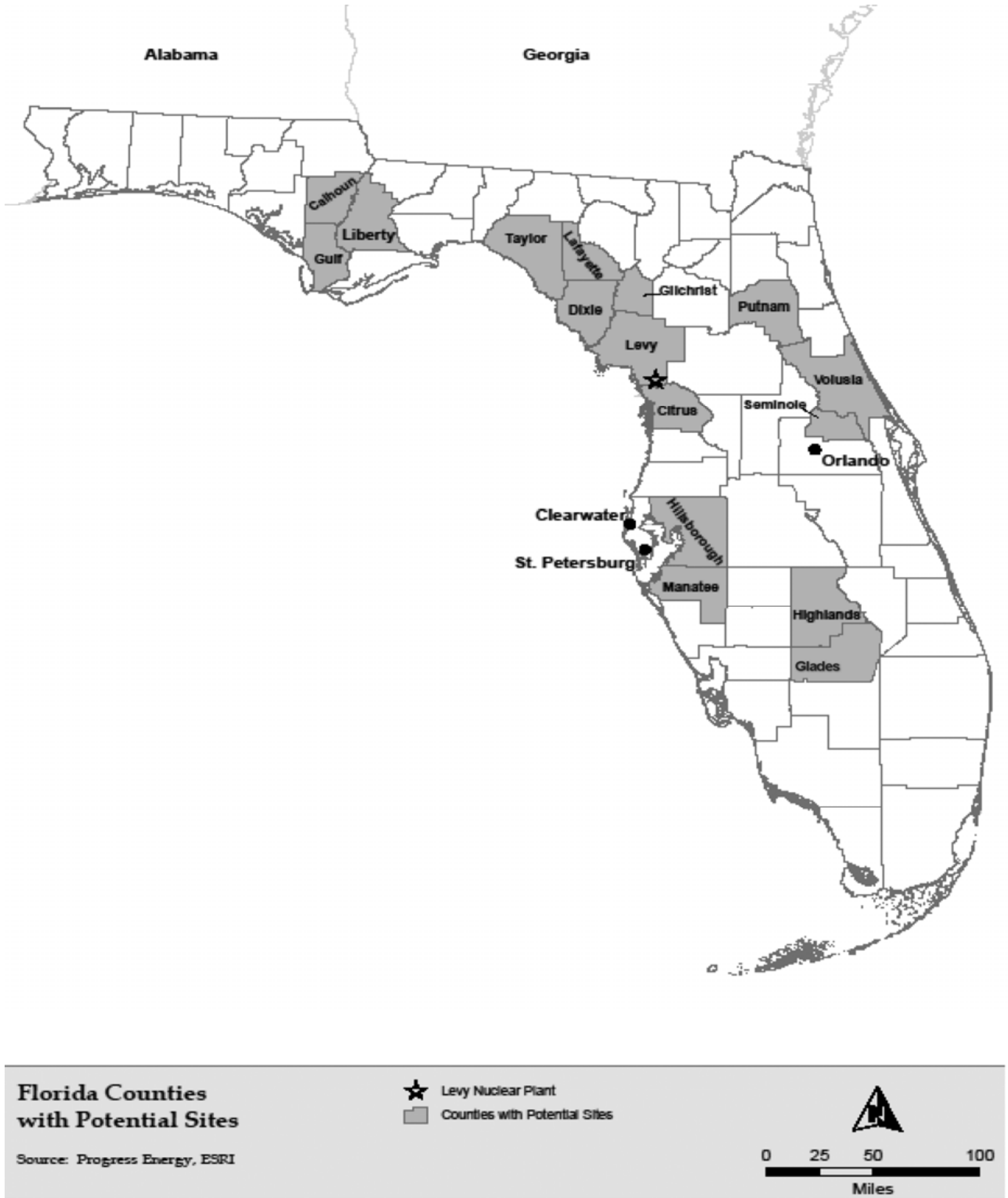

Figure 9-1. Map Highlighting the Florida Counties in Which the Top 20 Potential Sites for New Nuclear Units Are Located

PEF's technical evaluation and screening of the 20 potential sites were based on criteria derived from the EPRI Siting Guide (EPRI 2002) as well as PEF staff expertise on transmission issues, environmental issues, community support, economic development, and State and local regulations at each of the sites. The following nine screening criteria were used to select candidate sites:

- availability of an adequate cooling-water supply
- flooding potential
- distance to nearest population center and regional population density
- distance from hazardous land uses (e.g., airports, pipelines)
- numbers of threatened or endangered species within the site area
- acreage of wetlands within the site area
- railroad access
- transmission-line access
- estimated cost of acquiring the land at the site.

Numerical ranges were defined for each of the nine criteria. For example, for the wetlands criterion, the metric used in the screening process was the number of acres of wetlands within the potential site area, and the following ratings were defined (PEF 2009a):

- 5 = less than 60 ac
- 4 = less than 300 ac
- 3 = less than 600 ac
- 2 = less than 1200 ac
- 1= greater than 1200 ac

Each of the 20 potential sites was assigned a rating of 1, 2, 3, 4, or 5 on the wetlands criterion, and a rating was also assigned for the other eight screening criteria. PEF staff obtained criteria weights from previous nuclear power plant siting studies to reflect the relative importance of each criterion. The overall score for each potential site, reflecting its overall suitability for construction of a nuclear power plant, was developed by multiplying each criterion rating by its corresponding criterion weight, and then summing over all nine criteria. The potential sites with the highest overall scores were selected for more detailed analysis (PEF 2009g).

PEF's technical evaluation identified the following eight candidate sites for more detailed evaluation:

- Crystal River
- Dixie
- Gilchrist
- Hillsborough
- Lafayette
- Levy 2
- Levy 3
- Taylor.

For the reasons described below, PEF decided to make several modifications to the initial list of candidate sites (PEF 2009a):

Gilchrist was removed from the list due to the need for a supplemental reservoir and related water supply constraints.

Hillsborough was removed from the list due to water supply uncertainties and potential transmission connection constraints.

Putnam 3 was added to the list based on its location allowing an alternative water source (St. Johns River), proximity to PEF load centers, rail and transmission access advantages, and real estate considerations.

Highlands was added to the list based on its location allowing an alternative water source (Kissimmee River) and proximity to PEF load centers.

So the final list of eight candidate sites selected by PEF for more detail evaluation was as follows (PEF 2009a):

- Crystal River
- Dixie
- Highlands
- Lafayette
- Levy 2
- Levy 3

- Putnam 3
- Taylor

9.3.1.5 Selection of Alternative Sites

The next step in the site-selection process was to select from the eight candidate sites a suite of alternative sites for detailed evaluation and consideration. General siting criteria derived from the EPRI Siting Guide (EPRI 2002) were tailored to specific issues applicable to the candidate sites. PEF used 40 criteria related to health and safety (e.g., geology and seismology, extreme weather conditions, surface-water radionuclide pathway), environmental considerations (e.g., disruption of important species/habitats, dewatering effects on adjacent wetlands, thermal discharge effects), socioeconomics (e.g., construction-related effects, operations-related effects, environmental justice), and engineering and cost considerations (e.g., pumping distance, highway access, land rights) to screen the candidate sites and identify the five alternative sites.

The process used for this more-detailed analysis was analogous to the process described in Section 9.3.1.4. Each of the eight candidate sites was assigned a rating from 1 to 5 on each of the 40 criteria. PEF staff obtained criteria weights from other siting studies to reflect the relative importance of each criterion. The overall score for each candidate site, reflecting its overall suitability for construction of a nuclear power plant, was developed by multiplying each criterion rating by its corresponding criterion weight, and then summing over all 40 criteria (PEF 2009a). In addition to this quantitative analysis, helicopter flyovers of the sites provided additional input to the decision (PEF 2009g).

Following this analysis, PEF selected the following alternative sites:

- Crystal River
- Dixie
- Highlands
- Levy 2
- Putnam 3.

The other three candidate sites (Taylor, Levy 3, and Lafayette) were dropped from further consideration based on a number of factors. Even though Taylor had ranked in the top 5 sites using the 40-criteria evaluation, Taylor, along with Levy 3, would require extended pipelines in estuarine areas between the sites and the Gulf of Mexico, which could result in permitting and regulatory concerns. Both sites are also located along the coast, which makes them vulnerable to storm surge flooding. The Lafayette site would require zoning and land-use changes due to existing residential and recreational land uses. In addition, the Lafayette site has lower water flows than the Dixie site (PEF 2009a).

9.3.1.6 Selection of the Proposed Site

To screen the five alternative sites to identify a proposed site, PEF performed a technical evaluation of each alternative site that included the following components: transmission-line evaluations, geotechnical studies, environmental assessments, reliability analyses, and land-acquisition analyses. PEF's evaluations considered the land-use, water-related, ecological, and socioeconomic impacts of locating two new reactors at each of the five alternative sites. PEF concluded that all five alternative sites represented a cross-section of siting tradeoffs available within the ROI, including a variety of water sources, locations, and transmission connection strategies (PEF 2009a). The Crystal River and LNP sites were ranked highest mainly due to geological conditions and the availability of cooling-water sources (PEF 2009a).

PEF also evaluated whether the advantages of collocating new nuclear power-generating units with its existing power plant at the Crystal River site outweighed the potential advantages of the other alternative sites. The following potential advantages of collocation were identified in the application (PEF 2009a):

- The total number of required power-generating sites is reduced.
- Construction of new transmission-line corridors may not be required due to potential use of existing corridors.
- No additional land acquisitions would be necessary because PEF already controls the property.
- The site has already gone through the alternatives review process mandated by NEPA, and was the subject of extensive environmental screening during the original site-selection process.
- The site-development costs and environmental impacts of any preconstruction activities would be reduced.
- Construction, installation, and operation and maintenance costs would be reduced because of the existing site infrastructure.

However, strategic considerations indicated the LNP site would be preferable to the Crystal River site because it is located farther from the Gulf Coast and at a higher elevation. Thus, the LNP site would provide increased protection from wind and flood damage over the Crystal River site. In addition, adding new nuclear generating capacity at the CREC would result in a significant concentration of PEF's generating assets at one location, which would make the PEF system overly vulnerable to a major hurricane or other natural disaster. On the basis of its environmental analysis and strategic business considerations, PEF selected the Levy 2 area as its proposed site.

9.3.1.7 Review Team Evaluation of PEF's Site-Selection Process

The review team evaluated the methodology used by PEF to select its proposed and alternative sites. PEF's designated ROI is consistent with the description in NRC's guidance for preparation of ERs for nuclear power stations (NRC 2000). PEF established candidate areas based on a group of exclusionary criteria similar to those described in ESRP 9.3. The staff evaluated the exclusionary criteria and determined that they were reasonable. Next PEF identified potential sites within the candidate areas based on aerial photographs and other geographic information, and evaluated them against a set of high-level criteria. PEF then used more specific criteria to evaluate the potential sites and identify candidate sites, including the alternative sites and its preferred site. The staff reviewed the specific criteria used to identify potential sites, candidate sites, and alternate sites and concluded that application of the criteria would result in the identification of alternate sites that are among the best that can reasonably be found in the candidate areas. Additionally, the staff reviewed the technical evaluation used to evaluate each of the identified alternative sites and found the criteria and the application of the criteria to each alternative site reasonable.

Based on its review of PEF's site-selection process using NRC's guidance, the review team concludes that PEF's process for selecting its ROI, candidate areas, potential sites, candidate sites, alternative sites, and the proposed LNP site was reasonable; resulted in the identification of alternative sites that were among the best that could reasonably be found in the region of interest; did not arbitrarily exclude locations that might be suitable choices for siting two new nuclear generating units to satisfy the need for power identified in Chapter 8; and was consistent with the guidance in ESRP 9.3 and the EPRI siting guidance (EPRI 2002).

9.3.1.8 Evaluation of the Alternative Sites

The four alternative sites examined in detail in this chapter are Crystal River, located in Citrus County; Dixie, located in Dixie County; Highlands, located in Highlands and Glades counties; and Putnam, located in Putnam County – all in Florida. The NRC staff visited each of the four alternative sites and the proposed site. The review team used information in PEF's ER related to the four alternative sites and also independently collected and analyzed reconnaissance-level information for each of the alternative sites using ESRP 9.2 (NRC 2000) as guidance.

In the discussion of the alternative sites that follows, the review team evaluated cumulative impacts of building and operating two new nuclear units at each site for each resource category, considering the impacts of other nearby projects on that resource. Included in the cumulative analysis are past, present, and reasonably foreseeable Federal, non-Federal, and private actions that could have meaningful cumulative impacts with the proposed action. For purposes of this analysis, the past is defined as the time period before receipt of the COL application. The present is defined as the time period from the receipt of the COL application until the start of building the proposed Units 1 and 2. The future is defined as the start of building Units 1 and 2 through operation and eventual decommissioning.

Using Chapter 7 as a guide, the specific resources and components that could be affected by the incremental effects of the proposed action if implemented at the alternative site and other actions in the same geographic area were identified. The affected environment that serves as the baseline for the cumulative impacts analysis is described for each alternative site and includes a qualitative discussion of the general effects of past actions. For each resource area, the geographic area over which past, present, and future actions could reasonably contribute to cumulative impacts is defined and described in later sections. The analysis for each resource area at each alternative site concludes with a cumulative impact finding (SMALL, MODERATE, or LARGE). For those cases in which the impact level for a resource was greater than SMALL, the review team also discussed whether building and operating the nuclear units would be a significant contributor to the cumulative impact. In the context of this evaluation, “significant” is defined as a contribution that is important in reaching that impact-level determination.

The nonradiological waste impacts described in Sections 4.10 and 5.10 would not vary significantly from one site to another. The types and quantities of nonradiological and mixed waste would be approximately the same for the construction and operation of two AP1000 reactors at any of the alternative sites. For each alternative, all wastes destined for land-based treatment or disposal would be transported offsite by licensed contractors to existing, licensed, disposal facilities operating in compliance with all applicable Federal, State, and local requirements, and all nonradioactive, liquid discharges would be discharged in compliance with the provisions of the applicable NPDES permit. For these reasons, these impacts are not discussed separately in the evaluation of each alternative site.

The impacts described in Chapter 6 (e.g., nuclear fuel cycle, decommissioning) would not vary significantly from one site to another. This is true because all of the alternative sites and the proposed site are in low-population areas and because the review team assumes the same reactor design (therefore, the same fuel-cycle technology, transportation methods, and decommissioning methods) for all of the sites. As such, these impacts would not differ between the sites and would not be useful in the determination of whether an alternative site is environmentally preferable to the proposed site. For this reason, these impacts are not discussed in the evaluation of the alternative sites.

The cumulative impacts are summarized for each resource area at each site in the sections that follow. The level of detail is commensurate with the significance of the impact for each resource area. The findings for each resource area at each alternative site then are compared in Table 9-31 at the end of this chapter to the cumulative impacts at the proposed site (brought forward from Chapter 7). The results of this comparison are used to determine if any of the alternative sites is environmentally preferable to the proposed site.

9.3.2 Crystal River Site

This section covers the review team's evaluation of the potential environmental impacts of siting a new two-unit nuclear power plant adjacent to the CREC. The CREC is located in a rural area of Citrus County about 9 mi southwest of the LNP site, approximately 5 mi south-southwest of Inglis, and about 8 mi northwest of Crystal River. The Crystal River alternative site (hereafter Crystal River site) proposed for additional units would be located adjacent to the current CREC footprint on land owned by PEF. The Gulf of Mexico would be the source for water for plant cooling and other plant uses, and construction of a new water-storage reservoir would not be required. The CREC is an industrial site currently owned and operated by PEF (PEF 2009a). Conceptual routes of transmission lines necessary to connect the Crystal River site to the electrical grid are located in Levy, Citrus, Ocala, Sumter, Lake, and Hernando Counties.

The following sections include a cumulative impact assessment conducted for each major resource area. The specific resources and components that could be affected by the incremental effects of the proposed action if implemented at the Crystal River site and other actions in the same geographic area were considered. This assessment includes the impacts of NRC-authorized construction and operations and impacts of preconstruction activities. Also included in the assessment are past, present, and reasonably foreseeable future Federal, non-Federal, and private actions that could have meaningful cumulative impacts when considered together with the proposed action if implemented at the Crystal River site. Other actions and projects considered in this cumulative analysis are described in Table 9-6.

Table 9-6. Past, Present, and Reasonably Foreseeable Projects and Other Actions Considered in the Cumulative Analysis of the Crystal River Alternative Site

Project Name	Summary of Project	Location	Status
Energy Projects			
Operation and decommissioning of CREC Units 1 to 5	The CREC consists of five power-generating plants operated by PEF, four fossil-fuel plants, and one nuclear plant. The fossil-fuel plants began operations in 1966, 1969, 1982, and 1984. The nuclear plant began operations in 1977.	Adjacent to the Crystal River site	Operational. The State of Florida's Siting Board's Conditions of Certification for LNP would require PEF to discontinue the operations of two fossil-fuel units by December 31, 2020, assuming licensing, construction and commencement of operation of LNP occurs in a timely manner (DOE/EIA 2010a; FDEP 2010a).
Renewal of the CREC nuclear Unit 3 Operating License,	Extension of operations of CREC Unit 3 for an additional 20-year period beyond the end of the current license term, which is valid through midnight December 3, 2016.	Adjacent to the Crystal River site	Proposed. If granted, the license renewal would provide PEF the authority to continue operations through 2036. The draft Supplemental EIS for the license renewal is scheduled to be issued in 2010 (NRC 2010a).

1 **Table 9-6.** (contd)

Project Name	Summary of Project	Location	Status
Uprate at CREC Unit 3	CREC Unit 3 is planning to request a power uprate or increase in the maximum power level at which the nuclear power plant may operate. The project would also include construction of a new helper cooling tower.	Adjacent to the Crystal River site	Proposed. The application submitted to the State of Florida was approved in August 2008. USACE issued a public notice on May 25, 2010 (USACE 2010a). A Federal application is expected to be submitted to NRC in 2010 (PEF 2009f).
Inglis Lock bypass channel spillway hydropower project	2-MW hydroelectric project at the existing Inglis Lock bypass spillway. This project would include construction of an intake structure, intake and discharge channels, turbines, and a transmission line.	About 5 mi northeast of the Crystal River site	Proposed. An application has been submitted to the Federal Energy Regulatory Commission (FERC 2009a).
Florida Gas Transmission Company, LLC (FGT) Phase VIII Expansion Project	Construction and expansion of natural-gas pipelines, new compressor, meter, regulator stations, and other appurtenant facilities	Various Counties in Alabama and Florida, including Levy, Citrus, and Hernando. Route passes 2 mi east of Crystal River site.	Completion expected by 2011 (FERC 2010; Panhandle Energy 2010).
Mining Projects			
Tarmac King Road Limestone Mine	A 9400-ac aggregate mining site. The mining site would be 4900 ac (including 900 ac set aside for wetlands); with remaining 4500 ac donated to Florida for preservation.	The southern border of the site is about 8 mi north-northeast of the Crystal River site	Proposed. A permit application was submitted to USACE in September 2007. A draft EIS is expected to be completed in 2010 (USACE 2008; PEF 2009e).

1 **Table 9-6**. (contd)

Project Name	Summary of Project	Location	Status
Holcim Mine	Limestone quarry	About 1 mi north of the Crystal River site	Operational (FDEP 1997)
Inglis Quarry	Limestone quarry	About 3 mi north of the Crystal River site	Operational (EPA 2010a)
Crystal River Quarries – Red Level	Limestone quarry	About 3 mi east of the Crystal River site	Operational (EPA 2010b)
Crystal River Quarries – Lecanto	Limestone quarry	About 16 mi east-southeast of the Crystal River site	Operational (EPA 2010c)
Gulf Hammock Quarry	Limestone quarry	About 19 mi north of the Crystal River site	Operational (EPA 2010d)
Transportation Projects			
Cross Florida Barge Canal (CFBC)/ Marjorie Harris Carr Cross Florida Greenway	The CFBC was a proposal to connect the Gulf of Mexico to the Atlantic Ocean. Two sections were partially constructed between 1964 and 1971. A constructed section extends westward from Lake Rousseau to the Gulf of Mexico. Portions of the CFBC are currently used as part of the Marjorie Harris Carr Cross Florida Greenway (FDEP 2010b).	About 3 mi north of the Crystal River site	Operational downstream of Lake Rousseau. Marjorie Harris Carr Cross Florida Greenway is currently managed as a protected greenbelt corridor. Construction was suspended January 1971 (FDEP 2010b).

2

1 **Table 9-6**. (contd)

Project Name	Summary of Project	Location	Status
Parks and Aquaculture Facilities			
Parks, forests, and reserves	Numerous State and national parks, forests, reserves, and other recreational areas, including: Goethe State Forest, Big Bend Seagrasses Aquatic Preserve, St. Martens Marsh, Fanning Springs State Park, Chassahowitzka National Wildlife Refuge, Fort Cooper State Park, Cedar Keys National Wildlife Refuge; Cummer Sanctuary, Crystal River National Wildlife Refuge, Lower Suwannee National Wildlife Refuge; Withlacoochee State Forest; Ocala National Forest; Crystal River Preserve State Park; Silver River State Park; and the Homosassa Springs Wildlife State Park.	Throughout 50-mi region	Development likely limited in these areas (PEF 2008).
Crystal River Mariculture Center	Multi-species marine hatchery	Adjacent to Crystal River site	Operational (FFWCC 2010)
Other aquaculture facilities	Multi-species marine hatcheries	Throughout region	Operational
Other Actions/Projects			
Commercial forest management	Managed forests for timber production.	Throughout region	Operational
Commercial dairies	Several dairies are located within the 50-mi region, including the Levy County Dairy, Alliance, and Piedmont Dairies, Hill Top Dairy, and Oak Grove Dairy, Inc.	Throughout region	Operational

2

Table 9-6. (contd)

Project Name	Summary of Project	Location	Status
Minor water dischargers and wastewater-treatment plants	NPDES-permitted dischargers in Fanning Springs, Trenton, Blitchville, Bell, Chiefland, Cedar Key, Suwannee, and other locations.	Throughout region	Operational
Concrete companies	Two ready-mixed concrete suppliers.	Northern Levy County	Operational (EPA 2010e, f)
Various hospitals and industrial facilities that use radioactive materials	Medical and other industrial isotopes	Within 50 mi	Operational in nearby cities and towns
Future urbanization	Construction of housing units and associated commercial buildings such as the proposed Port District near Inglis; roads, bridges, and railroads, such as the Suncoast toll road expansion and the US-19 bridge and highway expansions; construction of water- and/or wastewater-treatment and distribution facilities and associated pipelines, as described in local land-use planning documents.	About 3 mi north of the CREC and throughout region	Construction would occur in the future, as described in local land-use planning documents (FTE 2010; FDOT 2010a, b; Citrus County 2009).

The geographic area of interest for cumulative impacts considers all existing and proposed nuclear power plants that have the potential to increase the probability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the Crystal River site. An accident at a nuclear plant within 100 mi of the Crystal River site could potentially increase this risk. However, other nuclear plants in Florida, Alabama, and Georgia that are more than 100 mi from the Crystal River site are not included in the cumulative impact analysis.

9.3.2.1 Land-Use Impacts

The following analysis includes impacts from building and operating two nuclear units at the Crystal River site, along with the necessary transmission lines to connect them to the electrical grid. The analysis also considers other past, present, and reasonably foreseeable future actions that affect land use, including the other Federal and non-Federal projects listed in

Table 9-6. For this analysis, the geographic area of interest is the area within the 15-mi radius of the Crystal River site and the area within the transmission-line corridors. The review team determined that a 15-mi radius would represent the smallest area that would be directly affected because it includes the primary communities (such as Crystal River, Homossassa Springs, Inglis, and Yankeetown) that would be affected by the proposed project if it were located at the Crystal River site.

Historically, Citrus County was known for mining and timber operations as well as its namesake citrus orchards, but today only one large grove remains. From 1964 to 1972, the CFBC was partially constructed from the Gulf of Mexico to Lake Rousseau. Currently, this area and other lands that were acquired to construct the CFBC are managed as the Marjorie Harris Carr Cross-Florida Greenway to conserve natural resources and provide recreational opportunities. Construction of the CREC, which consists of five power-generating plants operated by PEF, four fossil-fuel plants, and one nuclear plant, began in the 1960s. The fossil-fuel plants began operations in 1966, 1969, 1982, and 1984. The 860-MW nuclear plant began operations in 1977. From 1960 until 1985, the population of Citrus County increased from about 10,000 to about 70,000, and the population of Levy County increased from about 10,000 to about 22,000 (USCB 2000a). Thus, residential land use in the region increased dramatically during that period.

The Crystal River site is adjacent to the existing CREC and has level terrain that gradually slopes west toward the Gulf of Mexico. The land uses in the region are a mix of industrial development, agriculture, forestry, and mining. The site already includes both nuclear and fossil-fuel power plants, so zoning is compatible with additional nuclear power-generating plants. The Crystal River site is subject to the Florida Coastal Management Act (The Florida Senate 2009), because the plant is located within one of the designated Florida coastal zone counties. There are several public properties within the region, including the Goethe State Forest, Cedar Keys National Wildlife Refuge, Cummer Sanctuary, Crystal River National Wildlife Refuge, Lower Suwannee National Wildlife Refuge, Withlacoochee State Forest, Ocala National Forest, Crystal River Preserve State Park, Fanning Springs State Park, Silver River State Park, Chassahowitzka National Wildlife Refuge, Fort Cooper State Park, and Homosassa State Park (PEF 2009a).

PEF would not have to acquire new land for the siting of new nuclear reactor units at Crystal River. Like the LNP site, the footprint of new power-generating units would be approximately 627 ac, with about 150 ac of additional land needed for temporary facilities and laydown yards. Because the Crystal River site already has been developed as a power station, the review team expects additional land conversions to industrial or utility use would be minimal.

Additional land-use impacts include possible additional growth and land conversions to accommodate new workers and services. Because the workforce would be dispersed over larger geographic areas in the labor supply region, the impacts from land conversion for residential and commercial buildings induced by new workers relocating to the local area can be absorbed into the wider region. Therefore, the review team concludes that such impacts would be minimal.

Although transmission-line corridors exist to serve the Crystal River site, approximately 180 mi of additional transmission system infrastructure would be needed. The review team estimated the linear run of the expected transmission-line corridors by referring to Table 4-3, which addresses the potentially affected land use in the conceptual transmission-line corridors. In the case of Crystal River, this routing is somewhat similar to that described for LNP Units 1 and 2 in Section 4.1.2 and would amount to about 180 linear miles. For purposes of land-use impact analysis, the review team made the assumption that 10 ac/mi would be disturbed, based on the LNP case where 1790 ac are expected to be disturbed over the 180 mi of corridor, as discussed in Section 4.1.2. The review team concludes that this assumption is reasonable because siting in Florida through the Site Certification Application process is a rigorous process and the applicant would be bound by permit conditions resulting from that process, which would force it to use existing corridors to the extent practicable. The review team expects the FDEP Conditions of Certification for the LNP site (FDEP 2010a) would be consistently applied anywhere transmission lines are proposed in Florida, which would lessen the overall environmental impacts.

As stated above, the State of Florida requires that new transmission lines be collocated within existing transmission-line corridors to the extent possible, thereby minimizing potential terrestrial impacts (FDEP 2010a). In addition, transmission-line corridors, towers, and access road would be situated to avoid critical or sensitive habitats and species and historical and cultural resources to the extent possible. Transmission-line corridor width would be dependent on the size, voltage, and whether existing corridors could be used, and would vary from 55 ft to 460 ft. These widths were used in the analysis of the hypothetical routes for each alternative site to determine land-use cover types (CH2M Hill 2009). Existing transmission-line corridors run through counties designated under the Florida

Coastal Management Program (FDEP 2009b).[a] Any expansion of these transmission-line corridors would require review under the procedures established under the Florida Coastal Zone Management Act (The Florida Senate 2009). Procedures for siting new transmission lines in Florida are discussed in Section 4.1.2. The review team assumes that the conditions of certification issued to PEF by the FDEP would apply at all of the alternative sites. Similar to the case at the LNP site, the review team concludes that land-use impacts from developing about 180 mi of new transmission-line corridor to connect new units at the Crystal River site would be

(a) The Florida Coastal Management Program makes funds awarded under the Coastal Zone Management Act available as pass-through grants to State agencies, water-management districts, local governments, national estuary programs, and national estuarine research reserves for priority projects that protect coastal resources and communities.

noticeable, but not destabilizing, and additional mitigation beyond the measures identified by PEF and conditions identified by the State of Florida would not be warranted.

Cumulative Impacts

Within the geographic area of interest, the reasonably foreseeable project with the greatest potential to affect cumulative land-use impacts would be the Tarmac King Road Limestone Mine. The 4900-ac mine site is located 1 mi west of the intersection of U.S. Highway 19 (US-19) and King Road in Levy County, within about 8 mi of the Crystal River site. About 2700 ac would be mined over about a 100-year period, with an additional 1300 ac disturbed to site a quarry processing plant, roads, and other infrastructure. The company plans to donate another 4500 ac of land to the State of Florida for preservation. Tarmac America LCC (Tarmac) has applied for permits to begin construction of the mine in 2011, with operations targeted to begin in 2013. Tarmac estimates that at the height of mining activity, about 500 trucks would leave the mine site daily and enter US-19 (Tarmac America 2010). The potential impacts from this increased traffic, coupled with traffic from the CREC site, are considered in Section 9.3.2.5. Completion of the new US-19 bridge and highway expansion in the fall of 2010 would alleviate some of the traffic issues. Because the mine would include less than 7 percent of the geographic area of interest, excluding the Gulf water area, the review team expects that the proposed Tarmac mine would have a detectable, but not noticeable, effect on land use.

In the State of Florida's Conditions of Certification (FDEP 2010a), CREC Unit 1 and 2, two coal-fired plants, would stop operating by December 31, 2020, as long as PEF completes the licensing process, construction activities, and commences commercial operation of LNP Units 1 and 2 within a timely manner. If the Crystal River site were selected, the review team expects the same condition would apply. If CREC Units 1 and 2 are shut down, land use at the units likely would remain industrial. Depending on economic conditions, PEF sells 60 to 95 percent of the coal plant ash to cement and building materials manufacturers, with the remainder going to Citrus Central Landfill in Lecanto, Florida. With the closure of CREC Units 1 and 2, this source of ash no longer would be available locally. The review team expects land-use impacts associated with this project would be minimal.

Future urbanization in the review area could contribute to additional decreases in open areas, forests, and wetlands and generally result in some increased residential and industrialized areas. Currently, only about 18 percent of Citrus County is in residential land use (PEF 2008), but local land-use planning documents describe future construction of residential and commercial buildings. The University of Florida, Bureau of Economic and Business Research (BEBR) projects that the Citrus County population will increase approximately 40 percent from 2000 to 2020, which constitutes an average annual increase of about 2 percent (Citrus County 2005).

Increased urbanization, especially long linear projects such as new or expanded roads or pipelines also would contribute to the loss of open or forested areas and increase fragmentation of habitats along or near the transmission lines. Due to the extent of new transmission lines that would be built, the review team expects that the corridors would have a noticeable impact on the local area. The Florida Department of transportation (FDOT) currently plans to expand the US-19 bridge and the Suncoast toll road. Florida Gas Transmission Company proposes to expand its liquefied natural gas (LNG) pipeline collocated with the existing pipeline in the vicinity of the Crystal River site. These projects would have limited impacts on land use because a small incremental amount of land would be converted to a new land use, and it would be adjacent to the current roads or pipelines. Development would likely be limited in the nearby Goethe State Forest and other parks and recreational areas. Therefore, the incremental impacts associated with increased urbanization would be minimal.

Global climate change could increase temperature and reduce precipitation, which could result in reduced crop yields and livestock productivity (GCRP 2009), which, in turn, may change portions of agricultural and ranching land uses in the geographic area of interest. In addition, global climate change could increase sea level and storm surges in the geographic area of interest (GCRP 2009), thereby changing land use through inundation and loss of coastal wetlands and other low-lying areas. However, existing State and national forests, parks, reserves, and managed areas would help preserve wetlands and forested areas to the extent that they are not affected by sea-level rise. Because other projects identified in Table 9-6 that are within the geographic area of interest would be consistent with applicable land-use plans and control policies and would occur in dispersed locations, the review team considers their contribution to the cumulative land-use impacts to be relatively minor and manageable.

Because detailed information about the routing of the possible new transmission-line corridors is not known at this time, a complete evaluation of potential land-use impacts cannot be made. Based on the information provided by PEF and the review team's independent review, the review team concludes that the cumulative land-use impacts of building and operating two new nuclear power units at the Crystal River site and other projects would be MODERATE. The incremental impact from the proposed project would be a significant contributor to the MODERATE impacts due to the extent of new transmission lines that would be built.

9.3.2.2 Water Use and Quality

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that could affect water use and quality, including the other Federal and non-Federal projects listed in Table 9-6.

The geographic area of interest for surface water at the Crystal River site includes the Gulf of Mexico and the Springs Coast watershed in the vicinity of the site and for groundwater, the surficial aquifer at the site and the Upper Floridan aquifer within 20 mi of the site. These regions are of interest because they represent the water resource potentially affected by building and operating the proposed project at the Crystal River site.

Building Impacts

PEF has not determined whether new cooling-water intake and discharge structures would be required for the Crystal River site, but use of the existing intake configuration for existing CREC Units 4 and 5 and the existing discharge canal are likely sites for these respective structures. CREC Units 4 and 5 use water discharged from CREC Units 1 to 3 for cooling water, and the effluents may be a possible source of cooling water for the additional two units (CH2M Hill 2009). Similarly, the discharge canal receives discharge from all five existing units, and the discharge for the additional two units could outfall into the existing canal, or tie into blowdown pipelines from one of the existing units.

Consistent with the proposed water use at the LNP site, the review team assumed that no surface water would be used to build the units at the Crystal River site. Therefore, the review team determined that there would be no impacts on surface-water use.

Wetlands located on or adjacent to the site could be affected by surface-water runoff during site preparation and the building of the facilities. The FDEP would require PEF to develop an Erosion and Sediment Control Plan (E&SCP) and a stormwater pollution prevention plan (SWPPP) (PEF 2009a). These plans would be developed before initiation of site-disturbance activities and would identify control measures to be used during site-preparation activities to mitigate erosion and control stormwater runoff (PEF 2009a). The plan would identify BMPs to control stormwater runoff. The review team anticipates that PEF would construct new detention and infiltration ponds and drainage ditches to control delivery of sediment from the disturbed area to onsite waterbodies. Sediment carried with stormwater from the disturbed area would settle in the detention ponds and stormwater would infiltrate into the shallow aquifer. Implementation of BMPs should minimize impacts on bodies of surface water near the Crystal River site. Therefore, the impacts on surface-water quality near the Crystal River site would be temporary and minimal.

The review team assumes that the groundwater use for building activities at the Crystal River site would be identical to the proposed groundwater use for the LNP site. During building, the maximum groundwater withdrawal rate is projected to be 550,000 gpd and the projected average groundwater withdrawal rate would be 275,000 gpd (see Table 3-2). Groundwater would be used for potable and sanitary use as well as various building-related activities. The groundwater withdrawal rate during building activities would be less than the potential operation withdrawal rate. PEF provided no specific information about where it would obtain water for building the units at the Crystal River site. However, PEF currently draws water from the Upper Floridan aquifer for the operation of the existing units at the CREC (PEF 2008). The U.S.

Geological Survey (USGS) estimates that the current groundwater withdrawal in Citrus County to be about 30 Mgd (PEF 2007a). The additional water that would be withdrawn to build the new units would be a small fraction of this current withdrawal. The review team concludes that the impact of groundwater use for building the potential plant at the Crystal River site would be minimal and limited to the building period.

While building the potential plant at the Crystal River site, groundwater quality may be affected by leaching of spilled effluents into the subsurface. The review team assumes that the BMPs PEF has proposed for the LNP site would also be in place at the Crystal River site during building activities and therefore the review team concludes that any spills would be quickly detected and remediated. In addition, groundwater impacts would be limited to the duration of these activities, and therefore, would be temporary. The review team examined the BMPs that could be implemented at such a site (FDEP 2010a). Because any spills related to building activities would be quickly remediated under BMPs, and the activities would be temporary, the review team concludes that the groundwater-quality impacts from building at the Crystal River site would be minimal.

Operational Impacts

PEF has proposed a closed-cycle cooling system for two additional units at the LNP site. PEF indicated that the Gulf of Mexico would be the source of cooling water. The review team assumed that the cooling water system for the proposed units, if they were to be built and operated at the Crystal River site, would be similar to that proposed at the LNP site; specifically, the cooling water system would use cooling towers. The blowdown discharge from the additional units would be mixed with the CREC discharge. Because the two additional units at the Crystal River alternative site would also withdraw makeup water for their closed-cycle cooling systems, the review team assumed that the makeup water withdrawal rate and the blowdown discharge rate would be the same as that at the LNP site, specifically 84,780 gpm (190 cfs) and 57,923 gpm (129 cfs), respectively.

Because the Gulf of Mexico is a virtually unlimited source of water, the review team determined that the use of Gulf of Mexico waters for cooling the additional units at the Crystal River site would have a minimal impact. Therefore, the impact on surface-water resources due to plant use during operations would not be noticeable.

During the operation of the additional units at the Crystal River site, impacts on surface-water quality could result from stormwater runoff, discharges of treated sanitary and other wastewater, and blowdown from cooling towers into the Gulf of Mexico. The FDEP would require PEF to develop a SWPPP (PEF 2009a). The plan would identify measures to be used to control stormwater runoff (PEF 2009a). The blowdown would be regulated by FDEP pursuant to 40 CFR Part 423, and all discharges would be required to comply with limits established by FDEP in an NPDES permit.

The review team analyzed the impact of discharging effluent from the proposed Units 1 and 2 at the LNP site on the CREC discharge canal. The review team determined that the impact on water quality in the Gulf of Mexico would be small if the two proposed units were located at the LNP site. If the proposed units were located at the Crystal River site, the effluent would still be discharged to the Gulf of Mexico via the CREC discharge canal. Therefore, the review team determined that the assessment of surface-water quality impacts for the LNP site (see Section 5.2.3.1) would remain applicable to the Crystal River site. Therefore, the impact on surface-water quality due to operation of additional units at the Crystal River site would be minimal.

PEF currently relies on groundwater at the CREC to meet operational needs for potable water and other plant systems requiring freshwater (PEF 2008). PEF currently has seven active groundwater wells and three inactive groundwater wells at the CREC to supply groundwater to the existing power plants. The wells are currently permitted to withdraw 2 Mgd, and PEF is anticipating increasing the permitted amount by 265,000 gpd once the inactive wells are permitted. As indicated above, the USGS estimates the current groundwater withdrawal in Citrus County to be about 30 Mgd (PEF 2007a).

PEF indicated that the annual average groundwater withdrawal to support operations of two units at the LNP site would be 1.58 Mgd (PEF 2009e). The review team assumes that the groundwater use for operation of additional units at the Crystal River site would be similar to the proposed groundwater use for the LNP site. This would be an increase in groundwater withdrawal in the vicinity of the CREC of approximately 70 percent, and an increase in groundwater withdrawal in Citrus County of approximately 5 percent. Permits would be required for the additional withdrawal and the permitting process would make sure impacts on surrounding users would not be significant (SWFWMD 2010).

During the operation of the additional units at the Crystal River site, impacts on groundwater quality could result from accidental spills. Because BMPs would be used to quickly remediate spills and no intentional discharge to groundwater would occur, the review team concludes that the groundwater-quality impacts from operation of the additional units at the Crystal River site would be minimal.

Cumulative Impacts

In addition to water-use and water-quality impacts from building and operations activities, cumulative analysis considers past, present, and reasonably foreseeable future actions that affect the same water resources.

The geographic area of interest for surface water includes the Gulf of Mexico in the vicinity of the Crystal River site. The geographic area of interest for groundwater includes the surficial aquifer at the site and the Upper Floridan aquifer in the region. These areas are of interest because they represent the water resource potentially affected by building and operating the additional units at the Crystal River site. Key actions that have past, present, and future potential impacts on water supply and water quality near the Crystal River site include the operation and decommissioning of the existing units at the CREC and the power uprate proposed for Unit 3 at the CREC.

The FDEP Conditions of Certification for the LNP Units 1 and 2 (FDEP 2010a) indicate that Crystal River Unit 1 and Unit 2 may cease to be operated as coal-fired units by December 31, 2020. The document indicates the shutdown of these units may be linked to the startup of the proposed units. If the additional units are located at the Crystal River site, the staff assumes that the same conditions would apply.

Cumulative Water Use

The only surface-water-use impacts of building and operating the additional units at this site are the water demands occurring during operation. Because the Gulf of Mexico is a virtually unlimited source of water supply compared to the makeup-water requirements for additional units at the site and the makeup-water requirements for the other units at the CREC including Unit 3 after the proposed power uprate, the review team determined that the use of water from the Gulf of Mexico would have essentially no impact on surface water. Therefore, the review team concludes that cumulative impacts on surface-water use would be SMALL.

Groundwater would be used during the building and operation of additional units at the LNP site. The analysis included above considered groundwater withdrawal to support the existing units at the CREC and the groundwater withdrawal associated with two additional units at the Crystal River site. As mentioned above, PEF currently has permits to withdraw 2 Mgd and is anticipating increasing the permitted amount by 265,000 gpd once its inactive wells are permitted. An additional 1.58 Mgd (PEF 2009e) would be required to operate the additional units at the Crystal River site. Permits would be required for the additional withdrawal and the permitting process would make sure impacts on surrounding users would not be significant, or, otherwise alternative sources of freshwater would need to be developed (SWFWMD 2010). Therefore, the review team concludes that cumulative impacts on groundwater use would be SMALL. The impacts of other projects listed in Table 9-6 are either considered in the analysis included above or would have little or no impact on surface-water and groundwater use.

Cumulative Water Quality

As described above, the impacts from building and operating two additional units at the Crystal River site on surface-water quality would be minimal. Other present and reasonably foreseeable future actions in the geographic area of interest of the Crystal River site include the operation of CREC Units 1–5, the renewal of the operating license for Unit 3, and the shutdown of Unit 1 and Unit 2. As discussed in Chapter 7, the areal extent of the influence of these facilities on water quality is small, and the influence of these facilities would be minor in the Springs Coast watershed. The FDEP, under the Federal Water Pollution Control Act (Clean Water Act) Section 305(b), prepares a statewide Water Quality Inventory. The FDEP also identifies impaired waterbodies during this process and lists them on the 303(d) List.

Historically, streams, lakes, estuaries, and bays near the Crystal River site have been listed on the 303(d) list as impaired because of the presence of bacteria, nutrients, low dissolved oxygen, and mercury in fish. Therefore, the review team concludes that past and present actions in the region have noticeably affected the water quality adversely. Based on its evaluation, the review team concludes that the cumulative surface-water-quality impacts would be MODERATE. Building and operating the proposed units at the Crystal River alternative site would not be a significant contributor to these impacts on surface-water quality, because industrial and wastewater discharges from the proposed units would comply with NPDES permit limitations and any stormwater runoff from the site during operations would comply with the SWPPP (PEF 2009a).

As stated in Section 7.2.1.1, global climate change can result in a rise in sea level that may induce saltwater intrusion in the surficial and Floridan aquifers. Projected changes in the climate for the region during the life of the proposed units include an increase in average temperature and a decrease in precipitation. These changes are likely to result in changes to agriculture including crops, pests, and the associated changes in application of nutrients, pesticides, and herbicides that may reach groundwater. As a result, groundwater quality may be altered by the infiltration of chemicals. While the changes in groundwater quality that are indirectly attributable to climate change may not be insignificant, the review team did not identify anything that would alter its conclusion regarding groundwater quality above. The review team also concludes that with the implementation of BMPs, the impacts of groundwater quality from building and operating two additional units at the Crystal River site would likely be minimal, and therefore, the cumulative impact on groundwater quality would be SMALL. The impacts of other projects listed in Table 9-6 are either considered in the analysis included above or would have little or no impact on surface-water and groundwater quality.

9.3.2.3 Terrestrial and Wetland Resources

Site Description

The following impact analysis includes direct, indirect, and cumulative impacts from construction and preconstruction activities and operations. The analysis also considers past, present, and reasonably foreseeable future actions that affect the terrestrial ecological resources, including the other Federal and non-Federal projects and the projects listed in Table 9-6. For the analysis of terrestrial ecological impacts at the Crystal River site, the geographic area of interest is considered to be a 20-mi-wide radius centered on the Crystal River site and the corridors surrounding the entire length of proposed route for the associated transmission-lines. This area within the 20-mi radius and transmission-line corridor is expected to encompass the ecologically relevant landscape features and species.

The Crystal River site was predominately pine flatwoods before the mid-twentieth century, but most flatwoods have been converted from natural longleaf pine (*Pinus palustris*) and slash pine (*P. elliottii*) communities to managed forests made up of slash pine and loblolly pine (*P. taeda*). The surrounding landscape is predominately rural and habitats are typical of the Gulf Coast Flatwoods ecoregion, consisting of slash pine and remnant longleaf pine with bottomland oak-gum-cypress forest in some low-lying areas along most rivers (EPA 2010l). The site terrain is generally level and gradually slopes west toward the Gulf of Mexico. At an elevation of about 9 ft above sea level, the site is located entirely within the 100-year floodplain. There are also vast coastal estuaries and numerous protected natural areas near the site.

The area immediately surrounding the proposed site is a mix of hardwood hammock forest, pine forest, salt marsh, and freshwater swamp (PEF 2008). Hardwood hammock habitats found on the proposed site are characterized by magnolia (*Magnolia grandiflora*), laurel oak (*Quercus laurifolia*), and blue-beech (*Carpinus caroliniana*), although species composition is varied (PEF 2008). Pine forests on the proposed site are dominated by slash pine and loblolly pine (PEF 2008). The salt marshes on the proposed site are dominated by smooth cordgrass *(Spartina alterniflora)* and black rush *(Juncus roemerianus)* and are typical of coastal marshes of Central western Florida (PEF 2008). Freshwater swamps on the Crystal River site are characterized by pond cypress (*Taxodium ascenduns*), swamp tupelo, (*Nyssa biflora*) and swamp ash (*Fraxinus pauciflora*) (PEF 2008).

Common wildlife, including important species, that are known to occur in the habitats present on the Crystal River site include American alligator (*Alligator mississippiensis*); Florida white-tailed deer (*Odocoileus virginianus seminolus*); bobcat (*Lynx rufus*); feral hog (*Sus scrofa*); multiple squirrel species; northern bobwhite (*Colinus virginianus*); mourning dove (*Zenaida macroura*); several species of woodpecker, skunk, and river otter; and raccoon (*Procyon lotor*). Various bird, reptile, and amphibian species also reside on the Crystal River site (PEF 2008; USDA 2006; FNAI 2009).

The associated proposed transmission-line corridors begin in the Gulf Coast Flatwoods ecoregion and cross the Southwestern Florida Flatwoods and Central Florida Ridges and Uplands ecoregions. Vegetation community types in the Southwestern Florida Flatwoods ecoregion include slash pine, longleaf pine, cabbage palm (*Sabal palmetto*), and live oak (*Quercus virginiana*) with typical understory species of saw palmetto (*Serenoa repens*), gallberry (*Ilex glabra*), and grasses such as bluestems and wiregrasses (USDA 2006). Vegetation community types in the Central Florida Ridges and Uplands ecoregion include sand hill vegetation such as turkey oak (*Quercus laevis*), bluejack oak (*Quercus incana*), and longleaf pine for the dominant canopy species along with common understory species of running oak (*Quercus pumila*), gopher apple (*Licania michauxii*), and bluestem and panicum grasses (USDA 2006).

Important Species

Common wildlife, including important species, associated with the above-mentioned ecoregions that may occur in the associated transmission-line corridors includes recreationally important species such as Florida white-tailed deer, bobcat, feral hog, squirrel, northern bobwhite, mourning dove, as well as several woodpecker species, skunk, and raccoon. Various bird, reptile, and amphibian species also have the potential to reside on the Crystal River site and associated proposed transmission-line corridors (USDA 2006; FNAI 2009).

PEF consulted with the U.S. Fish and Wildlife Service (FWS), National Marine Fisheries Service (NMFS), and the Florida Fish and Wildlife Conservation Commission (FFWCC) in support of the CREC operating license renewal application, and determined that other than the Critical Habitat for the Florida manatee (*Trichechus manatus latirostris*) designated adjacent to the Crystal River site in King's Bay, there are no other areas designated as Critical Habitat for endangered species (PEF 2008). Table 9-7 lists all Federally and State-listed threatened and endangered species that could occur on the Crystal River site and in the vicinity, in the associated offsite facilities and corridors, as well as in the counties crossed by the associated proposed transmission-line corridors. Counties crossed by the proposed transmission-line corridors for the Crystal River site include Citrus, Marion, Hernando, Hillsborough, Pinellas, Pasco, and Sumter Counties. PEF has stated that on-the-ground field surveys would be conducted before commencement of ground-disturbing activities on the site or within transmission-line corridors (once final routes are determined) (PEF 2009a, CH2M Hill 2009).

Table 9-7. Federally and State-Listed Species That May Occur on and in the Vicinity of the Alternative Sites and Offsite Facilities and Corridors, and Associated Transmission-Line Corridors

Scientific Name	Common Name	Legal Status	Suitable Habitat	Alternate Site
Mammals				
Eumops floridanus	Florida bonneted bat	SE	Roosts in palms and hollow trees and in buildings	Highlands
Trichechus manatus latirostris	West Indian (Florida) manatee	FE/SE	Marine and freshwater habitats; prefer warm-water sites	Crystal River, Dixie, Putnam

Table 9-7. (contd)

Scientific Name	Common Name	Legal Status	Suitable Habitat	Alternate Site
Microtus pennsylvanicus dukecampbelli	Florida salt marsh vole	FE/SE	Periodically flooded high salt marsh zone (FWS 2009)	Crystal River, Dixie
Peromyscus polionotus niveiventris	Southeastern beach mouse	FT/ST	Sea oats (Uniola paniculata) zone of primary coastal dunes	Putnam
Puma concolor coryi	Florida panther	FE/SE	Heavily vegetated mixed swamp forests and hammock forests	Crystal River, Dixie, Highlands, Putnam
Ursus americanus floridanus	Florida black bear	ST	Large areas of forested uplands and forested wetlands	Crystal River, Dixie, Highlands, Putnam
Birds				
Ammodramus savannarum floridanus	Florida grasshopper sparrow	FE/SE	Large (greater than 50 ha), treeless, relatively poorly-drained grasslands that have a history of frequent fires	Highlands
Aphelocoma coeruluscens	Florida scrub-jay	FT/ST	Low-growing oak scrub habitat	Crystal River, Dixie, Highlands, Putnam
Charadrius alexandrinus	Snowy plover	ST	Open, dry sand near dunes	Crystal River, Dixie
Charadrius melodus	Piping plover	FT/ST	Tidal mudflats	Crystal River, Dixie, Putnam
Polyborus plancus audubonii	Audubon's crested caracara	FT/ST	Open country, dry prairies/pastures with cabbage palm/live oak hammocks, and shallow ponds and sloughs	Highlands, Putnam
Falco sparverius paulus	Southeastern American kestrel	ST	Open pine habitats, woodland edges, prairies, and pastures	Crystal River, Dixie, Highlands, Putnam
Grus americana	Whooping crane	ST	Along lake margins among rushes and sedges; estuarine marshes, shallow bays and tidal flats	Highlands

1 **Table 9-7**. (contd)

Scientific Name	Common Name	Legal Status	Suitable Habitat	Alternate Site
Grus canadensis pratensis	Florida sandhill crane	ST	Prairies, freshwater marshes, and pastures	Crystal River, Dixie, Highlands, Putnam
Mycteria americana	Wood stork	FE/SE	Cypress strands and domes, mixed hardwood swamps	Crystal River, Dixie, Highlands, Putnam
Picoides borealis	Red-cockaded woodpecker	FE	Mature longleaf and slash pine forests	Crystal River, Dixie, Highlands, Putnam
Rostrhamus sociabilis plumbeus	Snail kite	FE/SE	Freshwater marshes and shallow vegetated edges of lakes (natural and man-made)	Crystal River, Dixie, Highlands, Putnam
Sterna antillarum	Least tern	ST	Coastal areas, beaches, lagoons, bays, estuaries	Crystal River, Dixie, Highlands, Putnam
Reptiles				
Alligator mississippiensis	American alligator	FT/SC	Most permanent bodies of fresh water, including marshes, swamps, lakes, and rivers	Crystal River, Dixie
Crocodylus acutus	American crocodile	FT/SE	Freshwater and brackish coastal habitats	Crystal River, Dixie
Dymarchon corais couperi	Eastern indigo snake	FT/ST	Broad range of habitats, from scrub and sandhill to wet prairies and mangrove swamps; often commensal with gopher tortoises	Crystal River, Dixie, Highlands, Putnam
Eumeces egregius lividus	Blue-tailed mole skink	FT/ST	Well-drained sandy uplands with loose sand for burrowing	Highlands
Gopherus polyhemus	Gopher tortoise	ST	Dry upland habitats, including sandhills, scrub, xeric oak hammock, and dry pine flatwoods; also pastures, old fields	Crystal River, Dixie, Highlands, Putnam

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Table 9-7. (contd)

Scientific Name	Common Name	Legal Status	Suitable Habitat	Alternate Site
Neoseps reynoldsi	Sand skink	FT/ST	Rosemary scrub, sand pine and oak scrubs, scrubby flatwoods, turkey oak ridges within scrub, citrus groves occupying former scrub	Highlands, Putnam
Nerodia clarkii taeniata	Atlantic salt marsh snake	FT/ST	Coastal marshes and mangrove swamps along shallow tidal creeks and pools; often associated with fiddler crab burrows	Putnam
Stilosoma extenuatum	Short-tailed snake	ST	Sandhills, xeric hammock, and sand pine scrub	Crystal River, Dixie, Highlands, Putnam
Amphibians				
Ambystoma cingulatum	Flatwoods salamander	FT	Seasonally wet pine flatwoods near cypress ponds	Putnam
Vascular Plants				
Acrostichum aureum	Golden leather fern	ST	Brackish and freshwater marshes	Crystal River, Dixie, Putnam
Adiantum tenerum	Brittle maidenhair fern	SE	Limestone outcrops, grottoes, sinkholes	Crystal River, Dixie
Agrimonia incisa	Incised groove-bur	SE	Sandhills and scrub	Crystal River, Dixie, Putnam
Andropogon arctatus	Pine-woods bluestem	ST	Wet pine flatwoods	Crystal River, Dixie, Highlands, Putnam
Arnoglossum diversifolium	Variable-leaf Indian plantain	ST	Freshwater and riparian habitats	Crystal River, Dixie
Asplenium dentatum	American toothed spleenwort	SE	Tropical hardwood hammock	Putnam
Asplenium erosum	Auricled spleenwort	SE	Pinelands	Crystal River, Dixie, Putnam

1 **Table 9-7**. (contd)

Scientific Name	Common Name	Legal Status	Suitable Habitat	Alternate Site
Asplenium pumilum	Dwarf spleenwort	SE	Pinelands	Crystal River, Dixie, Putnam
Asplenium verecundum	Modest spleenwort	SE	Rockland hammocks, limestone outcrops, grottoes, sinkholes	Crystal River, Dixie
Adiatum tenerum	Brittle maidenhair fern	SE		Crystal River, Dixie
Balduina atropurpurea	Purple honeycomb-head	SE		Putnam
Bigelowia nuttallii	Nuttall's rayless goldenrod	SE	Sand pine scrub in Pinellas County	Crystal River, Dixie
Blechnum occidentale	Sinkhole fern	SE	Moist woodlands, hammocks, rocky creek banks, woodlands with open shade	Crystal River, Dixie
Bonamia grandiflora	Florida bonamia	FT/SE	Openings or disturbed areas in white sand scrub	Crystal River, Dixie, Highlands, Putnam
Calaminntha ashei	Ashe's savory	ST	Sandhills and scrub	Highlands, Putnam
Calopogon multiflirus	Many-flowered grasspink	SE	Dry to moist flatwoods with longleaf pine, wiregrass, saw palmetto	Highlands
Calydorea coelestina	Bartram's Ixia	SE		Putnam
Campanula robinsiae	Brooksville bellflower	FE/SE	Wet, grassy slopes and drying pond edges in vicinity of Chinsegut Hill in Hernando County	Crystal River, Dixie
Carex chapmanii	Chapman's sedge	SE	Grasslands, pinelands	Crystal River, Dixie, Highlands, Putnam
Centrosema arenicola	Sand butterfly pea	SE	Sandhill, scrubby flatwoods, dry upland woods	Crystal River, Dixie, Highlands, Putnam

2

Table 9-7. (contd)

Scientific Name	Common Name	Legal Status	Suitable Habitat	Alternate Site
Chamaesyce cumulicola	Sand-dune spurge	SE	Coastal scrub and stabilized dunes	Crystal River, Dixie, Putnam
Cheilanthes microphylla	Southern lip fern	SE	Coastal habitats	Crystal River, Dixie
Chionanthus pygmaeus	Pygmy fringe tree	SE	Scrub, sandhill, and xeric hammock	Highlands, Putnam
Chrysopsis (=Heterotheca) floridana	Florida golden aster	FE/SE	Sand pine scrub, sand ridges of excessively well-drained, fine sands, railroad and highway corridors	Crystal River, Dixie
Cladonia perforata	Perforate reinder lichen	FE/SE	High, xeric white sand rosemary scrub (FNAI 2010)	Highlands
Clitoria fragrans	Scrub pigeon-wing	FT/SE	Turkey oak barrens with wire grass, bluejack and turkey oak; scrubby high pine	Highlands, Putnam
Coelorachis tuberculosa	Piedmont jointgrass	ST	Freshwater habitats	Highlands, Putnam
Conradina brevifolia	Short-leaved rosemary	FE/SE	White sand scrub with sand pine and evergreen scrub oaks	Highlands
Conradina grandiflora	Large-flowered rosemary	ST	Deep, fine sandy soils on or in the vicinity of ancient dunes (CPC 2010)	Highlands, Putnam
Conradina etonia	Etonia rosemary	FE/SE	Deep, white-sand scrub with sand pine and oak shrubs in natural or artificial clearings	Putnam
Crotalaria avonensis	Avon Park rabbit bells	FE/SE	White sand scrub dominated by rosemary and oaks and/or sand pine; mostly in open areas with bare sand.	Highlands
Ctenium floridanum	Florida toothache grass	SE	Sandhills and dry pinelands	Putnam
Cucurbita okeechobeensis	Okeechobee gourd	FE/SE	Pond apple swamps and mucky soils on Lake Okeechobee shores and islands and along the St. Johns River (CPC 2010)	Putnam
Deeringothamnus rugelii	Rugel's pawpaw	FE/SE	Poorly-drained slash pine/saw palmetto flatwoods (FWS 2009)	Putnam
Dennstaedtia bipinnata	Hay scented fern	SE	Hydric hammocks, wet woods (FNAI 2010)	Putnam
Dicerandra christmanii	Garrett's scrub balm	FE/SE	Exclusively on well-drained yellow sands in oak-dominate Florida scrub (ABS 2003a)	Highlands
Dicerandra cornutissima	Longspurred mint	FE/SE	Sand pine and oak scrub	Crystal River, Dixie, Putnam
Dicerandra frutescens	Scrub mint	FE/SE	Well-drained yellow soils (ABS 2003b)	Highlands

1 **Table 9-7**. (contd)

Scientific Name	Common Name	Legal Status	Suitable Habitat	Alternate Site
Drosera intermedia	Spoon-leaved sundew	ST	Freshwater habitats	Crystal River, Dixie, Highlands, Putnam
Eltroplectris calcarata	Spurred neottia	SE	Mesic hammock, rockland hammock (FNAI 2010)	Highlands
Eragrostis pectinacea var. *tracyi*	Sanibel lovegrass	SE	Disturbed beach dunes, maritime hammocks, coastal strands, coastal grasslands, old fields, clearings, and other disturbed sites	Crystal River, Dixie
Eryngium cuneifolium	Wedge-leaved button-snakeroot	FE/SE	Sand pine scrub, mostly in gaps on rosemary balds (FNAI 2010)	Highlands
Eriogonum logifolium var. *gnaphalifolium*	Scrub wild buckwheat	FT/SE	Sandhill, oak-hickory scrub	Crystal River, Dixie, Highlands, Putnam
Euphorbia coommutata	Wood spurge	SE	Riparian habitats	Crystal River, Dixie, Putnam
Forestiera godfreyi	Godfrey's swampprivet	SE	Upland hardwood forests with limestone at or near the surface, often on slopes above lakes and rivers	Crystal River, Dixie, Putnam
Gladularia maritima	Coastal vervain	SE	Back dunes, dune swales, coastal hammocks	Crystal River, Dixie, Putnam
Gladularia tampensis	Tampa vervain	SE	Live oak–cabbage palm hammocks and pine-palmetto flatwoods	Crystal River, Dixie, Putnam
Gossypium hirsutum	Wild cotton	SE	Coastal strands and disturbed areas	Crystal River, Dixie
Harrisia fragrans	Fragrant prickly apple	FE/SE	Scrubby flatwoods and xeric hammocks with sand live oak, myrtle oak, cabbage palm, and prickly pear (FNAI 2010)	Putnam
Harrisia simpsonii	Simpson's prickly apple	SE	Mangroves and coastal thickets and strands (FNAI 2010)	Putnam

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1 **Table 9-7**. (contd)

Scientific Name	Common Name	Legal Status	Suitable Habitat	Alternate Site
Hartwrightia floridana	Hartwrightia	ST	Seepage slopes, edges of baygalls and springheads, wet prairies, flatwoods	Highlands, Putnam
Hasteola robertiorum	Florida hasteola	SE	Saturated, peaty soils of river and creek floodplain swamps; hydric hammocks with cabbage palm, cypress, or hardwood canopy	Crystal River, Dixie, Putnam
Helianthus carnosus	Lake-side sunflower	SE	Wet flatwoods and prairies (FNAI 2010)	Putnam
Hypericum cumicola	Highlands scrub hypericum	FE/SE	Openings in white sand and rosemary scrubs; sometimes found in scrubby flatwoods and oak scrubs in yellow sands.	Highlands
Hypericum edisonianum	Edison's ascyrum	SE	Depressions in scrub, cutthroat seeps, flatwoods ponds, lake margins, wet prairie	Highlands
Illicium parviflorum	Star anise	SE	Banks of spring-run or seepage streams, bottomland forest, hydric	Highlands, Putnam
Justicia cooleyi	Cooley's water-willow	FE/SE	Mesic hardwood hammocks over limestone	Crystal River, Dixie
Justicia crassifolia	Thick-leaved water willow	SE		Highlands
Lantana depressa var. *floridana*	Atlantic coast Florida lantana	SE	Dunes and sandy inland ridges (FNAI 2010)	Putnam
Lechea cernua	Nodding pinweed	ST	Usually ancient dunes with evergreen scrub oaks, mature scattered pine or oak forest	Crystal River, Dixie, Highlands, Putnam
Lechea divaricata	Pine pinweed	SE	Scrub and scrubby flatwoods	Crystal River, Dixie, Highlands
Leineria floridana	Corkwood	ST	Edges of marshy openings and along small drainages in coastal hydric hammocks; fresh or tidal marshes	Crystal River, Dixie
Liatris ohlingerae	Florida blazing star	SE	Rosemary balds, edges of oak scrub; scrubby flatwoods and disturbed scrub (FNAI 2010)	Highlands
Litsea aestivalis	Pondspice	SE	Edges of baygalls, flatwoods ponds, and cypress domes. May form thickets around edges of ponds	Crystal River, Dixie, Putnam
Lupinus aridorum	Scrub lupine	FE/SE		Highlands

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Table 9-7. (contd)

Scientific Name	Common Name	Legal Status	Suitable Habitat	Alternate Site
Matalea floridana	Florida spiny-pod	SE	Pinelands and temperate forests	Crystal River, Dixie, Highlands, Putnam
Monotropa hypopithys	Pinesap	SE	Temperate forests	Putnam
Monotropsis reynoldsiae	Pygmy pipes	SE	Upland mixed hardwood forest, mesic and xeric hammock, sand pine and oak scrub	Crystal River, Dixie, Putnam
Najas filifolia	Narrowleaf naias	ST	Freshwater habitats	Highlands, Putnam
Nemastylis floridana	Celestial lily	SE	Freshwater habitats	Crystal River, Dixie, Highlands, Putnam
Nolina atopocarpa	Florida beargrass	ST	Grasslands, pinelands	Highlands, Putnam
Nolina brittoniana	Britton's beargrass	FE/SE	Scrub, sandhill, scrubby flatwoods, and xeric hammock	Crystal River, Dixie, Highlands, Putnam
Ophioglossum palmatum	Hand fern	SE	Old leaf bases of cabbage palms in maritime and wet hammocks	Crystal River, Dixie, Highlands, Putnam
Panicum abscissum	Cutthroat grass	SE		Highlands, Putnam
Parnassia grandifolia	Large-leaved grass-of-parnassus	SE	Seepage slopes, wet prairies, edges of cypress strands	Putnam
Paronychia chartacea ssp. *chartacea*	Paper-like nailwort	FT/SE		Highlands, Putnam
Pecluma dispersa	Widespread polypody	SE	Tree branches and limestone outcrops in dry hammocks	Crystal River, Dixie, Putnam

1 **Table 9-7.** (contd)

Scientific Name	Common Name	Legal Status	Suitable Habitat	Alternate Site
Pecluma plumula	Plume polypody	SE	Tree branches or limestone in hammocks, wet woods, and limesinks	Crystal River, Dixie, Highlands, Putnam
Pecluma ptilodon	Swamp plume polypody	SE	Rockland hammocks, strand swamps, wet woods	Crystal River, Dixie, Highlands, Putnam
Phyllanthus leibmannianus	Pinewood dainties	SE	Hydric hammocks, floodplain and bottomland forests	Crystal River, Dixie
Peperomia humilis	Terrestrial pepperomia	SE	Shell mounds and limestone outcrops in mesic hammocks, coastal berms, cypress swamps	Crystal River, Dixie, Highlands
Platanthera integra	Yellow fringeless orchid	SE	Wet pine flatwoods, wet prairies, depressions within pinelands	Highlands
Polygala lewtonii	Lewton's polygala	FE/SE	Oak scrub, sandhill	Highlands, Putnam
Polygonella basiramia	Florida jointweed	FE/SE		Highlands
Polygonella myriophylla	Small's jointweed	FE/SE	Open, sandy areas within scrub	Highlands, Putnam
Prunus geniculata	Scrub plum	FE/SE	Sandhill and oak scrub	Highlands, Putnam
Pteroglossaspis ecristata	Giant orchid	ST	Sandhill, scrub, pine flatwoods, pine rocklands	Crystal River, Dixie, Highlands, Putnam
Pycnanthemum floridanum	Florida mountain-mint	ST	Pinelands, sandhills, scrub	Crystal River, Dixie, Putnam
Rudbeckia triloba var. *pinnatiloba*	Pinnate-lobed coneflower	SE	Freshwater habitats, grasslands, pinelands	Crystal River, Dixie
Salix Floridana	Florida willow	SE	Springheads, edges of spring runs, hydric hammocks, floodplains	Highlands, Putnam

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Table 9-7. (contd)

Scientific Name	Common Name	Legal Status	Suitable Habitat	Alternate Site
Schizachurium niveum	Scrub bluestem	SE	Rosemary, sand pine, and oak scrub	Crystal River, Dixie, Highlands
Schwalbea Americana	Chaffseed	FE/SE	Moist, grassy ecotones around ponds in longleaf pine sandhills and savannas (FNAI 2010)	Putnam
Sideroxylon alachuense	Silver buckthorn	SE	Upland hardwood forests around limesinks	Putnam
Sideroxylon lycioides	Buckthorn	SE	Wooded slopes, floodplains, and bluffs	Dixie, Putnam
Spigelia loganioides	Pinkroot	SE	Floodplain forests, upland and hydric hardwood hammocks over limestone	Crystal River, Dixie, Putnam
Spiranthes polyantha	Green ladies'-tresses	SE	Rock outcrops in mesic hammock, rockland hammock, maritime hammock	Crystal River, Dixie
Stylisma abdita	Scrub stylisma	SE	Pinelands, sandhills, scrub	Crystal River, Dixie, Highlands, Putnam
Thelypteris reptans	Creeping maiden fern	SE	Limestone grottoes and sinkholes	Crystal River, Dixie
Thelypteris serrata	Toothed maiden fern	SE	Cypress swamps, sloughs, floodplains	Crystal River, Dixie, Highlands
Trichomanes punctatum ssp. *Floridanum*	Florida filmy fern	SE	Rock outcrops	Crystal River, Dixie
Triphora amazonica	Broad-leaved nodding-caps	SE	Rich damp hardwood hammocks	Crystal River, Dixie
Triphora graigheadii	Craighead's nodding-caps	SE	Mesic hardwood hammocks	Crystal River, Dixie
Vicia ocalensis	Ocala vetch	SE	Open, wet thickets along margins of spring runs and streams	Putnam
Warea amplexifolia	Clasping warea	FE/SE	Sandhill with longleaf pine and wiregrass	Highlands, Putnam

Table 9-7. (contd)

Scientific Name	Common Name	Legal Status	Suitable Habitat	Alternate Site
Warea carteri	Carter's warea	FE/SE	Sandhill, scrubby flatwoods, scrub	Highlands, Putnam
Zephyranthes simpsonii	Redmargin zepyrlily	FE/SE	Wet flatwoods and meadows (FDACS 2004)	Highlands
Ziziphus celata	Scrub ziziphus	FE/SE		Highlands

Species list sources: FNAI (2009), FWS (2009)
FE = Federally listed as endangered; FT = Federally listed as threatened; SE = State listed as endangered; ST = State listed as threatened

Building Impacts

Impacts from building two nuclear units and supporting facilities on wildlife, including important species and habitats, would be unavoidable. Activities that would affect terrestrial resources include land clearing and grading (temporary and permanent), filling and or draining of wetlands, increased human presence, heavy equipment operation, traffic, noise, avian collisions, and fugitive dust. These activities would likely displace or destroy wildlife that inhabits the areas of disturbance. Some wildlife, including important species, would perish or be displaced during land clearing for any of the above activities as a consequence of habitat loss, fragmentation and competition for remaining resources. Less mobile animals, such as reptiles, amphibians, and small mammals, would be at greater risk of incurring mortality than more mobile animals, such as birds, many of which would be displaced to adjacent communities. Undisturbed land adjacent to areas of disturbance could provide habitat to support displaced wildlife, but increased competition for available space and resources could affect population levels. Wildlife would also be subjected to impacts from noise and traffic, and birds could be injured if they collide with tall structures. The impact on wildlife from noise is expected to be temporary and minor. The creation of new transmission-line corridors could be beneficial for some important wildlife species, including those that inhabit early successional habitat or use edge environments, such as white-tailed deer (*Odocoileus virginianus*), northern bobwhite, eastern meadowlark (*Sturnella magna*), and the gopher tortoise (*Gopherus polyphemus*). Birds of prey, such as red-tailed hawks (*Buteo jamaicensis*) would likely exploit newly created hunting grounds. Forested wetlands within the corridors would be converted to and maintained in an herbaceous or scrub-shrub condition that could provide improved foraging habitat for waterfowl and wading birds. However, fragmentation of upland and wetland forests could adversely affect species that are dependent on large tracts of continuous forested habitat.

To accommodate the building of two nuclear units on the Crystal River site, PEF would need to clear approximately 442 ac of terrestrial habitats for the nuclear facility and approximately 61 ac for associated offsite structures and corridors; not including transmission lines, which are discussed in the paragraph below (see Table 9-2 and Table 9-3) (CH2M Hill 2009). The proposed facility footprint of approximately 442-ac parcel lies within the CREC boundary (CH2M

Hill 2009). Based upon Florida Land Use, Cover and Forms Classification System (FLUCFCS) analysis, approximately 27 ac of wetlands on the site would be filled (CH2M Hill 2009). PEF states that the nuclear facility would be sited to avoid wetlands whenever possible and that potential impacts on wetlands would be minimized through the use of established BMPs (PEF 2009a). Approximately 6 ac of wetlands would be filled to build the associated offsite facilities (other than transmission lines)(CH2M Hill 2009).

New transmission system infrastructure would be needed to support a nuclear power facility at the Crystal River site and would include approximately 180 mi of transmission lines (estimates made by measuring the approximate distance of hypothetical corridors provided by CH2M Hill [2009]; see Section 9.3.2.1). The proposed transmission-line corridors are situated mostly in or adjacent to existing transmission lines; however, some new right-of-way would have to be created to accommodate the new lines (CH2M Hill 2009). The total acreage of transmission-line corridor for the Crystal River site is approximately 9038 ac, of which approximately 1516 ac are wetlands and approximately 1653 ac are forested habitat (see Table 9-8) (CH2M Hill 2009). Some portion of the total 1653 ac of forested habitat and 1516 ac of wetland habitat present in the corridors would be affected; however, because actual routes have not been determined, impacts on forests and wetlands cannot be quantified. Under Federal and State permitting requirements, PEF would be obligated to mitigate any unavoidable construction impacts on jurisdictional wetlands and listed species (PEF 2009a; FDEP 2010a).

Table 9-8. Summary of Impacts by Land-Use Class for the Crystal River Site

Land-Use Class (FLUCFCS) (acreage)	Onsite	Offsite Corridors (Except Transmission)	Transmission Corridors[(a)]
Urban and Built Environment (percent of area)	9 (2%)	0 (0%)	1769 (19%)
Agriculture	129 (29%)	4 (7%)	1714(19%)
Upland Nonforested	0 (0%)	1 (2%)	172 (2%)
Upland Forested	277 (63%)	35 (57%)	1654 (18%)
Water	0 (0%)	1 (1%)	114 (1%)
Wetlands	27 (6%)	6 (10%)	1516 (16%)
Barren Lands	0 (0%)	0 (0%)	9 (<1%)
Transportation, Communication and Utilities	0 (0%)	14 (23%)	2091 (22%)

Source: CH2M Hill 2009
(a) Acreages are the total acres of each land-use class (FLUCFCS) cover type present in the transmission-line corridor, not acres affected.

PEF stated that all land clearing associated with the nuclear facility, offsite structures, and transmission-line corridor development would be conducted according to Federal, State, and local regulations, permit requirements, existing procedures, and established BMPs (PEF 2009a).

Building two new nuclear reactors at the Crystal River site would result in the loss of approximately 503 ac of terrestrial habitat on the site and offsite corridors (excluding transmission-line corridors) (see Table 9-9).

Table 9-9. Total Terrestrial Habitat Impacts for the Crystal River Site

Impact Areas	Acres[(a)]
Onsite Impact Areas	442
Reservoir Impact Areas	Not applicable
Transmission-Line Corridor Areas	9038[(a)]
Offsite Impact Areas	61
Total Impact Areas	503 (plus portion of 9038 ac transmission corridor)

Source: CH2M Hill 2009
(a) Transmission-line acreages are the total acres available, not total acres affected. Only a portion of the total available would be affected.

Clearing land within the 9038-ac transmission-line corridor would further increase forested habitat losses and increase habitat fragmentation. Other sources of impacts on terrestrial resources such as noise, increased risk of collision and electrocution, and displacement of wildlife would likely be temporary and result in minimal impacts on the resource. Because of the extent of unavoidable terrestrial habitat losses, building the two new units and associated offsite facilities, including transmission lines, would noticeably alter the available terrestrial habitat on and in the landscape surrounding the Crystal River Site.

Operational Impacts

Impacts on terrestrial ecological resources, including important species, from operation of two new nuclear units at the Crystal River site include those associated with transmission system structures, maintenance of transmission-line corridors, and operation of the cooling towers. Also, during plant operation, wildlife would be subjected to impacts from increased traffic.

Impacts on crops, ornamental vegetation, and native plants from cooling-tower drift cannot be evaluated in detail in the absence of information about the specific location of cooling towers at each alternative site. Similarly, bird collisions with cooling towers cannot be evaluated in the absence of information about the specific location of cooling towers at the site. The impacts of cooling-tower drift and bird collisions for existing power plants were evaluated in NUREG-1437 (NRC 1996) and found to be of minor significance for nuclear power plants in general, including those with various numbers and types of cooling towers. On this basis, the review team concludes, for the purpose of comparing the alternative sites, that the impacts of cooling-tower drift and bird collisions with cooling towers resulting from operation of new nuclear units would be minor.

Outdoor noise levels on the Crystal River site are predicted to range from 90 dBA near the loudest equipment to 65 dBA in areas more distant from major noise sources (PEF 2009a). Noise modeling predicts not perceptible to slight increases in noise from plant operations at the site boundary (PEF 2009a). Except in areas immediately adjacent to major noise sources, expected noise levels would be below the 60- to 65-dBA threshold at which birds and red foxes (a surrogate for small and medium-sized mammals) are startled or frightened (Golden et al. 1980). Thus, noise from operating cooling towers at the Crystal River site would not be likely to disturb wildlife beyond the site boundary. Consequently, the review team concludes that the impacts of cooling-tower noise on wildlife would be minimal.

An evaluation of specific impacts resulting from building of transmission lines and transmission-line corridor maintenance cannot be conducted in any detail due to the lack of information, such as the specific locations of new corridors that could result from transmission system upgrades. However, in general, impacts associated with transmission-line operation consist of bird collisions with transmission lines, electromagnetic field (EMF) effects on flora and fauna, and habitat loss due to corridor maintenance. The impacts associated with transmission-line corridor maintenance activities include alteration of habitat, including but not limited to wetland and floodplain habitat, due to cutting and herbicide application.

Transmission lines and associated structures pose a potential avian collision hazard. Direct mortality resulting from birds colliding with tall structures has been observed (Erickson et al. 2005). Factors that appear to influence the rate of avian impacts with structures are diverse and related to bird behavior, structure attributes, and weather. Migratory flight during darkness by flocking birds has contributed to the largest mortality events. Tower height, location, configuration, and lighting also appear to play a role in avian mortality. Weather, such as low cloud ceilings, advancing fronts, and fog also contribute to this phenomenon. Waterfowl may be particularly vulnerable due to their low, fast flight, and flocking behavior (EPRI 1993). Bird collisions with transmission lines are recognized as being of minor significance at operating nuclear power plants, including transmission-line corridors with variable numbers of power lines (NRC 1996). Although additional transmission lines would be required for new nuclear units at the alternative sites, increases in bird collisions would be minor and these would likely not be expected to cause a measurable reduction in local bird populations. PEF would also be required to have an Avian Protection Plan in compliance with State certification guidelines

(FDEP 2010a). Consequently, the incremental number of bird collisions posed by the addition of new transmission lines for new nuclear units would be negligible.

EMFs are unlike other agents that have an adverse impact (e.g., toxic chemicals and ionizing radiation) in that dramatic acute effects cannot be demonstrated and long-term effects, if they exist, are subtle (NRC 1996). A careful review of biological and physical studies of EMFs did not reveal consistent evidence linking harmful effects with field exposures (NRC 1996). At a distance of 300 ft, the magnetic fields from many lines are similar to typical background levels in most homes. Thus, impacts of EMFs on terrestrial flora and fauna are of small significance at operating nuclear power plants, including transmission systems with variable numbers of power lines (NRC 1996). Since 1997, more than a dozen studies have been published that looked at cancer in animals that were exposed to EMFs for all or most of their lives (Moulder 2003). These studies have found no evidence that EMFs cause any specific types of cancer in rats or mice (Moulder 2003). Therefore, the incremental EMF impact posed by addition of new transmission lines for new nuclear units would be negligible.

Existing roads providing access to the existing transmission-line corridors at the alternative sites would likely be sufficient for use in any expanded corridors; however, new roads would be required during the construction of new transmission-line corridors. Management activities (cutting and herbicide application) related to transmission-line corridors and related impacts on floodplains and wetlands in transmission-line corridors are recognized as being of minor significance at operating nuclear power plants, including those with transmission-line corridors of variable widths (NRC 1996). The review team assumes that the same vegetation and construction management of corridors currently used by PEF would be used in the establishment and maintenance of the new corridors. Under the Conditions of Certification for Levy County, PEF would also be required to retain existing vegetation whenever practicable and use BMPs that comply with the Florida State regulations (FDEP 2010a). Consequently, the incremental effects of the maintenance of transmission-line corridors and associated impacts on floodplains and wetlands posed by expanding existing corridors or the addition of a new transmission-line corridor for new nuclear units would be negligible.

To summarize, the potential effects of operating two new nuclear reactors at the Crystal River site would be primarily associated with the maintenance of transmission-line corridors and increased traffic. In general, operational impacts on terrestrial resources would be expected to be minimal.

Cumulative Impacts

Past and present actions in the geographic area of interest that have influenced terrestrial resources in a similar way to the proposed two new nuclear units at the Crystal River site include development and operation of the CREC, located adjacent to the Crystal River site; development and operation of the Crystal River Quarries, Inc. mine, approximately 3 mi east of the Crystal River site; and development and operation of the Inglis Limestone Quarry, which is part of the Citrus Mining and Timber Company, approximately 3 mi north of the Crystal River site. All of these projects have contributed to loss of terrestrial habitat in the area. Furthermore, terrestrial habitats throughout the geographic area of interest have been extensively altered by a history of forestry and agricultural practices as well as low density residential development.

Proposed reasonably foreseeable future actions that would affect terrestrial resources in a way similar to development at the Crystal River site include development and operation of the proposed Tarmac King Road Limestone Mine, as close as 8 mi north-northeast of the proposed Crystal River site. The proposed mine would occupy approximately 9400 ac including a quarry, processing plant, roads, and buffers. This proposed project would affect approximately 2700 ac of wetlands and uplands by incremental losses extending over approximately 100 years. In addition to its ongoing quarrying activities noted in the paragraph above, Citrus Mining and Timber Inc. is also proposing to develop a "Port District" approximately 2 mi north of the Crystal River site, which would include waterfront residential, commercial, and industrial development.

The Inglis Lock bypass channel spillway is a proposed project to construct an intake structure, intake and discharge channels, turbines and a transmission line located approximately 5 mi northeast of the Crystal River site. This project would contribute to terrestrial habitat loss and fragmentation within the ROI. The FDOT is planning an expansion of US-19 at the CFBC, approximately 3 mi north-northeast from the Crystal River site, which would include construction of a two-lane bridge and expansion of the existing roadway to a four-lane divided highway. Transmission-line creation and/or upgrading throughout the designated geographical ROI, and future urbanization would also be expected to occur. There are, however, several areas within the geographic ROI that are managed for the benefit of wildlife, including (but not limited to) Goethe State Forest, Crystal River National Wildlife Refuge, Waccasassa Bay Preserve State Park, Gulf Hammock Wildlife Management Area, and the Big Bend Seagrasses Preserve.

The other impact on terrestrial resources at the Crystal River site would be the effect of global climate change on plants and wildlife. The impact of global climate change on terrestrial wildlife and habitat in the geographic area of interest is not precisely known. Global climate change could result in a rise in sea level and may cause regional increases in the frequency of severe weather, decreases in annual precipitation, increases in average temperature, and saltwater intrusion into freshwater wetlands (GCRP 2009). Such changes in climate could alter terrestrial community composition on or near the Crystal River site through changes in species diversity, abundance, and distribution. Elevated water temperatures, droughts, and severe weather phenomena may adversely affect or severely reduce terrestrial habitat. Specific predictions on habitat changes in this region due to global climate change are inconclusive at this time. However, because of the regional nature of climate change, the impacts related to global climate change would be similar for all of the alternative sites.

Summary Statement

Impacts on terrestrial ecology resources, including important species, are estimated based on the information provided by PEF and the review team's independent review. Past, present, and reasonably foreseeable future activities in the geographic area of interest could affect terrestrial ecology in ways similar to building and operation of the proposed two new units at the LNP site. The Crystal River site and some of the associated transmission-line corridors are natural habitats that would be substantially altered by development and maintenance activities, noticeably affecting the level and movement of terrestrial wildlife populations in the surrounding landscape. Other anticipated development projects would further alter wildlife habitats and migration patterns in the surrounding landscape. The review team therefore concludes that the cumulative impacts on baseline conditions for terrestrial ecological resources would be MODERATE.

This determination is based upon the extent of expected wetland loss and habitat fragmentation from ongoing and planned development projects, continued widespread manipulation of habitats for commercial forest management, and anticipated losses of habitat for important species. The incremental impacts from building and operating the Crystal River project would be a significant contributor to the moderate cumulative impact, primarily because of a loss or modification of habitats that support wildlife, wetlands, and important species. Although incremental impacts on terrestrial resources could be noticeable near the Crystal River project, these impacts would not be expected to destabilize the overall ecology of the regional landscape.

9.3.2.4 Aquatic Resources for the Crystal River Energy Complex Site

The following impact analysis includes impacts from building activities and operations on aquatic ecology resources. The CREC site is located on Crystal Bay, which is a small embayment of the Gulf of Mexico. CREC has four fossil-fuel units and one nuclear unit, which draw a total of 1897 Mgd from May 1 to October 31, and 1613 Mgd from November 1 to April 30. Water from Crystal Bay is drawn in through three intakes on a common intake canal for Units 1, 2, and 3. Cooling water for Units 4 and 5 is provided from Units 1–3 effluent, and all effluents including blowdown from CREC Units 4 and 5 are ultimately discharged via a discharge canal to the Gulf of Mexico. Mechanical draft helper cooling towers cool the station discharge for thermal compliance (PEF 2008). A two-unit, closed-cycle plant would require 84,780 gpm (190 cfs) of cooling water, which would be obtained from the Gulf of Mexico, and station blowdown would be added to the existing discharge for CREC Units 1–5 (PEF 2009a). The geographic area of interest is considered to be hydrologically related water bodies surrounding the proposed Crystal River site, which encompasses Levy and Citrus counties offshore areas of the Gulf of Mexico, including the mouth of the CFBC, and the mouth of the Withlacoochee River, and associated transmission-line corridors.

The CREC site is a coastal facility near a shallow inshore estuarine habitat in the Gulf of Mexico. Crystal River enters to the Gulf of Mexico 2 mi to the south, and the Withlacoochee River opens 2 mi to the north. The mouth of the CFBC in the Gulf of Mexico is between the CREC discharge and the Withlacoochee River. There are no sanctuaries or preserves that could be affected by the proposed action. The nearest managed areas are the Big Bend Seagrasses aquatic preserve to the north of the mouth of the Withlacoochee River (FDNR 1988), St. Martins Marsh that includes the estuarine coastal areas between Crystal River and Homosassa River (FDNR 1987), and the Crystal River National Wildlife Refuge (Buckingham 1989). Big Bend Seagrasses is managed by the FDEP and is approximately 5 mi to the north along the Gulf Coast of Florida from the mouth of the CFBC, and extends up along the coast and up to 8 mi offshore to the St. Marks National Wildlife Refuge to cover 945,000 ac. St. Martins Marsh is also managed by FDEP and encompasses 23,000 ac in the nearshore and offshore region due west of the city of Crystal River, 3.5 mi to the south of the CREC discharge location. Both aquatic preserves were established to protect seagrass bed habitats, which provide nursery areas for finfish and shellfish as well as foraging resources for local birds and aquatic vertebrates. The Crystal River National Wildlife Refuge is managed by the FWS and is the Kings Bay headwaters of Crystal River, which lies 10 mi inland from the mouth of Crystal River on the Gulf of Mexico. The Crystal River National Wildlife Refuge was designated to protect the West Indian (Florida) manatee and its habitat.

Historically, the construction and operation of CREC Units 1–5 have had some impact on fisheries in the Gulf of Mexico, which PEF mitigates by hatchery supplementation. The Crystal River Mariculture Center began operation in October 1991, with red drum (*Sciaenops ocellatus*), spotted seatrout (*Cynoscion nebulosus*), and pink shrimp (*Farfantepenaeus duorarum*) among the primary species cultured. Other species such as pinfish (*Lagodon rhomboides*), pigfish (*Orthopristis chrysoptera*), stone crab (*Menippe mercenaria*), and blue crab (*Callinectes sapidus*) are also cultured and released in the Gulf of Mexico (PEF 2009c). Between 1999 and 2005, 8 loggerhead sea turtles (*Caretta caretta*), 38 green sea turtles (*Chelonia mydas*), 1 hawksbill sea turtle (*Eretmochelys imbricata*), and 92 Kemp's ridley sea turtles (*Lepidochelys kempii*) have been collected at CREC (Eaton et al. 2008). PEF currently has an incidental take permit from NMFS that allows an incidental live take of 75 sea turtles annually, 3 annual causal sea turtle mortalities, and a reporting requirement for non-causal related mortalities of 8 or more within a 12-month period (NMFS 2002). PEF has an ongoing program to monitor the intake canal for the presence of sea turtles, perform rescues for stranded individuals, provide rehabilitation, and release resources when possible. In 2000, NRC found no significant impact on marine turtles from the operation of CREC Unit 3 (NMFS 2002). Aquatic species and habitats associated with the discharge from CREC have been characterized historically from CREC operations (Stone & Webster Engineering 1985), and were again sampled from April through November 2008. The extent of seagrass beds have been surveyed beginning in the early 1990s as a part of quantifying recovery of the CREC offshore Gulf of Mexico habitats following installation of helper cooling towers (MML 1993, 1994, 1995). Previously affected seagrass areas nearest the CREC discharge were observed to recover with 50-percent bottom coverage by colonization by shoal grass (*Halodule wrightii*), a dominant, quick-growing seagrass. However, between 1995 and 2001, overall seagrass abundance declined, likely from a number of environmental influences such as turbidity, salinity, and storm events (Marshall 2002).

The potential for impacts from construction and/or operation of two new CREC units on aquatic biota would be primarily to organisms inhabiting the Crystal Bay habitat of the Gulf of Mexico. Aquatic commercial, recreational, and indicator species of importance would include the same species described for the proposed LNP site.

Commercial and Recreational Species

The Crystal River site has the same species as those listed for the proposed LNP site (see Section 2.4.2). Commercial fisheries allowed in the Gulf of Mexico in offshore Florida waters for Citrus and Levy Counties include black mullet (*Mugil cephalus*), red grouper (*Epinephelus morio*), crevalle jack (*Caranx hippos*), ladyfish (*Elops saurus*), black grouper (*Epinephelus mystacinus*), gag grouper (*Mycteroperca microlepis*), grunts (family *Haemulidae*), porgies (family Sparidae), pink shrimp (*Farfantepenaeus duorarum*), blue crab, stone crab , and oysters (*Crassostrea viginica*). All of these species are also considered recreationally important and are described in detail in Section 2.4.2.

Important Species

Important species and species of concern listed for the Crystal River site are the same as those already described for the proposed LNP site. For species and habitat descriptions, refer to Table 2-13 in Section 2.4.2.

Critical Habitats

There are no critical habitats designated by the NMFS or FWS in the vicinity of the Crystal River site. Critical habitat for the gulf sturgeon (*Acipenser oxyrinchus desotoi*) occurs on the Gulf Coast of Florida in the Suwannee River over 29 mi to the northwest from the mouth of the CFBC, and immediate offshore area and is described further under the Federally and State-listed species subheading for gulf sturgeon (68 FR 13370). Critical habitat for the smalltooth sawfish (*Pristis pectinata*) is currently under review for designation of more than 220,000 ac of coastal habitat in the Charlotte Harbor estuary and more than 619 coastal ac in the Ten Thousand Islands/Everglades region of Florida Bay and are described further under the Federally and State-listed species subheading for smalltooth sawfish (73 FR 70290). Critical habitat for the Florida manatee closest to the Crystal River site includes Crystal River and its Kings Bay headwaters in Citrus County (41 FR 41914).

Essential Fish Habitats

The CREC intake and discharge areas of the Gulf of Mexico are designated by the Gulf of Mexico Fisheries Management Council as Ecoregion 2, which is a management unit that extends from Tarpon Springs north to Pensacola Bay, Florida (GMFMC 2004). Estuarine essential fish habitat has been designated by NMFS for Crystal Bay for species listed in Table 2.14 in Section 2.4.2.3. There are no habitat areas of particular concern near the CREC.

Non-Native and Nuisance Species

No invasive aquatic species have been noted in the aquatic environments at the Crystal River site (PEF 2008).

Federally and State-Listed Species

Federally and State-listed aquatic species that may occur near the Crystal River site and along existing transmission-line corridors include the endangered Florida manatee, green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), hawksbill sea turtle (*Eretmochelys imbricata*), Kemp's ridley sea turtle (*Lepidochelys kempii*), smalltooth sawfish, and the threatened gulf sturgeon and loggerhead sea turtle (*Caretta caretta*). Detailed species information is provided in Section 2.4.2.3.

Building Impacts

No onsite waterbodies would be adversely affected by building activities on the CREC site. Installation of a new intake and discharge structure in the existing CREC discharge canal would result in the temporary displacement of aquatic biota within the vicinity of these structures. It is expected that these biota would return to the area after installation is complete. Impacts on aquatic organisms from installation activities in the discharge canal would be temporary and minor and largely mitigable through the use of BMPs. Installation activities for makeup water and discharge for two new units at CREC would have minimal impact on the aquatic ecology of Crystal Bay.

New transmission lines would be required to connect the facility to the existing load centers. The additional transmission lines could be installed in existing corridors when possible to avoid sensitive or critical habitat areas. Transmission-line corridors are assumed to follow those identified for LNP without the need for an LNP-to-CREC corridor (CH2M Hill 2009). PEF anticipates transmission-line corridors would cross 6 streams and 135 open waterbodies and should have minimal impact on aquatic resources (CH2M Hill 2009). Therefore, assuming that no transmission towers are placed in waterbodies and the use of good management practices during construction, the staff concludes that the impacts associated with new transmission lines would be minimal.

Operational Impacts

Impingement and entrainment of organisms from Crystal Bay would be the most likely impacts on aquatic populations that could occur from operation of two new nuclear units at CREC. After submission of a Clean Water Act Section 316 (b) report by PEF (Stone and Webster 1985), the EPA found that entrainment and impingement of fish and shellfish was unacceptable at CREC due to use of once-through cooling for CREC Units 1–3. Mitigation for entrainment and impingement is currently met through seasonal flow reduction and a restocking program at CREC for red drum, spotted seatrout, pink shrimp, striped mullet, pigfish, silver perch, blue crab, and stone crab (PEF 2008).

The NMFS issued a Biological Opinion in 2002 allowing for an incidental take of 75 live sea turtles from CREC intake structures and 3 causally related lethal takes annually. The annual take and release of 75 live turtles annually was determined to have no impact on turtle populations, and the annual lethal take of 3 turtles was considered to represent a small percentage of total sea turtle take in the Southeast United States (NMFS 2002). Due to PEF's commitment to use best available technology, and the small incremental increase in cooling-water withdrawal for the two new units, it is expected that there will be no significant increase in sea turtle mortalities attributable to the operation of two additional closed-cycle units at the CREC site.

Assuming a closed-cycle cooling system and a maximum through-screen intake velocity of 0.5 ft/sec or less which meets the EPA's Phase I regulations for new facilities (66 FR 65256), the anticipated additional impacts on aquatic populations from entrainment and impingement are expected to be minimal.

The current NPDES permit for CREC requires that thermal effluents not exceed 96.5°F during the summer months. Helper cooling towers are used to comply with thermal limits, and reduction in power generation from coal-fired CREC Units 1 and 2 is sometimes used during the hottest summer months to ensure thermal compliance. The additional discharge associated with two new units (122 Mgd) would increase the total CREC site discharge volume by less than 5 percent. Thermal impacts could be mitigated by the addition of helper cooling towers as is proposed for the CREC Unit 3 uprate (PEF 2007a). The impact on aquatic populations from the additional discharge of water from two new closed-cycle units into Crystal Bay is expected to be minimal.

The review team concludes that operational impacts on aquatic biota from maintenance of the transmission-line corridors would also be minimal assuming that appropriate BMPs and transmission-line maintenance procedures are used.

Cumulative Impacts

Cumulative impacts on aquatic resources within Crystal Bay may include the operation of CREC Units 1–5 for impingement, entrainment effects, and chemical and thermal impacts from discharge. Two new units would require an additional 122 Mgd of makeup water that is likely to come from discharge effluent from CREC Units 1–5. It is therefore expected that intake operations would have no impact on impingement and entrainment rates. Discharge for two additional units would likely increase overall discharge to Crystal Bay by less than 5 percent (CH2M Hill 2009). Addition of helper cooling towers to control the temperature of discharge to Crystal Bay, and compliance with FDEP NPDES permitting requirements would minimize the potential for thermal and chemical discharge impacts, respectively. The proposed uprate of CREC Unit 3, when combined with existing CREC Units 1–5 discharge would result in no thermal increase with the operation of a new South Cooling Tower to augment the current modular helper cooling towers (PEF 2007a).

In addition, in the FDEP Conditions of Certification, there is a condition that PEF will retire its two oldest coal-fired plants (Units 1 and 2) when LNP Units 1 and 2 are licensed, built, and begin commercial operation (FDEP 2010a). If this occurs, the two new units would still require 122 Mgd of makeup water that would likely come from the discharge effluent of CREC Units 3, 4, and 5. It is again expected that intake operations would have minimal impact on impingement and entrainment rates. The discharge for the two additional units, with CREC Units 1 and 2 shut down, would decrease the discharge volume to Crystal Bay. With the cessation of operations for CREC Units 1 and 2, the thermal and chemical discharge plume to Crystal Bay, even with the addition of the two new units, would likely not result in an increase in impacts over current operating conditions at CREC.

Anthropogenic activities such as residential or industrial development near the vicinity of the nuclear facility can present additional constraints on aquatic resources. Future activities may include shoreline development (i.e., removal of habitat), increased water needs, and increased discharge of effluents into the Gulf of Mexico near Crystal Bay. Shoreline development is currently proposed by Citrus Mining and Timber, Inc. for commercial, industrial, and residential waterfront development along the CFBC to the west of US-19 (Citrus County 2009). The effects of future development could result in additional habitat loss and/or degradation due to water use using surface waters and groundwater withdrawal, point and non-point source pollution, siltation, and bank erosion. The review team is also aware of the potential for global climate change affecting aquatic resources. The impact of global climate change on aquatic organisms and habitat in the geographic area of interest is not precisely known. Global climate change would result in a rise in sea level and may cause regional increases in the frequency of severe weather, decreases in annual precipitation, and increases in average temperature (GCRP 2009). Such changes in climate could alter aquatic community composition on or near the Crystal River site through changes in species diversity, abundance, and distribution. Elevated water temperatures, droughts, and severe weather phenomena may adversely affect or severely reduce aquatic habitat, but specific predictions of aquatic habitat changes in this region due to global climate change are inconclusive at this time. The level of impact resulting from these events would depend on the intensity of the perturbation and the resiliency of the aquatic communities.

Summary Statement

Impacts on aquatic ecology resources are estimated based on the information provided by PEF, the State of Florida, and the review team's independent review. There are past and future activities in the geographic area of interest that could affect aquatic ecology resources in ways similar to the building and operation of two additional units at the Crystal River site. The use of Gulf of Mexico water for cooling eliminates much of the potential impact associated with water development needed for closed-cycle cooling for a new site. Proper siting of associated transmission lines, avoiding habitat for protected species, minimizing interactions with waterbodies and watercourses along the corridors, and the use of BMPs during corridor preparation and tower placement would minimize impacts related to the transmission system. Therefore, the review team concludes that the cumulative impacts of building and operating two new reactors on the Crystal River site combined with other past, present, and future activities on most aquatic resources in the Gulf of Mexico would be SMALL.

9.3.2.5 Socioeconomics

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affect socioeconomics, including the other Federal and non-Federal projects listed in Table 9-6. For the analysis of socioeconomic impacts at the Crystal River site, the geographic area of interest is considered to be the 50-mi radius (region) centered on the Crystal River site with special consideration of Citrus, Levy, and Marion Counties, because that is where the review team expects socioeconomic impacts to be the greatest. In evaluating the socioeconomic impacts of site development and operation at the Crystal River site in Citrus County, the review team undertook a reconnaissance survey of the site using readily obtainable data from the Internet or published sources.

The Crystal River site is in Citrus County, approximately 5 mi south-southwest of Inglis and 8 mi northwest of the City of Crystal River. The review team drew upon U.S. Census Bureau (USCB) 2000 data to find the available total construction workforce within the host county, adjacent counties, and any nearby counties with a major population center within a reasonable commuting distance from the site. For the Crystal River site, this included Citrus, Levy, Marion, Hernando, Sumter, and Pasco Counties. The total construction workforce available in these counties in 2000 was 33,633. Based on this availability, the review team assumed that 50 percent of the 3300 construction workforce, or 1650 workers would migrate into the area.

The review team identified Citrus County and the immediately adjacent Levy and Marion Counties as a primary Economic Impact Area (EIA) for the two new nuclear units in Citrus County on the basis of expected effects of in-migrating construction workers and families. The review team expects that a few of the in-migrating workers would choose to reside in Alachua County, more than an hour's commute distance, because of the amenities available in the large city of Gainesville, but the county's economy and community infrastructure are sufficiently large that the review team expects the effects would not be noticeable. Hernando, Pasco, and Sumter Counties offer no attractions beyond those offered by the immediately adjacent counties that would encourage a longer commute; consequently, the review team expects few in-migrating construction workers would live in these counties and associated effects would not be noticeable. The review team focused on effects of the construction workforce because the operations workforce would be smaller, with expected smaller socioeconomic impacts. Table 9-10 provides some socioeconomic data for the EIA.

For purposes of this analysis the review team projected that about 15 percent, or 247, of the in-migrating workers would choose to reside outside the EIA, with the remaining 1403 in-migrating workers distributed in the remainder of the 50 mi region. The review team considered two key factors that would influence in-migrating worker housing patterns: vacant housing in the EIA (with Marion at 56 percent, Citrus at 34 percent, and Levy at 10 percent of the total vacant housing in this area), and commute time. From these factors, the review team assumed that in-migrating workers at peak construction-related employment would be distributed 45 percent in Marion County, 45 percent in Citrus, and 10 percent in Levy. The review team further assumed that all workers would bring families; this is unlikely but provides an upper bound to population increase associated with the project. The review team used the 2.49 average Florida family size to project the distribution of new jobs and population in the EIA due to in-migrating workers listed in Table 9-11.

Physical and Aesthetics Impacts

The physical impacts on workers and the public of construction and operation at the Crystal River site would be similar to those described for the LNP site, with the primary differences due to the presence of the existing facilities and their workforces. People who work or live around the site could be exposed to noise, fugitive dust, and gaseous emissions from construction activities. Construction workers and personnel working onsite could be the most affected. Air-pollution emissions are expected to be controlled by applicable BMPs and Federal, State, and local regulations. During operation of the two units, standby diesel generators used for auxiliary power would have air-pollution emissions. It is expected that these generators would see limited use and, if used, would be used for only short time periods. Applicable Federal, State, and local air-pollution requirements would apply to all fuel-burning engines. The review team anticipated that the annual average exposure from gaseous emission sources at the site boundary would not exceed applicable regulations during normal operations. The impacts of

Table 9-10. Selected Socioeconomic Data for the EIA for the Crystal River Site

	Citrus	Levy	Marion	Data source
Population				
1980	54,703	19,870	122,488	(b)
1990	93,515	25,923,	194,833	(b)
2000	118,085	34,450	259,914	(c)
Projected 2010	147,311	40,694	348,610	(d)
Median Household Income (1999)	$31,001	$26,959	$31,944	(e)
Vacant Housing Units				
2000	9570	2703	15,908	(c)-(i)
2005	14,165	3360	24,860	(c)-(i)
Total Housing Units				
2000	62,204	16,570	122,663	(c)-(i)
2005	73,070	17,701	152,624	(c)-(i)
Workforce				
Employed	38,837	12,935	98,248	(e)
Construction	2105	1397	8803	(e)
Total schools[(a)]	0 A, 5B, 10 A-B, 4C, 1 A-C, 1 A-B-C	1 A, 1 A-B-C, 4 A-B, 3 B-C, 2 B, 2 C	2 A, 9 B, 29 A-B, 8 C, 1 B-C, 1 A-B-C	(f)
Number of Schools Failing Student-Teacher Ratio	4	0	4	(f)
Sheriff and Police	Crystal River	Inglis, Williston, Chiefland, Cedar Key.	Dunnellon, Belleview, Ocala	(g)
Emergency Services	23 fire stations; 29 paid and 98 volunteer firefighters	14 fire stations; 8 paid and 183 volunteer firefighters	27 fire stations; 351 paid and 100 volunteer firefighters	(h)
Population				(c)
White	96	87.1	85.3	
African American	2.6	11.2	12	
Hispanic	2.7	3.9	35.7	
Low-Income	11.7	18.6	13.1	(e)

Table 9-10. (contd)

(a) A = elementary school; B = middle school; C = high school
(b) USCB 1990
(c) USCB 2000b
(d) 2010 projection assuming 2000-2008 growth rate (USCB 2009) extends to 2010
(e) USCB 2000c
(f) FDOE 2009a
(g) Section 2.5.2.6
(h) Citrus, Levy: Section 2.5.2.6, Marion: Marion EM (2009), Marion Fire (2009)
(i) USCB 2007

Table 9-11. Projected Distribution of Workers and Associated Population Increase in the EIA for the Crystal River Site

County	Percent Population Increase 1990–2000(a)	Projected Percent Increase 2000–2010 (b)	Workers In-Migrating to Construct Two New Units at Crystal River Site	Employed Workforce in 2000	Population of In-Migrating Workers and Families	Population of Workers and Families (as a percent of projected 2010 population	Population of Workers and Families (as a percent of projected 2010 population + in-migrants)
Citrus	26.3	24.8	631	38,837	1572	1.07	1.06
Marion	32.9	34.1	631	98,248	1572	0.45	0.45
Levy	32.9	18.1	141	12,935	351	0.86	0.86

(a) Based on USCB data, as reported in PEF (2007b).
(b) Calculated as 1.25 times percent change 2000–2008 shown in USCB (2009), i.e., assumes rate of change for first 8 years would continue through last 2 years of the decade.

operations on air quality are expected to be minimal. As with building impacts, potential offsite receptors during operations are generally located well away from the site boundaries.

Residential and commercial areas are located away from the site boundaries, applicable air-pollution regulations would have to be met by PEF, and applicable BMPs would be put in place. Therefore, based on information provided by PEF and the review team's independent review of reconnaissance-level information, the staff concludes that the physical impacts of station construction and operation on workers and the local public around the Crystal River site would be minimal.

Construction and operations activities are not expected to affect any offsite buildings. Most buildings not located onsite are well removed from the site boundaries. Buildings most vulnerable to shock and vibration from pile-driving and other related activities are those located on the site, which could suffer noticeable temporary and short-term effects. No long-term physical impacts on structures, including any residences near the site boundaries, would be expected. Therefore, based on consideration of reconnaissance-level information, the review team concludes that the physical impacts of building and operating the two units at the Crystal River site on onsite and offsite buildings would be minor.

Although transmission-line corridors already exist to serve the Crystal River site, approximately 180 mi of additional transmission system infrastructure would be needed (estimates made by measuring the approximate distance of hypothetical corridors provided by CH2M Hill [2009]). PEF has assumed that new transmission lines would be collocated within existing transmission-line corridors to the extent possible, thereby minimizing potential terrestrial impacts. In addition, transmission-line corridors, towers, and access road would be situated to avoid critical or sensitive habitats and species to the extent possible. The width of the transmission-line corridor would depend on the size, voltage, and whether or not existing corridors could be used, and would vary from 55 ft to 460 ft wide. The buildings, cooling towers, and transmission lines and corridors associated with the new reactors would add an increasingly industrial landscape visible to viewers, with a noticeable aesthetic impact.

Demographic Impacts

Table 9-10 shows that the population in Citrus and Marion Counties increased between 1990 and 2000 at about the same rate as is forecast between 2000 and 2010; for Levy County, about half the rate of increase is forecast for 2000–2010 than for the prior decade. Based on the projections that the peak in-migrating population associated with the proposed project would constitute less than a 2-percent increase over the estimated 2010 populations, the review team found that the in-migrating population associated with building two new nuclear generating units would have a minor demographic impact in the EIA.

Economic Impacts

The review team determined that the impact of jobs associated with construction and preconstruction would have a minor effect on total employment in the EIA. The projected in-migrating workers would account for less than 2 percent of the year 2000 employee base of the EIA. The impact of approximately 541 jobs (70 percent of operations jobs) filled by in-migrating operations workers within a 1-hour commute of the site and the associated 519 indirect jobs would be minor on employment levels in the EIA. See Section 4.4.3.1 for derivation of indirect labor.

The review team assumed that tax revenues generated from sales and use taxes associated with construction and operation of two additional units at the Crystal River site would be similar to those evaluated for the LNP site in Sections 4.4.3.3 and 5.4.3.3, with a similar minimal impact on revenues in the EIA and the region. The review team concluded that increased property taxes from two new operating units at the Crystal River site following reassessment for improvements and for its expanded use as a utility would have a noticeable and substantial beneficial impact on Citrus County. The review team found that additional property taxes on new houses built by in-migrating workers would constitute a small percentage increase in the local tax base in the EIA; thus the impact of operations on residential property tax revenues would be minor.

Housing

The review team compared the 2000 figures for vacant housing in the EIA listed in Table 9-10 with the number of in-migrating workers projected for peak workforce years listed in Table 9-11. Table 9-10 housing figures do not include recreational vehicle (RV) parks, campgrounds, or hotels, and thus provide a lower bound of what would be available to house workers. In the EIA, less than 7 percent of the year 2000 vacant housing units in each county would be needed to house in-migrating workers, assuming that each worker occupied a separate housing unit. To estimate the number of houses required to accommodate the increase in population without the project, the review team divided by 2.49 (Florida average family size). The review team examined estimated housing stock for 2005–2007, based on USCB American Community Survey data, shown in Table 9-10 as year 2005 vacant housing units. The review team considered that half of the projected 2000–2010 increase was housed at the time the American Community Survey data were collected. The review team considered the housing needs of the other half, against the vacant housing figures produced by the survey. This analysis indicated that the EIA could absorb the projected increase. Based on this analysis, the review team concluded that impacts on housing availability related to the building and operation of a plant at the Crystal River site would be minor in the EIA.

Public Services

As discussed in Section 2.5, Citrus County has the capacity in community infrastructure to absorb incoming populations; the review team concluded that the impacts of building and operating two new nuclear generating units at Crystal River would be minimal on public services. Some localized noticeable effects would be felt in Levy County (fire-protection services and schools serving Yankeetown and Inglis) and Marion County (Dunnellon schools, police, and emergency services) for the reasons discussed in Section 4.4.4.4.

Transportation

The review team considered that the primary roads used to access the Crystal River site would be US-19, County Road 40 (CR-40), State Route 44 (SR-44), and SR-121, with US-19 linking to the site access road. US-19 has a level of service (LOS) standard of “B,” and SR-44, CR-40, and SR-121 have an LOS standard of “C.” The review team considered the impact of project-related traffic in terms of the likelihood that it would lower the LOS along US-19 below the assigned standard “B.” One-way annual average daily traffic (AADT) counts for US-19 range from 1600 to 8600 vehicles per day in southern Levy County, 4600 in northern Citrus County, 9300 north of the intersection with SR-44, and 13,000 south of the intersection with SR-44 (FDOT 2008). The review team assumed 2281 trips daily (following the LNP site analysis in Section 4.4.4.1); split 30 percent to/from the north and 70 percent to/from the south, based on the split of in-migrating worker residence patterns discussed above. At morning shift change, this would add 1977 cars to the total flow on US-19, 397 incoming from the north, 1025 from the south; and 165 outgoing to the north, 385 to the south. This would add about 10 percent volume to traffic coming south into the north of Citrus County and about 10 percent coming north from the intersection with SR-44. The review team found no evidence that the LOS for US-19 would change as a result of project-related traffic, and concluded that building two new units at the Crystal River site would have a minor transportation impact.

Recreation

Because of the close proximity of the Crystal River alternative site to the proposed site, the review team determined that impacts on recreational facilities and on the quality of the recreational experience during construction and preconstruction would also be minor at the Crystal River alternative site.

Education

Table 9-12 provides data about schools in the EIA. All schools met the State teacher-student ratio classroom requirements in 2007–2008 with the exception of four schools in Citrus County and four schools in Marion County. The review team assumed that school districts in the EIA, like those analyzed for the LNP site, would address short-term gains in student population with mobile classrooms. The review team assumed that students would accompany each in-migrating worker family in the same manner as indicated in Table 9-12.

Table 9-12. Educational System Impacts from In-Migrating Families at Peak Workforce Years

County	In-Migrating Worker Households	Grades PK–3 students	New Grades PK-3 Rooms[(a)]	Grades 4–8 Students	New Grades 4-8 Rooms[(b)]	Grades 9–12 Students	New Grades 9-12 Rooms[(c)]
Citrus	631	85	5	45	3	51	3
Marion	631	52	3	26	2	30	2
Levy	141	67	4	37	2	37	2

Source: Table 4-14 and State of Florida 2002.
(a) 18 students per teacher required by State law
(b) 22 students per teacher required by State law
(c) 25 students per teacher required by State law
PK = preschool

The review team found that the addition of up to 11 classrooms in Citrus County, 7 classrooms in Marion County, and 8 classrooms in Levy County would amount to less than 1 additional classroom per school, a minor impact even during the period when the greatest number of project-related students would be present.

Summary of Socioeconomics

Physical impacts on workers and the general public include impacts on existing buildings, transportation, aesthetics, noise levels, and air quality. Social and economic impacts span issues of demographics, economy, taxes, infrastructure, and community services. Based on information provided by PEF and its own independent evaluation, the review team finds that the socioeconomic effects of building of two additional nuclear units at Crystal River site would be minor for the EIA and region with the following exceptions. There could be possible short-term noticeable shock and vibration effects to onsite buildings during preconstruction and construction; and noticeable adverse effects on public services in Levy County (fire protection and schools serving Yankeetown and Inglis) and Marion County (Dunnellon schools, police, and emergency services) until local funding is adjusted after the units are operating. In addition, the review team anticipates long-term noticeable aesthetic affects for viewers of the new structures and transmission lines/corridors; and noticeable and substantial beneficial tax impacts in Citrus County once the units are operational.

Cumulative Impacts

In addition to assessing the incremental socioeconomic impacts from the building and operation of two nuclear units on the Crystal River site, the cumulative impact assessment considers other past, present, and reasonably foreseeable future actions that could contribute to the cumulative socioeconomic impacts on the region, including other Federal and non-federal projects and the projects listed in Table 9-6. As indicated in Table 9-6, the Crystal River site, the location of the CREC, contains four fossil-fuel units that began operating in 1966, 1969, 1982, and 1984 and a nuclear plant that began operating in 1977. This table also identifies other projects that might contribute to socioeconomic impacts.

Within the wider region, the resident population is concentrated around the cities of Gainesville to the north-northeast, Crystal River to the southeast, and Ocala to the east-northeast. In the EIA, Levy is the least populated and most rural county; followed by Citrus, which gained population and urban development after construction of the CREC; and then followed by Marion the most populated and least rural. All EIA school districts reported trends in school enrollments that indicated increasing populations of retired persons in the late 1990s and early 2000s, and all had projected a continuation of that trend before the recent economic downturn.

Within the region, the two reasonably foreseeable projects listed in Table 7-1 with the greatest potential to affect cumulative socioeconomic impacts would be the Tarmac King Road

Limestone Mine during construction and preconstruction of the LNP and the closure of two coal-fired units at CREC that would possibly occur during operation of the LNP. The other projects involve continuation of restricted development in existing parkland and open space, little or no change in current levels of employment at existing establishments, or new development consistent with controls in existing county comprehensive plans. The effects of these projects have been included in population and demand projections in the county comprehensive plans and in other public agency planning processes referenced in Sections 4.4 and 5.4, and have therefore been taken into consideration in the discussion above.

Tarmac has applied for permits to begin construction of the Tarmac King Road Limestone Mine in 2010, with operations beginning in 2012. The 4900-ac mine site is located 1 mi west of the intersection of US-19 and King Road in Levy County, within about 10 mi of the Crystal River site. Tarmac estimates that at the height of mining activity, about 500 trucks would leave the mine site daily and enter US-19 (Tarmac America 2010). These 500 trucks would add to the approximately 800 new trips heading south along US-19 and to the approximately 2000 total new trips during morning shift changes while the new units are being built at the CREC. Given the distance of the Tarmac site from the Crystal River site, the review team determined that this would not be sufficient to change the LOS of US-19, because the potential impacts from this increased traffic, coupled with increased traffic from the CREC during building of new units at the site, would be minor except during shift changes.

After construction, the EIA would experience reduced direct construction employment and related indirect jobs. This reduction would be somewhat offset by the introduction of new operations workers at the new units. The planned closure of two of the four coal-fired units at CREC that is expected to occur after the proposed two nuclear power units are operating would slightly increase the differential between peak construction and long-term employment. In addition, Citrus County would see a loss in tax revenue paid by PEF for the two coal-fired units at CREC, but the review team determined the loss in revenue would not be destabilizing given the new revenue from the two nuclear units and other remaining revenue sources. If the operating license for the existing nuclear unit at CREC were not renewed (it is currently valid through midnight December 3, 2016) and the unit closed, the loss of employment, income, and tax revenues would be larger.

In addition to socioeconomic effects directly related to building and operating the new units, cumulative socioeconomic impacts include economic, infrastructure, and community services impacts associated with the items listed in Table 9-6: operation of a new limestone mine, continued operation of a local quarry, continued and uprated operation of an existing nuclear unit at CREC, some expanded residential and commercial development consistent with county comprehensive plans, and some loss of employment and taxes associated with the potential shutdown of two coal-fired units at CREC.

The review team found that physical, demographic, economic, infrastructure, and community service impacts of construction, preconstruction, and operations of the new units at Crystal River would be generally minor. The review team identified noticeable short-term adverse effects on police, emergency, and fire-protection services and schools in specific local communities during peak employment years. The short-term adverse effects would be expected to become minor once local funding has been adjusted after a few years of operation. There would be long-term noticeable aesthetic effects for viewers of the new structures and Citrus County would see long-term noticeable and substantial beneficial tax impacts from two nuclear units.

The team determined that the cumulative socioeconomic effects of the Crystal River nuclear expansion and other past, present, and reasonably foreseeable projects would be SMALL with the following exceptions attributable to building and operating the two new nuclear units at the Crystal River site. There would be MODERATE short-term adverse effects on police, emergency service, fire protection, and schools in specific local communities during peak construction and preconstruction employment years. The short-term adverse effects would be expected to become SMALL once local funding has been adjusted after a few years of LNP operation. There would be long-term MODERATE adverse aesthetic effects for viewers of the new structures at the Crystal River site. Revenues from property taxes and sales taxes from operating the two new nuclear units at the site result in a LARGE beneficial impact level. This LARGE and beneficial tax benefit would fully offset the loss of tax revenues to Citrus County that would occur if the coal-fired CREC units 1 and 2 are decommissioned; but the net beneficial impact to tax revenues from the two new units at the Crystal River site would still be LARGE.

9.3.2.6 Environmental Justice

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that could have environmental justice effects, including the other Federal and non-Federal projects listed in Table 9-6. The cumulative environmental justice impacts were assessed for a 50-mi radius centered on the Crystal River site (NRC 2000).

The review team used the distribution of minority and low-income populations around the proposed LNP site to consider distributions around the nearby Crystal River site, which is approximately 9 mi southwest of the LNP site. As shown in Figures 2-26 through Figure 2-29, all census block groups with minority and low-income populations that meet the criteria discussed in Section 2.6 are located 10 mi or farther away from the LNP site; they are even farther away from the Crystal River site. The closest minority populations (both aggregate and African American) are in Citrus County between Citrus Springs and Dunnellon, approximately 18 mi from the Crystal River site; and the closest low-income populations, near Otter Creek in Levy County, are almost 30 mi from the site. There are concentrations of block groups with African-American populations around the communities of Otter Creek, Usher, Chiefland, and

Williston in Levy County between 25 and 35 mi from the site; around Ocala in Marion County, about 40 mi from the site; around Gainesville in Alachua County, about 55 mi from the site; as well as in the northwest corner of Sumter County, between 15 and 25 mi from the site. (Note: These are estimated linear distances from the Crystal River site; driving distances to all communities are greater.) There are concentrations of block groups with low-income populations that overlap with African-American populations around Otter Creek, Usher, and Chiefland in Levy County and around Ocala (Marion County) and Gainesville (Alachua County). As discussed in Section 2.6.2, the review team did not identify any evidence of unique characteristics or practices in minority or low-income communities that may result in different socioeconomic impacts for the LNP site compared to the general population. This conclusion holds for the Crystal River site.

As discussed in Section 9.3.3.5, the review team expects that building and operating two new nuclear units at the Crystal River site would have minimal physical impacts on all populations in Citrus and surrounding counties, including minority and low-income populations, because of their distance from the site, with the exception of long-term noticeable aesthetic affects for viewers of the new structures, including transmission lines and corridors. The adverse socioeconomic impacts on minority and low-income populations are also expected to be in proportion with the impacts discussed in Section 9.3.3.5 and are therefore minor for most elements, and noticeable in the short term for education, police, emergency services, fire protection, and transportation in certain locations. In these locations, there is no evidence that impacts would be disproportionately high and adverse towards minority or low-income populations as compared to other populations. Therefore, the review team concludes that the adverse impacts on minority and low-income populations resulting from construction and operation of two new nuclear reactors at the Crystal River site would be minimal. Because the review team found no evidence of unique characteristics or practices among minority or low-income populations that would lead to a disproportionately high and adverse impact, the review team concludes that environmental justice impacts would be minor.

Cumulative Impacts

The review team concluded that, as for socioeconomics effects discussed in Section 9.3.3.5, within the region, the two reasonably foreseeable projects listed in Table 9-6 with the greatest potential to affect cumulative environmental justice impacts would be the proposed Tarmac King Road Limestone Mine during preconstruction and construction of LNP and the possible closure of two coal-fired units at CREC during operation of LNP. The other projects involve continuation of restricted development in existing parkland and open space, little or no change in current levels of employment at existing establishments, or new development consistent with controls in existing county comprehensive plans. The review team believes the effects of these projects have been included in population and demand projections in the county comprehensive plans and in other public agency planning processes.

The review team found no evidence that the minor traffic contribution of the new mine and the net minor employment and tax effects of the possible closure of two CREC coal-fired units could impose disproportionately high and adverse affects on minority or low-income populations. The review team concluded that, in addition to other past, present, and reasonably foreseeable future projects, building and operating two new nuclear units at Crystal River would impose only a minor impact on minorities or low-income populations. Therefore, the environmental justice impacts would be SMALL.

9.3.2.7 Historic and Cultural Resources

The following cumulative impact analysis includes building and operating two new nuclear generating units at the Crystal River site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect historic and cultural resources, including the other Federal and non-Federal projects listed in Table 9-6. For the analysis of cultural impacts at the Crystal River site, the geographic area of interest is considered to be the Area of Potential Effect (APE) that would be defined for this site. This includes the direct effects APE, defined as the area physically affected by the site-development and operation activities at the site and within transmission–line corridors. The indirect effects APE is defined as the area visually affected and includes an additional 0.5-mi-radius APE around the transmission-line corridors and a 1-mi-radius APE around the cooling towers.

Reconnaissance activities in a cultural resource review have particular meaning. Typically, they include preliminary field investigations to confirm the presence or absence of cultural resources. However, in developing this EIS, the review team relied upon reconnaissance-level information to perform its alternative site evaluation in accordance with ESRP 9.3 (NRC 2000). Reconnaissance-level information is data that are readily available from agencies and other public sources. It can also include information obtained through visits to the site area. The following information was used to identify the historic and cultural resources at the Crystal River site:

- PEF ER (PEF 2009a)
- Atomic Energy Commission Final EIS for Crystal River Unit 3 (CREC Unit 3) (AEC 1973)
- PEF Crystal River Unit 3 License Renewal ER (PEF 2008)
- National Register of Historic Places database (NPS 2010)
- Florida Historical Markers Program (FDOS 2010)
- NRC Alternative Sites Visit October 14–17, 2008 (NRC 2009).

The Crystal River site is owned by PEF and is located adjacent to the CREC. Five existing power-generation units are located on the CREC site – four coal-fueled plants and one nuclear unit. Power generation at the CREC began in 1966. Historically, the site and vicinity were largely undisturbed and likely contained intact archaeological sites associated with the past 10,000 years of human settlement. Over time, the area has been disturbed by development associated with phosphate mining, cattle ranching, citrus farming, and timber production (PEF 2008). Cultural resource investigations, related to the initial construction and operation of CREC nuclear Unit 3, have been ongoing at the CREC since the 1970s.

A search of the Florida Historical Markers Program revealed that there is one historic marker located in Citrus County – the Historic Citrus County Courthouse, which was built in 1887 (FDOS 2010). The courthouse is also in the National Register of Historic Places (NRHP or National Register). A search of the NRHP database revealed that there are nine places in the NRHP, including the Floral City Historic District and the Crystal River Indian Mounds (NPS 2010). According to the Final EIS completed for the CREC Unit 3, the Crystal River Historical Memorial, a Native American ceremonial center and burial site is located near the CREC Unit 3 location (AEC 1973).

According to the ER for the license renewal of CREC Unit 3, the Florida Master Site File records list 37 archaeological studies that have been conducted in the vicinity of the CREC. Two of the studies appear to have been conducted in support of CREC Unit 3 projects and activities. Of particular interest is the archaeological survey of the CREC conducted in 1972 that included some additional investigations within a 5-mi radius of the facility. As a result of this survey, 43 archaeological sites were inventoried, 20 within the boundary of the CREC. With regard to the 20 sites identified on the Crystal River property, 18 were prehistoric, one was prehistoric and historic, and one was unspecified. None of these sites has been evaluated by the State Historic Preservation Office (SHPO) for eligibility for listing in the National Register. Siting of the two proposed units at the Crystal River site has the potential to affect resources through visual impacts from buildings and transmission lines. If any of the 20 properties is subsequently listed in the National Register, the visual impacts from the proposed project may result in significant alterations to the visual landscape within the geographic area of interest.

Building Impacts

To accommodate building two new nuclear generating units on the Crystal River site, PEF would need to clear approximately 300 ac for the main power plant site – the same area needed for the LNP site (PEF 2009a). If the Crystal River site were chosen for the proposed project, identification of cultural resources would be accomplished through additional cultural resource surveys and consultation with the SHPO, Tribes, and interested parties. The results would be used in the site-planning process to avoid cultural resources impacts. If significant cultural resources were identified by these surveys, the review team assumes that PEF would use the same protective measures used at the LNP site, and therefore the impacts would be minimal. If direct effects on significant cultural resources could not be avoided, land clearing, excavation, and grading activities could potentially destabilize important attributes of historic and cultural resources.

Section 9.3.2.1 describes the transmission-line corridors. While there are no existing transmission lines connecting directly to the Crystal River site, transmission-line corridors that connect to the CREC may be used to construct transmission lines for the Crystal River site (PEF 2009a). However, a new transmission-line corridor would be built to serve the Crystal River site. If the Crystal River site were chosen for the proposed project, the review team assumes that PEF would conduct its transmission line-related cultural resource surveys and procedures in a manner similar to that for the LNP site including Florida State site-certification conditions. In addition, the review team assumes the State of Florida's Conditions of Certification regarding transmission-line siting and building activities would also apply, and therefore the impacts would be minimal. If direct effects on significant cultural resources could not be avoided, land clearing, excavation, and grading activities could potentially destabilize important attributes of historic and cultural resources.

Operations Impacts

Impacts on historic and cultural resources from operation of two new nuclear generating units at the Crystal River site would include those associated with the operation of new units and maintenance of transmission lines. The review team assumes that the same procedures currently used by PEF, including the State of Florida's Conditions of Certification (FDEP 2010a), would be used for onsite and offsite maintenance activities. Consequently, the incremental effects of the maintenance of transmission-line corridors and operation of the two new units and associated impacts on the cultural resources would be negligible for the physical and visual APEs.

Cumulative Impacts

Past actions in the geographic area of interest that have similarly affected historic and cultural resources include rural, agricultural, and industrial development and activities associated with these land-disturbing activities such as road development. Table 9-6 lists past, present, and reasonably foreseeable projects and other actions that may contribute to cumulative impacts on historic and cultural resources in the geographic area of interest. Projects from Table 9-6 that may fall within the geographic area of interest for cultural resources include operation of CREC Units 1–5, uprate at CREC Unit 3, Crystal River Mariculture Center, other aquaculture facilities, and future urbanization.

Long linear projects such as new or expanded roads and pipelines may intersect the proposed transmission-line corridors. Because cultural resources can likely be avoided by long linear projects, the impacts on cultural resources would be minimal. Future projects associated with the CREC would not result in increased significance of the current physical or visual alterations of cultural resources when considered in addition to past and present activities. If building associated with such activities results in significant alterations (both physical alteration and visual intrusion) of cultural resources in the transmission-line corridors, then cumulative impacts on cultural resources would be greater.

Cultural resources are nonrenewable; therefore, the impact of destruction of cultural resources is cumulative. Based on the information provided by PEF and the review team's independent evaluation, the review team concludes that the cumulative impacts from building and operating two new nuclear generating units on the Crystal River site would be SMALL. This impact-level determination reflects the fact that the known cultural resources on the Crystal River site have not been evaluated by the SHPO for National Register eligibility, and if the Crystal River site were to be developed, then cultural resource surveys and evaluations would need to be conducted and PEF would assess and resolve adverse effects of the undertaking. Adverse effects could result in greater cumulative impacts.

9.3.2.8 Air Quality

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affect air quality, including the shutdown of two coal-fired units, and other Federal and non-Federal projects listed in Table 9-6. The geographic area of interest for the Crystal River site is Citrus County, which is in the West Central Florida Intrastate Air Quality Control Region (40 CFR 81.96).

The emissions related to building and operating a nuclear plant at the Crystal River site would be similar to those at the LNP site. The air quality status for Citrus County as set forth in 40 CFR 81.310 reflects the effects of past and present emissions from all pollutant sources in the region. Citrus County is classified as being in attainment for all NAAQSs.

The atmospheric emissions related to building and operating a nuclear plant at the LNP site in Levy County, Florida, are described in Chapters 4 and 5. Emissions of criteria pollutants were found to have a SMALL impact. In Chapter 7, the cumulative impacts of criteria pollutant emissions at the LNP site were evaluated and also determined to have a SMALL impact.

Cumulative Impacts

Reflecting on the projects listed in Table 9-6, the most significant with regard to air quality within Citrus County are the operations of Units 1–5 at the CREC. Four of these units are fossil-fuel plants. Assuming a timely completion and startup of LNP Units 1 and 2, PEF has agreed to shut down coal-fired CREC Units 1 and 2 by December 31, 2020 (FDEP 2010a). In the period while the fossil-fuel plants are in operation, their effluents are typically released through stacks with significant vertical velocity. Other industrial projects listed in Table 9-6 would have *de* *minimis* impacts. Given that these projects would be subject to institutional controls, it is unlikely that the air quality in the region would degrade to the extent that the region would be declared to be in nonattainment for any of the NAAQSs.

The air quality impact of the Crystal River site development would be local and temporary. The distance from building activities to the site boundary would be sufficient to generally avoid significant air quality impacts. There are no land uses or projects, including the aforementioned units at CREC, that would have emissions during site development that would, in combination with emissions from the Crystal River site, result in a degradation of air quality in the region.

Releases from the operation of two new units at the Crystal River site would be intermittent and made at low altitudes with little or no vertical velocity. The air quality impacts of the CREC are included in the baseline air quality status. The cumulative impacts from emissions of effluents from the Crystal River site and the aforementioned sources would be noticeable until 2020. After 2020, when the fossil-fuel units at CREC will likely be discontinued, the emissions from the Crystal River site and aforementioned sources would not be noticeable.

The cumulative impacts of greenhouse gas emissions related to nuclear power are discussed in Section 7.6.2. The impacts of the emissions are not sensitive to the location of the source. Consequently, the discussion in Section 7.6 is applicable to a nuclear power plant located at the Crystal River site. The review team concludes that the national and worldwide cumulative impacts of greenhouse gas emissions are noticeable. The review team further concludes that the cumulative impacts would be noticeable with or without the greenhouse gas emissions of the project at the Crystal River site or the potential shutdown of the fossil-fuel units at CREC.

Cumulative impacts on air quality resources are estimated based on the information provided by PEF and the review team's independent evaluation. Other past, present, and reasonably foreseeable future activities exist in the geographic area of interest (local for criteria pollutants and global for greenhouse gas emissions) that could affect air quality resources. The cumulative impacts on criteria pollutant air quality from emissions from the Crystal River site, other projects, and the CREC could be noticeable, principally as a result of the contribution of the fossil-fuel units at CREC. The national and worldwide cumulative impacts of greenhouse gas emissions are noticeable with or without the greenhouse gas emissions from the Crystal River site. The review team concludes that cumulative impacts from construction, preconstruction, and operations, as well as other past, present, and reasonably foreseeable future actions on air quality resources in the geographic area of interest would be SMALL to MODERATE for criteria pollutants (assuming the shutdown of the two coal units occurs) and MODERATE for greenhouse gas emissions. The incremental contribution of impacts on air quality resources from building and operating two new nuclear units at the Crystal River site would be insignificant for both criteria pollutants and greenhouse gas emissions.

9.3.2.9 Nonradiological Health

The following impact analysis includes impacts from building activities and operations for the Crystal River site. The analysis also considers other past, present, and reasonably foreseeable future actions that could affect nonradiological health, including the other Federal and non-Federal projects listed in Table 9-6. The building activities that have the potential to affect the health of members of the public and workers include exposure to dust and vehicle exhaust, occupational injuries, noise, and the transport of construction materials and personnel to and from the site. The operation-related activities that have the potential to affect the health of members of the public and workers include exposure to etiological agents, noise, EMFs, and impacts from the transport of workers to and from the site.

The nonradiological health impacts for the Crystal River alternative site would be similar to the impacts evaluated for the LNP site. For the same reasons discussed in Section 7.7, most of the nonradiological health impacts for building and operation (e.g., air emissions, noise, occupational injuries) would be limited to areas within approximately 2 mi from the site. Occupational injuries would occur only within the boundaries of the Crystal River site, and there would thus be no potential for cumulative impacts with other projects. Impacts of air and particulate pollutants released during building activities, and noise from construction and operation have likewise been assessed as minimal for the offsite receptors nearest to the Crystal River site.

For nonradiological health impacts associated with transmission lines, the geographic area of interest would be the transmission-line corridor. As was the case for operation at the LNP site, thermal discharge from two new units built at the Crystal River site would be discharged into the CREC outfall.

Building Impacts

Nonradiological health impacts on construction workers and members of the public from building two new nuclear units at the Crystal River site would be similar to those evaluated in Section 4.8 for the LNP site. The impacts include noise, vehicle exhaust, dust, occupational injuries, and transportation accidents, injuries, and fatalities. Applicable Federal and State regulations on air quality and noise would be complied with during the site-preparation and building phase. A detailed noise study has not been performed for the Crystal River site, but it is likely that noise impacts from building, except for rare, high-noise activities such as pile-driving, would comply with the Citrus County noise limit for industrial and agricultural areas of 75 dBA (Citrus County 2010). The incidence of construction worker accidents would be the same as the incidence of accidents estimated for the LNP site.

Analyses in Section 9.3.2.5 indicated that the traffic impacts in the vicinity of the Crystal River site would be minor and would not require mitigation. Interactions between the traffic destined for the Crystal River nuclear power plant project and the other power-generating plants are likely to increase the nonradiological health effects from traffic accidents in the vicinity of the Crystal River site. The additional injuries and fatalities from traffic accidents involving transportation of materials and personnel for building of a new nuclear power plant at the Crystal River site would be similar to those evaluated in Section 4.8.3 for the LNP site. Noise impacts from construction at the Crystal River site would be similar to those predicted for construction at the LNP site, although detailed noise modeling has not been performed. Noise levels would again be limited to comply with applicable Occupational Safety and Health Administration (OSHA) and local regulations.

The cumulative impacts of building two new units at the Crystal River site would, for the most part, be the same as for construction at the LNP site, because the bulk of the current and future projects are too distant from the Crystal River site for any interactions to occur. The exception is the Holcim Mine, which is approximately 1 mi from the CREC. Potential combined noise and particulate air emission impacts from quarry operations and nuclear plant construction activities might occur. The Crystal River Mariculture Center is also located adjacent to the Crystal River site, but combined nonradiological health impacts are unlikely to occur, given that the Mariculture center is already in operation and is unlikely to be a significant source of noise or air pollutant emissions. Combined impacts of building activities with other present and future projects in the area would be unlikely. The review team has concluded that cumulative nonradiological health impacts associated with construction at the Crystal River site and all current and foreseeable future projects would be minimal.

Operational Impacts

Occupational injuries and nonradiological health impacts on members of the public from operation of two new nuclear units at the Crystal River site would be similar to those evaluated in Section 5.8 for the LNP site. Occupational health impacts on workers (e.g., falls, electric shock or exposure to other hazards) at the Crystal River site are expected to be the same as those evaluated for workers at two new units at the LNP site. Exposure of the public to waterborne etiological agents at the Crystal River site would be limited by the current physical and administrative controls around the thermal discharge of the existing facility, and the exposures would be similar to those discussed in Section 5.8.1. The operation of the new units at the Crystal River site would not likely lead to an increase in waterborne diseases in the vicinity. Noise and EMF exposure would be monitored and controlled in accordance with applicable OSHA regulations. Noise impacts would be similar to those predicted for operations at the LNP site, although no detailed noise modeling has been performed for the Crystal River site. Effects of EMF on human health would be controlled and minimized by conformance with National Electrical Safety Code (NESC) criteria and adherence to the standards for transmission systems regulated by the FDEP. Traffic impacts during facility operation would be less than the impacts during building (minor).

Current and future energy projects with the potential for combined impacts include the ongoing operation of the CREC; these activities include the license renewal and uprate of CREC nuclear Unit 3 and the retirement of two older coal-fired generation plants at CREC when LNP Units 1 and 2 come online. The review team has concluded that the cumulative nonradiological human health impact would be minimal for operation at the Crystal River site. The increase risk to humans from exposure to etiological agents as a result of two additional nuclear closed-cycle units at the Crystal River site would be insignificant. Facility operations at Crystal River are unlikely to have any combined health impacts with other nearby projects (Crystal River Quarry and Crystal River Mariculture Center), and the other projects identified in Table 9-6 are too far away from the Crystal River site for cumulative impacts to be a concern. Thus, the cumulative nonradiological health impacts of these operations and the facility operations at the Crystal River alternative site would also be minimal.

The review team is also aware of the potential climate changes that could affect human health; recent analyses of these issues (GCRP 2009) have been considered in the preparation of this EIS. Projected changes in the climate for the region include an increase in average temperature and a decrease in precipitation, which may alter the presence of microorganisms and parasites in surface water. While the overall impacts of climate change may not be insignificant (Section 7.7), the effect of, or contribution to, these effects from operation at the Crystal River site is likely to be minor. The review team did not identify anything that would alter its conclusion regarding the presence of etiological agents or change in the incidence of waterborne diseases.

Summary

Based on the information provided by PEF and the review team's independent evaluation, the review team expects that nonradiological health impacts from building and operation of two new units at the Crystal River alternative site would be similar to the impacts predicted for the LNP site. While past, present, and future activities in the geographic area of interest could affect nonradiological health in ways similar to the building and operation of two units at the Crystal River site, the impacts would be localized and managed through adherence to existing regulatory requirements. The review team concludes, therefore, that cumulative impacts of nonradiological health associated with building activities and operations at the Crystal River site would be SMALL.

9.3.2.10 Radiological Impacts of Normal Operations

The following impact analysis includes radiological impacts from building activities and operation for two additional nuclear units at the Crystal River site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health, including other Federal and non-Federal projects listed in Table 9-6. As described in Table 9-6 (Section 9.3.2), the Crystal River site consists of five power-generating plants operated by PEF, four fossil-fuel plants and one nuclear plant, CREC Unit 3. The geographic area of interest is the area within a 50-mi radius of the Crystal River site. Other than CREC Unit 3, there are no major facilities that result in regulated exposures to the public or biota within 50 mi of the Crystal River site. However, there are likely to be hospitals and industrial facilities with 50 mi of the Crystal River site that use radioactive materials.

The radiological impacts of building and operating the proposed two AP1000 reactors at the Crystal River site include direct radiation and liquid and gaseous radioactive effluents. Releases of radioactive materials and all pathways of exposure would produce low doses to people and biota offsite, well below regulatory limits. The impacts are expected to be similar to those estimated for the LNP. The NRC staff concludes that the dose from direct radiation and effluents from hospitals and industrial facilities that use radioactive material would be an insignificant contribution to the cumulative impact around the Crystal River site. This conclusion is based on the radiological monitoring program conducted for the currently operating CREC Unit 3.

Based on the information provided by PEF and the NRC staff's independent analysis, the NRC staff concludes that the cumulative radiological impacts from building and operating the two proposed AP1000 units and other past, present, and reasonably foreseeable projects and actions in the geographic area of interest around the Crystal River site would be SMALL.

9.3.2.11 Postulated Accidents

The following impact analysis includes radiological impacts from postulated accidents from operations for two additional nuclear units at the Crystal River site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health from postulated accidents, including the other Federal and non-Federal projects and the projects listed in Table 9-6. The geographic area of interest considers all existing and proposed nuclear power plants that have the potential to increase the probability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the Crystal River site. As described in Section 9.3.2, the Crystal River site is adjacent to an existing power plant site; there is currently one nuclear facility on the adjacent site. There are no proposed reactors that have the potential to increase the probability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the Crystal River site.

As described in Section 5.11.1, the NRC staff concludes that the environmental consequences of design basis accidents (DBAs) at the LNP site would be minimal for AP1000 reactors. DBAs are addressed specifically to demonstrate that a reactor design is robust enough to meet NRC safety criteria. The AP1000 design is independent of site conditions, and the meteorological conditions of the Crystal River and LNP sites are similar; therefore, the NRC staff concludes that the environmental consequences of DBAs at the Crystal River site would be minimal.

Because the meteorology, population distribution, and land use for the Crystal River site are similar to the LNP site, risks from a severe accident for an AP1000 reactor located at the Crystal River site are expected to be similar to those analyzed for the LNP site. The risks for the LNP site are presented in Tables 5-17 and 5-18 and are well below the median value for current-generation reactors. In addition, estimates of average individual early fatality and latent cancer fatality risks are well below the Commission's safety goals (51 FR 30028). For the existing plant within the geographic area of interest, namely CREC Unit 3, the Commission has determined that the probability-weighted consequences of severe accidents are SMALL (10 CFR Part 51, Appendix B, Table B-1). The planned 20-percent power uprate at CREC Unit 3 will only be approved by the NRC if the probability-weighted consequences of severe accidents would continue to meet NRC's regulatory requirements. Therefore, the impact would continue to be SMALL. On this basis, the NRC staff concludes that the cumulative risks of severe accidents at any location within 50 mi of the Crystal River site would be SMALL.

9.3.3 Dixie Site

This section covers the review team's evaluation of the potential environmental impacts of siting a new two-unit nuclear power plant at the Dixie alternative site (hereafter Dixie site) in northern Florida. The site is located in a rural area of Dixie County northwest of the Suwannee River. The Suwannee River would be the source for water for plant cooling and other plant uses, and construction of a new water-storage reservoir would be required. Dixie is a greenfield site not currently owned by PEF (PEF 2009a). Conceptual routes of the transmission lines necessary to connect the Dixie site to the electrical grid are located in Taylor, Lafayette, Suwannee, Columbia, Gilchrist, Dixie, Levy, Citrus, Ocala, Sumter, Lake, and Hernando Counties.

The following sections include a cumulative impact assessment conducted for each major resource area. The specific resources and components that could be affected by the incremental effects of the proposed action if implemented at the Dixie site and other actions in the same geographic area were considered. This assessment includes the impacts of NRC-authorized construction and operations and impacts of preconstruction activities. Also included in the assessment are past, present, and reasonably foreseeable future Federal, non-Federal, and private actions that could have meaningful cumulative impacts when considered together with the proposed action if implemented at the Dixie site. Other actions and projects considered in this cumulative analysis are described in Table 9-13.

Table 9-13. Past, Present, and Reasonably Foreseeable Future Projects and Other Actions Considered in the Cumulative Analysis of the Dixie Site

Project Name	Summary of Project	Location	Status
Energy Projects			
Operation and Decommissioning of CREC Units 1–5	The CREC consists of five power-generating plants operated by PEF – four fossil-fuel plants and one nuclear plant. The fossil-fuel plants began operations in 1966, 1969, 1982, and 1984. The nuclear plant began operations in 1977.	Within 50 mi of the Dixie site in northern Citrus County	Operational. The State of Florida Siting Board's Conditions of Certification for LNP would require PEF to discontinue the operations of the two fossil-fuel units by December 31, 2020, assuming licensing, construction, and commencement of operation of LNP occurs in a timely manner (DOE/EIA 2010a; FDEP 2010a).
Renewal of the operating license for the CREC nuclear Unit 3	Extension of operations of CREC Unit 3 for an additional 20-year period beyond the end of the current license term, which is valid through midnight on December 3, 2016.	Within 50 mi of the Dixie site in northern Citrus County	Proposed. If granted, the license renewal would provide PEF the authority to continue operations through 2036. The draft Supplemental EIS for the license renewal is scheduled to be issued in 2010 (NRC 2010a).
Uprate at CREC Unit 3	CREC Unit 3 is planning to request a power uprate, or increase in the maximum power level at which the nuclear power plant may operate. The project would also include construction of a new helper cooling tower .	Within 50 mi of the Dixie site in northern Citrus County	Proposed. The application submitted to the State of Florida was approved in August 2008. USACE issued a public notice on May 25, 2010 (USACE, 2010a). An application is expected to be submitted to NRC in 2010 (PEF 2009f).
Florida Gas Transmission Company, LLC (FGT) Phase VIII Expansion Project	Construct natural-gas pipelines, new compressor , meter, regulator stations, and other appurtenant facilities	Various Counties in Alabama and Florida, including Levy, Citrus, and Hernando	Completion expected in 2011 (FERC 2010; Panhandle Energy 2010).

1 **Table 9-13.** (contd)

Project Name	Summary of Project	Location	Status
Parks and Conservation Areas			
Parks, forests, and reserves	Several parks, recreation, and conservation areas are located within the 50-mi region. Examples of such areas include Goethe State Forest, Cedar Keys National Wildlife Refuge; Cummer Sanctuary, Crystal River National Wildlife Refuge, Lower Suwannee National Wildlife Refuge; Crystal River Preserve State Park, Manatee Springs State Park, Yellow Jacket Conservation Area, Fowlers Bluff Conservation Area, Lower Coastal Creeks Conservation Area, and Steinhatchee Wildlife Management Area	Throughout region	Currently managed by various local, State, and Federal agencies and organizations. Development likely limited in these areas.
Other Actions/Projects			
Commercial forest management	Managed forests for timber production.	Throughout region	Operational
Commercial dairies	Several dairies are located within the 50-mi region, including the Levy County Dairy, Alliance, and Piedmont Dairies, Hill Top Dairy, Aurora Dairy, Dairy Production Systems, and Oak Grove Dairy, Inc.	Throughout region	Operational
Minor water dischargers and wastewater-treatment plants	NPDES-permitted dischargers in Fanning Springs, Trenton, Blitchville, Bell, Chiefland, Cedar Key, Suwannee, and other locations.	Throughout region	Operational
Concrete companies	Two ready-mixed concrete suppliers.	Within 10 mi	Operational (EPA 2010e, f)
Bryan Farms	Animal aquaculture	Within 10 mi	Operational (EPA 2010g)

2

Table 9-13. (contd)

Project Name	Summary of Project	Location	Status
Crystal River Mariculture Center	Multi-species marine hatchery adjacent to the CREC.	Within 50 mi	Operational (FFWCC 2010)
Kaiser Agricultural Chemicals	RCRA site on Suwannee River in Branford, Florida	Within 40 mi	Operational (EPA 2010h)
Other Actions/Projects			
Various hospitals and industrial facilities that use radioactive materials	Medical and other industrial isotopes	Within 50 mi	Operational in nearby cities and towns
Future urbanization	Construction of housing units and associated commercial buildings; roads, such as widening, bridges, and railroads; construction of water- and/or wastewater-treatment and distribution facilities and associated pipelines, as described in local land-use planning documents.	Throughout region	Construction would occur in the future, as described in State and local land-use planning documents (FDOT 2010a; Dixie County 2006).

The geographic area of interest for cumulative impacts considers all existing and proposed nuclear power plants that have the potential to increase the probability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the Dixie site. An accident at a nuclear plant within 100 mi of the Dixie site could increase this risk. The CREC is within 50 mi of the Dixie site and is included in Table 9-13. Other nuclear plants in Florida, Alabama, and Georgia that are more than 100 mi from the Dixie site are not included in the cumulative impact analysis.

9.3.3.1 Land Use and Transmission Lines

The following analysis includes impacts from building and operating two nuclear units at the Dixie site, along with the necessary transmission lines to connect them to the electrical grid. The analysis also considers other past, present, and reasonably foreseeable future actions that affect land use, including the other Federal and non-Federal projects listed in Table 9-13. For this analysis, the geographic area of interest for considering cumulative impacts is the area within the 20-mi radius of the Dixie site and within the transmission-line corridors. The review team determined that the 20-mi radius would represent the smallest area that would be directly affected because it includes the primary communities (such as Trenton, Chiefland, and Fanning Springs) that would be affected by the proposed project if it were located at the Dixie site.

Historically, Dixie County was known for commercial fishing, agriculture, and timber operations. Existing land uses in the vicinity of the Dixie site include agriculture, forestry, and low-density residential development. Several subdivisions are located along the Suwannee River. The area around the site is relatively flat, but prone to flooding (PEF 2009a). The Dixie site is subject to the Coastal Zone Management Act because the site is located within one of the designated Florida coastal zone counties. Manatee Springs State Park, Yellow Jacket Conservation Area, Fowlers Bluff Conservation Area, Lower Coastal Creeks Conservation Area, and Steinhatchee Wildlife Management Area lie within the region.

Zoning changes would likely be needed to accommodate construction and operation of a nuclear power plant at the Dixie site. Like the LNP site, the footprint of new power-generating units would be approximately 627 ac, with about 150 ac of additional land needed for temporary facilities and laydown yards. In addition, PEF indicates that a 1291-ac reservoir would be needed at the Dixie site to provide cooling water during periods of low flow of the Suwannee River (PEF 2009d; CH2M Hill 2009). Construction of these facilities would result in a permanent land-use change from the existing land uses described in the previous paragraph to a transportation, communications, and utilities land-use category.

Additional land-use impacts include possible additional growth and land conversions to accommodate new workers and services. Because the workforce would be dispersed over larger geographic areas in the labor supply region, the impacts from land conversion for residential and commercial buildings induced by new workers relocating to the local area can be absorbed into the wider region. Therefore, the review team concludes that such impacts would be minimal.

There are no existing transmission lines or transmission-line corridors in the geographic area of interest around the Dixie site. New transmission lines would need to be constructed to connect the site to existing transmission lines. The transmission lines would run through counties designated under the Florida Coastal Management Program. Any expansion of these transmission-line corridors would require review under the procedures established under the Florida Coastal Management Program. Procedures for siting new transmission lines in Florida are discussed in Section 4.1.2. The review team assumes that the conditions of certification issued to PEF by the FDEP would apply at all of the alternative sites

The review team estimated the linear run of the expected transmission-line corridors by referring to PEF Figure 3.3.3-9 (PEF 2009d), which depicts the potential routing of corridors needed to connect the Dixie units to the grid. That figure suggests that 340 mi of transmission-line corridor would be needed. For purposes of land-use impact analysis, the review team made the assumption that 10 ac/mi would be disturbed, based on the LNP case where 1790 ac are expected to be disturbed over the 180 mi of corridor, as discussed in Section 4.1.2. The review team concludes that this assumption is not unreasonable because siting in Florida is a relatively rigorous process (Site Certification Application process), and the applicant would be bound by permit conditions resulting from that process, which would require it to use existing corridors to the extent practicable. The review team expects that the Site Certification Application (SCA) process would be consistently applied anywhere transmission lines are proposed in Florida. Therefore, the review team concludes that about 3400 ac of land would be disturbed to construct the transmission-line corridors for the Dixie site. Similar to the case at the LNP site, the review team concludes that land-use impacts from developing about 340 mi of new transmission-line corridor to connect new units at the Dixie site would be noticeable, but not destabilizing, and additional mitigation beyond the measures and conditions identified would not be warranted.

Cumulative Impacts

Future urbanization in the review area could contribute to additional decreases in open areas, forests, and wetlands and generally result in some increased residential and industrialized areas. Currently, the area around the Dixie site consists of farmland, forests, and low-density rural residential land uses, but local land-use planning documents describe potential future construction of residential and commercial buildings. The population of Dixie County grew by 30.6 percent between 1990 and 2000 (USCB 2000d), so it seems reasonable to expect that an increase of 3 percent per year might continue into the foreseeable future. Increased urbanization, especially long linear projects such as new or expanded roads or pipelines also would contribute to the loss of open or forested areas and increase fragmentation of habitats along or near the transmission lines. Due to the extent of new transmission lines that would be built, the review team expects that the corridors would have a noticeable impact on the local area. These projects would have limited impacts on land use because a small incremental amount of land would be converted to a new land use, and it would be adjacent to the current roads or pipelines. Development would likely be limited in the nearby parks and recreational areas. Therefore, the incremental impacts associated with increased urbanization would be minimal.

Global climate change could increase temperature and reduce precipitation, which could result in reduced crop yields and livestock productivity (GCRP 2009), which, in turn, may change portions of agricultural and ranching land uses in the geographic area of interest. In addition, global climate change could increase sea level and storm surges in the geographic area of interest (GCRP 2009), thereby changing land use through inundation and loss of coastal wetlands and other low-lying areas. However, existing State and national forests, parks, reserves, and managed areas would help preserve wetlands and forested areas to the extent that they are not affected by sea-level rise. Because other projects identified in Table 9-13 that are within the geographic area of interest would be consistent with applicable land-use plans and control policies and would occur in dispersed locations, the review team considers their contribution to the cumulative land-use impacts to be relatively minor and manageable.

In the State of Florida's Conditions of Certification (FDEP 2010a), CREC Unit 1 and 2, two coal-fired plants, would stop operating by December 31, 2020, as long as PEF completes the licensing process, construction activities, and commences commercial operation of LNP Units 1 and 2 within a timely manner. If the Dixie site were selected, the review team expects the same condition would apply. If CREC Units 1 and 2 are shut down, land use at the units likely would remain industrial. Depending on economic conditions, PEF sells 60 to 95 percent of the coal plant ash to cement and building materials manufacturers, with the remainder going to Citrus Central Landfill in Lecanto, Florida. With the closure of CREC Units 1 and 2, this source of ash no longer would be available locally. The review team expects land-use impacts associated with the shutdown of CREC Units 1 and 2 would be minimal.

Because detailed information about the routing of the possible new transmission-line corridors is not known at this time, a complete evaluation of potential land-use impacts cannot be made. Based on the information provided by PEF and the review team's own independent review, the review team concludes that the cumulative land-use impacts of building and operating two new nuclear reactor units at the Dixie site and other projects would be MODERATE. The proposed project would be a significant contributor to the MODERATE impacts because of the substantial amount of land that would be needed for the proposed power plant, reservoir, and transmission infrastructure.

9.3.3.2 Water Use and Quality

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that could affect water use and quality, including the other Federal and non-Federal projects listed in Table 9-13. PEF has indicated that the development of this site for two nuclear units would require the building of a water reservoir on the Dixie site supplied with water from the Suwannee River (PEF 2009a). PEF has indicated that the site is located in an area considered to be low-lying and flood prone, and the construction of flood protection structures may be required (PEF 2009a).

The geographic area of interest for surface water at the Dixie site is considered to be the drainage basin of the Suwannee River upstream and downstream of the site, because the water resource in this area that could be affected if the proposed project were located at the Dixie site. For groundwater, the geographic area of interest is limited to the alternative site because PEF has indicated no plans for use of groundwater to build or operate the plant (PEF 2009a).

Historical flow data for water years 1941–2008 are available for Suwannee River near Wilcox and for the Suwannee River above the Gopher River near Suwannee, Florida (USGS 2010a, b). The Suwannee River near the Wilcox streamflow gauge is upstream of the Dixie site and the Suwannee River above the Gopher River streamflow gauge is downstream of the Dixie site.

Minimum flows and levels for the Suwannee River are summarized by the Suwannee River Water Management District (SRWMD) (SRWMD 2005).

The average streamflow reported by the SRWMD is approximately 10,000 cfs based on historic data from the gauge at Wilcox (SRWMD 2005). Mean annual flow for the past 10 years in the Suwannee River above Gopher River is reported as 7440 cfs (USGS 2009). Minimum flow and level objectives are established by the SRWMD for the Suwannee River (SRWMD 2005). For the Suwannee River near the Wilcox streamflow gauge, the recommended minimum flow is 6600 cfs from May to October and 7600 cfs from November to April (PEF 2007b). These minimum flows provide an indication of the water potentially available for use in building and operating two units at the site. During the 2008 water year, these minimum flows were equaled or exceeded only during the months of March and September. SRWMD would determine the actual yield available for consumption that exceeds recommended minimum flow. Based on the available information, the review team determined that the Suwannee River occasionally does not meet the SRWMD recommendation for minimum flow for extended periods during a water year.

The Lower Suwannee River was identified as being impaired by nutrients and was included on Florida's Verified List of Impaired Waters (Hallas and Magley 2008). A USGS report on the condition of the river states, "human health and ecological concerns have arisen recently because of the large nitrogen inputs to the land surface from fertilizers, animal wastes and atmospheric deposition. This problem occurs primarily in the middle and lower Suwannee and lower Santa Fe Rivers in Florida, where spring water and diffuse upward leakage of groundwater contribute substantial loads of nitrate-N" (USGS 2004). Based on available information, the review team determined that the waters of the Lower Suwannee River are impaired because of historical activities in the basin.

Building Impacts

Because the building activities at the Dixie site would be similar to those at the LNP site, the review team determined that the amount of surface water needed for building activities at the Dixie site would be similar to the proposed amount of groundwater use for building at the LNP site. During building activities at the LNP site, the total maximum usage is projected to be 550,000 gpd (0.85 cfs) and the projected average estimated groundwater usage is 275,000 gpd (0.43 cfs) (see Table 3-2). The review team assumed that surface water from the Suwannee River would be used at the Dixie site for potable and sanitary use as well as for various building-related activities. This surface-water withdrawal rate is minor when compared to the average annual flow in the Suwannee River (10,000 cfs). However, as mentioned above, recommended minimum flows were met only during March and October of the 2008 water year. The applicant would need to obtain an approval from the SRWMD to use surface water from the river for building activities. Because the surface-water withdrawal would be minor compared to the average annual flow and because the withdrawal from the river would be temporary and limited to the building period, the review team concludes that the impact of surface-water use for building the potential units at the Dixie site would be minimal.

As stated above, the review team assumed that no groundwater would be used to build the units at the Dixie site. The review team also assumed that the impact of dewatering the excavations needed for building two units at the site would be managed through the installation of diaphragm walls and grouting as is proposed for the LNP site. Therefore, because there would be no groundwater use and the impact of dewatering would be controlled, the review team determined that there would be minimal impact on groundwater resources.

Surface-water quality would most likely be affected by surface-water runoff during site preparation and the building of the facilities. The FDEP would require PEF to develop an E&SCP and a SWPPP (PEF 2009a). The plan would identify BMPs to control the impacts of stormwater runoff. The review team anticipates that PEF would construct new detention and infiltration ponds and drainage ditches to control delivery of sediment from the disturbed area to nearby waterbodies. Sediment carried with stormwater from the disturbed area would settle in the detention ponds and the stormwater would infiltrate into the shallow aquifer. While stormwater runoff is anticipated to contain nitrogen in low concentrations (Table 3-3) it is not anticipated to contribute significantly to the nutrient concentrations in the river and implementation of BMPs should minimize impacts on the Suwannee River near the Dixie site. Therefore, during building activities, the surface-water-quality impacts near the Dixie site would be temporary and minimal.

While building new nuclear units at the Dixie site, impacts on groundwater quality may occur from leaching of spilled effluents into the subsurface. The review team assumes that the BMPs PEF has proposed for the LNP site would also be in place during building activities at the Dixie site, and therefore the review team concludes that any spills would be quickly detected and remediated. In addition, groundwater impacts would be limited to the duration of these activities, and therefore would be temporary. The review team examined the BMPs that could be implemented at such a site (FDEP 2010a). Because any spills related to building activities would be quickly remediated under BMPs, and the activities would be temporary, the review team concludes that the groundwater-quality impacts from building at the Dixie site would be minimal.

Operational Impacts

PEF determined that a cooling-water reservoir would be needed at the Dixie alternative site. The review team assumed that the cooling water system for the proposed plant, if built and operated at the Dixie alternative site, would be similar to that proposed at the LNP site; specifically, the cooling water system would use cooling towers and blowdown would be discharged to the Suwannee River. The cooling-water reservoir would provide capacity for times when adequate water from the river may not be available. PEF did not provide details of the cooling-water intake and effluent discharge locations. However, it is standard practice for power plants to design cooling-water intake and effluent discharge locations such that recirculation of discharged effluent to the intake does not occur. The reservoir was sized assuming the plant would operate on four cycles of concentration, and that the total cooling-water requirements would be 45 Mgd (31,250 gpm). The reservoir was sized so that the storage is sufficient for a 90-day supply of cooling (PEF 2009d; CH2M Hill 2009).

PEF determined that the total amount of water required to operate two units would be approximately 40,000 gpm (89 cfs). As indicated in Chapter 3, evaporative losses from cooling two units would be approximately 28,000 gpm (62 cfs). As described above, minimum flows were equaled or exceeded for only 2 months during the 2008 water year, suggesting that even with a reservoir, alternative sources of water or other water-saving strategies may be required for operation of two units at the Dixie site. Monthly mean streamflow lower than the recommended minimum flows have occurred in other recent water years, most notably in 2000 (12 of 12 months were below recommended minimum flow), 2001 (10 of 12 months), 2002 (12 of 12 months), 2004 (9 of 12 months), 2006 (9 of 12 months), 2007 (12 of 12 months), 2008 (10 of 12 months), and 2009 (9 of 12 months). The review team determined that out of 69 water years of available streamflow record at Wilcox, mean monthly streamflow at Wilcox was less than the recommended minimum at least six months during the water year in 26 water years. Of these 26 water years, mean monthly streamflow was less than the recommended minimum at least nine months during the water year for 16 water years. The review team also determined that based on established minimum flows, the discharge in the Suwannee River at Wilcox does not exceed 22 and 16 percent of the months during the periods November through April and May through October, respectively. The cooling water withdrawal needed for the proposed plant is 89 cfs, which is less than 2 percent of the smallest recommended minimum streamflow at Wilcox in the Suwannee River. Based on the minimum flow requirements for the Suwannee River and the recent extended periods when these low flows have not been met, the review team determined that the operational impact of the proposed plant at the Dixie alternative site on surface water would be noticeable but not destabilizing.

As stated above, the review team assumed that no groundwater would be used to operate the units at the Dixie site. Therefore, because there would be no groundwater use, the review team determined that there would be no impact on groundwater resources.

During the operation of the proposed plant at the Dixie site, impacts on surface-water quality could result from stormwater runoff, discharges of treated sanitary and other wastewater, and blowdown from cooling towers into the receiving waterbody. PEF did not provide the blowdown rate at the Dixie site. The review team conservatively assumed that the blowdown rate would be the same as that at the LNP site, 57,923 gpm (129 cfs). This assumption is conservative because the proposed plant at the Dixie site would use freshwater from the Suwannee River rather than more saline water at the LNP site, requiring less frequent and smaller blowdown discharge. The FDEP would require PEF to develop a SWPPP (PEF 2009a). The plan would identify measures to be used to control stormwater runoff (PEF 2009a). The blowdown would be regulated by FDEP pursuant to 40 CFR Part 423 and all discharges would be required to comply with limits established by FDEP in an NPDES permit.

During the operation of new nuclear units at the Dixie site, impacts on groundwater quality could result from potential spills. Spills that might affect the quality of groundwater would be prevented or remediated by using BMPs. Because BMPs would be used to quickly remediate spills and no intentional discharge to groundwater should occur, the review team concludes that the impacts on groundwater quality from operation of two nuclear units at the Dixie site would be minimal.

Cumulative Impacts

In addition to water-use and water-quality impacts from building and operation activities, the cumulative impacts analysis considers past, present, and reasonably foreseeable future actions that affect the same water resources.

For the cumulative analysis of impacts on surface water, the geographic area of interest for the Dixie site is considered to be the drainage basin of the Suwannee River upstream and downstream of the site because this is the water resource in the river basin could be affected by the proposed project. For groundwater, the geographic area of interest is limited to 20 mi from the Dixie site because it is sufficiently large to characterize the cumulative groundwater-use impacts. Actions that have past, present, and future potential impacts on water supply and water quality near the Dixie site include existing agriculture and existing and future urbanization in the region.

The U.S. Global Change Research Program (GCRP) has compiled the state of knowledge in climate change (GCRP 2009). This compilation has been considered in the preparation of this EIS. The projections for changes in temperature, precipitation, droughts, and increasing reliance on aquifers within the Suwannee Basin are similar to those at the LNP site. Such significant changes in climate would necessitate adaptations to both surface-water and groundwater management practices and policies that are unknown at this time.

Cumulative Water Use

The water use during operation of the two units at the Dixie site (89 cfs) would significantly exceed the amount of water use during building activities (less than 1 cfs). The amount of water needed for plant operation, 89 cfs, is less than 1 percent of the long-term average flow of the Suwannee River at the site (10,000 cfs). Extended periods when flows in the Suwannee River are below the minimum flow levels set by the SRWMD have been observed. Reasonably foreseeable future actions in the Suwannee River basin (see Table 9-13) would also use additional waters. Based on the minimum flow requirements for the Suwannee River and the recent extended periods when these low flows have not been met, the review team determined that the surface-water-use impact of the proposed plant at the Dixie site would be minor but alternative sources of water or other water-saving strategies may be needed to support operation of two units at this site because the river discharge is frequently less than the recommended minimum flow.

Other projects listed in Table 9-13 are considered in the analysis included above or would have little or no impact on surface-water use. Therefore, the review team concludes that cumulative impacts on surface-water use would be MODERATE. Building and operating the proposed plant at the Dixie site would not be a significant contributor to these water-use impacts.

As stated above, the review team assumed that no groundwater would be used to build or operate the units at the Dixie site and that groundwater impacts from dewatering would be controlled with diaphragm walls and grouting. Therefore, the review team determined that there would be minimal impact on groundwater resources.

Other projects listed in Table 9-13 are considered in this analysis or would have little or no impact on groundwater use. Therefore, the review team concludes that cumulative impacts on groundwater use would be SMALL.

Cumulative Water Quality

Point and non-point sources have affected the water quality of the Suwannee River upstream and downstream of the site. As mentioned above, the Lower Suwannee River was identified as being impaired by nutrients and was included on Florida’s Verified List of Impaired Waters. Water-quality information presented for the impacts of building and operating the new units at the Dixie site would also apply to evaluation of cumulative impacts. The State of Florida would require PEF to develop a SWPPP (PEF 2009a), which would identify measures to be used to control stormwater runoff (PEF 2009a). The blowdown would be regulated by FDEP pursuant to 40 CFR Part 423 and all discharges would be required to comply with limits established by FDEP in an NPDES permit. Such permits are designed to protect water quality, and while stormwater runoff and plant discharge are anticipated to contain nitrogen in low concentrations (Table 3-3), they are not anticipated to contribute significantly to the nutrient concentrations in the river.

The lower Suwannee River appears on Florida’s list of impaired waters because of the presence of nutrients, fecal coliform, iron, and mercury in fish tissue (FDEP 2009f); therefore, the review team concluded that the cumulative impact on surface-water quality of the receiving waterbody would be MODERATE. Building and operating the proposed units at the Dixie site would not be a significant contributor to these impacts on surface-water quality because industrial and wastewater discharges from the proposed units would comply with NPDES permit limitations and any stormwater runoff from the site during operations would comply with the SWPPP (PEF 2009a).

As stated in Section 7.2.2.2, global climate change can result in a rise in sea level that may induce saltwater intrusion in the surficial and Floridan aquifers. Projected changes in the climate for the region during the life of the proposed units include an increase in average temperature and a decrease in precipitation. These changes are likely to result in changes in agriculture including crops, pests, and the associated changes in application of nutrients, pesticides, and herbicides that may reach groundwater. As a result, groundwater quality may be altered by the infiltration of chemicals. While the changes in groundwater quality that are indirectly attributable to climate change may not be insignificant, the review team did not identify anything that would alter its conclusion regarding groundwater quality above. The review team also concluded that with the implementation of BMPs, the impacts on groundwater quality from building and operating two new nuclear units at the Dixie site would likely be minimal. Therefore, the cumulative impact on groundwater quality would be SMALL.

Other projects listed in Table 9-13 are either considered in the analysis included above or would have little or no impact on surface-water and groundwater quality.

9.3.3.3 Terrestrial and Wetland Resources

Site Description

The following impact analysis includes direct, indirect, and cumulative impacts from construction and preconstruction activities and operations on terrestrial and wetland resources. The analysis also considers past, present, and reasonably foreseeable future actions that affect those resources, including the other Federal and non-Federal projects and the projects listed in Table 9-13. For the analysis of terrestrial ecological impacts at the Dixie site, the geographic area of interest is considered to be a 20-mi-wide area centered on the Dixie site and the associated offsite and transmission-line corridors. This 20-mi radius and corridor around each proposed transmission-line is expected to encompass the locations of possible development projects potentially capable of substantially influencing terrestrial ecological resources on and close to the Dixie project site. This geographical area of interest generally coincides with those defined for hydrology and aquatic ecology, both of which are closely interrelated with the terrestrial ecology of this setting. This area includes watersheds providing direct runoff from the Dixie site to the Suwannee River and other river basins, as well as the watersheds through which the transmission lines would be routed.

The Dixie site is a greenfield site located in the Gulf Coast Flatwoods ecoregion. It is situated in a remote rural area on the Lower Suwannee River, which is classified by the FDEP as an Outstanding Florida Water. The Suwannee River is considered one of the largest and most ecologically unique blackwater river systems in the southeastern United States. Land uses in the Lower Suwannee River basin generally include agriculture, commercial forestry, and low-density residential development. Vegetation communities present on the site and in the vicinity, including offsite corridors, are typical of those found in the Gulf Coast Flatwoods ecoregion consisting of slash pine and remnant longleaf pine with bottomland oak-gum-cypress forests in low-lying areas along most rivers (USDA 2006). Predominant cover types on the site include managed pine forestland and scrub vegetation. The topography is relatively flat with only minor relief (approximately 2 ft).

The proposed associated transmission-line corridors would begin in the Gulf Coast Flatwoods ecoregion and cross the Southwestern Florida Flatwoods and Central Florida Ridges and Uplands ecoregions. Vegetation community types in the Southwestern Florida Flatwoods ecoregion include forests dominated by slash pine, longleaf pine, cabbage palm, and live oak with typical understory species of sawpalmetto, gallberry, and grasses such as bluestems and wiregrasses (USDA 2006). Vegetation community types in the Central Florida Ridges and Uplands ecoregion include sandhill vegetation such as turkey oak, bluejack oak, and longleaf pine for the dominant canopy species along with common understory species of running oak, gopher apple, and bluestem and panicum grasses (USDA 2006).

Important Species

Common wildlife, including important species, associated with the above-mentioned ecoregions that may occur on the Dixie site, associated offsite corridors, and transmission-line corridors, includes recreationally important species such as Florida white-tailed deer, bobcat, feral hog, squirrel, northern bobwhite, and mourning dove, as well as skunk, raccoon and several species of woodpecker. Various bird, reptile, and amphibian species also have the potential to reside on the Dixie site and within the associated transmission-line corridors (USDA 2006; FNAI 2009).

Federal and State-listed threatened and endangered terrestrial species occur in Dixie County and all counties crossed by the transmission-line corridors. Some of these species may at times be found on or in vicinity of the Dixie site or within associated offsite corridors and transmission-line corridors. No critical habitat for these listed species has been designated by the FWS in Dixie County; however, no field studies have been conducted on the site and in vicinity offsite corridors or the associated transmission-line corridors. Table 9-13 lists all Federally and State-listed species that could occur on the Dixie site and in the vicinity, offsite corridors, and in the counties crossed by the likely transmission-line corridors. Counties that would be crossed by the transmission-line corridors include Citrus, Dixie, Levy, Marion, Hernando, Hillsborough, Pinellas, Pasco, and Sumter Counties. PEF has stated that on-the-ground field surveys would be conducted before commencement of ground-disturbing activities on the site and in the offsite corridors and transmission-line corridors as required by the FDEP (PEF 2009a; CH2M Hill 2009; FDEP 2010a).

Building Impacts

Some impacts from building two nuclear units and supporting facilities on wildlife habitat would be unavoidable. Activities that would affect wildlife include land clearing and grading (temporary and permanent), filling and or draining of wetlands, increased human presence, heavy equipment operation, traffic, noise, avian collisions, and fugitive dust. These activities would likely displace or destroy wildlife that inhabits the areas of disturbance. Some wildlife, including important species, would perish or be displaced during land clearing for any of the above projects as a consequence of habitat loss, fragmentation, and competition for remaining resources. Less mobile animals, such as reptiles, amphibians, and small mammals, would be at greater risk of incurring mortality than more mobile animals, such as birds, many of which would be displaced to adjacent communities.

Undisturbed land adjacent to the areas of disturbance could provide habitat to support displaced wildlife, but increased competition for available space and resources could affect population levels. Wildlife would also be subjected to impacts from noise and traffic, and birds could be injured if they collide with tall structures. The impact on wildlife from noise is expected to be temporary and minor. The creation of new transmission-line corridors could be beneficial for some important species, including those that inhabit early successional habitat or use edge environments, such as white-tailed deer, northern bobwhite, eastern meadowlark, and the gopher tortoise. Birds of prey, such as red-tailed hawks would likely exploit newly created hunting grounds. Forested wetlands within the corridors would be converted to and maintained in an herbaceous or scrub-shrub condition that could provide improved foraging habitat for waterfowl and wading birds. However, fragmentation of upland and wetland forests could adversely affect species that are dependent on large tracts of continuous forested habitat.

To accommodate the building of two nuclear units on the Dixie site, PEF would need to clear approximately 441 ac of terrestrial habitats for the nuclear facility and approximately 579 ac for associated offsite structures and corridors, and an additional 1292 ac of land would need to be cleared and excavated to accommodate a reservoir (see Table 9-14 and Table 9-15) (CH2M Hill 2009).

Table 9-14. Summary of Impacts by Land-Use Class for the Dixie Alternative Site

Land-Use Class (FLUCFCS) (acreage)	Onsite	Reservoir	Offsite Corridors (Except Transmission)	Transmission Corridors[(a)]
Urban and Built Environment (percent of area)	0 (0%)	0 (0%)	95 (16%)	2518 (19%)
Agriculture	0 (0%)	0 (0%)	172 (30%)	2147 (16%)
Upland Nonforested	0 (0%)	32 (2%)	16 (3%)	265 (2%)
Upland Forested	433 (98%)	1170 (91%)	254 (44%)	3180 (24%)
Water	0 (0%)	0 (0%)	3 (1%)	149 (1%)

Table 9-14. (contd)

Land-Use Class (FLUCFCS) (acreage)	Onsite	Reservoir	Offsite Corridors (Except Transmission)	Transmission Corridors[(a)]
Wetlands	8 (2%)	90 (7%)	38 (7%)	2163 (16%)
Barren Lands	0 (0%)	0 (0%)	0 (0%)	18 (<1%)
Transportation, Communication and Utilities	0 (0%)	0 (0%)	2 (<1%)	2849 (21%)

Source: CH2M Hill 2009
(a) Acreages shown in table for transmission-line corridors are total acres available, not total acres affected.

Table 9-15. Total Terrestrial Habitat Impacts on the Dixie Site

Impact Areas	Acres
Onsite Impact Areas	441
Reservoir Impact Areas	1292
Transmission-Line Corridor Areas	13,288[(a)]
Offsite Impact Areas	579
Total Impact Areas	2312 (plus portion of 13,288 ac transmission corridor)

Source: CH2M Hill 2009
(a) Acreages for transmission lines are total acres available, not total acres affected.

Based upon FLUCFCS land-use data, approximately 8 ac of wetlands would be affected on the site during building (CH2M Hill 2009). Approximately 38 ac of wetlands would be affected in the offsite corridors (CH2M Hill 2009). Approximately 90 ac of wetlands would be affected to excavate the reservoir (CH2M Hill 2009). PEF states that the nuclear facility would be sited to avoid wetlands whenever possible and potential impacts on wetlands near building zones would be minimized through the use of established BMPs (PEF 2009a). Under Federal and State permitting requirements, PEF would be obligated to mitigate any unavoidable construction impacts on jurisdictional wetlands and listed species (FDEP 2010a).

New transmission system infrastructure would be needed to support a nuclear power facility at the Dixie site and would include approximately 340 mi of transmission lines (estimates made by measuring the approximate distance of hypothetical corridors provided by CH2M Hill [2009]; see Section 9.3.3.1). There are no existing transmission lines or transmission-line corridors present on the site. PEF has assumed that new transmission lines would be collocated within existing transmission-line corridors to the extent possible to minimize potential terrestrial impacts. In addition, transmission-line corridors, towers, and access road would be situated to avoid critical or sensitive habitats and species to the extent possible. Transmission-line corridor width would vary from 55 ft to 460 ft wide, depending on size, voltage, and whether or not existing corridors could be used. These widths were used in the analysis of the hypothetical routes for each alternative site to determine land-use cover types (CH2M Hill 2009). The likely transmission-line corridors for the Dixie site consist of approximately 13,288 ac, of which approximately 2163 ac are wetlands (CH2M Hill 2009). Some portion of the total 3180 ac of upland forested habitat and 2163 ac of wetland habitat present in the corridors would be affected; however, because actual routes have not been determined, the impacts on forests and wetlands cannot be quantified (see Table 9-14). Under Federal and State permitting requirements, PEF would be obligated to mitigate any unavoidable construction impacts on jurisdictional wetlands and listed species. PEF stated that all land clearing associated with nuclear facility, offsite structures, and transmission-line creation would be conducted according to Federal, State, and local regulations, permit requirements, existing procedures, and established BMPs (PEF 2009a).

Building two new nuclear reactors at the Dixie site, including offsite corridors (excluding transmission line corridors) and a reservoir, would result in the loss of approximately 2312 ac of terrestrial habitat (Table 9-15). Clearing land within the 13, 288-ac transmission-line corridor would also result in a loss of an undetermined additional amount of forested terrestrial habitat and increase habitat fragmentation along the corridor. Other sources of impacts on terrestrial resources such as noise, increased risk of collision and electrocution, and displacement of wildlife would likely be temporary and result in minimal impacts on the resource. Because of the extent of unavoidable terrestrial habitat losses, building the two new units and associated facilities (including transmission lines) would noticeably alter the available terrestrial habitat on and in the landscape surrounding the Dixie site.

Operational Impacts

Impacts on terrestrial ecological resources, including important species, from operation of two new nuclear units at the Dixie site include those associated with transmission system structures, maintenance of transmission-line corridors, and operation of the cooling towers. Also, during plant operation, wildlife would be subjected to impacts from increased traffic.

Impacts on crops, ornamental vegetation, and native plants from cooling-tower drift cannot be evaluated in detail in the absence of information about the specific location of cooling towers at each alternative site. Similarly, bird collisions with cooling towers cannot be evaluated in the absence of information about the specific location of cooling towers at the site. The impacts of cooling-tower drift and bird collisions for existing power plants were evaluated in NUREG-1437 (NRC 1996) and found to be of minor significance for nuclear power plants in general, including those with various numbers and types of cooling towers. On this basis, the review team concludes, for the purpose of comparing the alternative sites, that the impacts of cooling-tower drift and bird collisions with cooling towers resulting from operation of new nuclear units would be minor.

Outdoor noise levels on the Dixie site are predicted to range from 90 dBA near the loudest equipment to 65 dBA in areas more distant from major noise sources (PEF 2009a). Noise modeling predicts not perceptible to slight increases in noise from plant operations at the site boundary (PEF 2009a). Except in areas immediately adjacent to major noise sources, expected noise levels would be below the 60- to 65-dBA threshold at which birds and red foxes (a surrogate for small and medium-sized mammals) are startled or frightened (Golden et al. 1980). Thus, noise from operating cooling towers at the Dixie site would not be likely to disturb wildlife beyond the site boundary. Consequently, the review team concludes that the impacts of cooling-tower noise on wildlife would be minimal.

An evaluation of specific impacts resulting from building of transmission lines and transmission-line corridor maintenance cannot be conducted in any detail due to the lack of information, such as the specific locations of new rights of way that could result from transmission system upgrades. However, in general, impacts associated with transmission-line operation consist of bird collisions with transmission lines, EMF effects on flora and fauna, and habitat loss due to corridor maintenance. The impacts associated with transmission-line corridor maintenance activities include alteration of habitat, including but not limited to wetland and floodplain habitat, due to cutting and herbicide application.

Transmission lines and associated structures pose a potential avian collision hazard. Direct mortality resulting from birds colliding with tall structures has been observed (Erickson et al. 2005). Factors that appear to influence the rate of avian impacts with structures are diverse and related to bird behavior, structure attributes, and weather. Migratory flight during darkness by flocking birds has contributed to the largest mortality events. Tower height, location, configuration, and lighting also appear to play a role in avian mortality. Weather, such as low cloud ceilings, advancing fronts, and fog also contribute to this phenomenon. Waterfowl may be particularly vulnerable due to their low, fast flight and flocking behavior (EPRI 1993). Bird collisions with transmission lines are recognized as being of minor significance at operating nuclear power plants, including those with transmission-line corridors with variable numbers of power lines (NRC 1996). Accordingly, although additional transmission lines would be required for new nuclear units at the alternative sites, increases in bird collisions would be minor and these would likely not be expected to cause a measurable reduction in local bird populations. PEF would also be required to have an Avian Protection Plan in compliance with State certification guidelines (FDEP 2010a). Consequently, the incremental number of bird collisions posed by the addition of new transmission lines for new nuclear units would be negligible.

EMFs are unlike other agents that have an adverse impact (e.g., toxic chemicals and ionizing radiation) in that dramatic acute effects cannot be demonstrated and long-term effects, if they exist, are subtle (NRC 1996). A careful review of biological and physical studies of EMFs did not reveal consistent evidence linking harmful effects with field exposures (NRC 1996). At a distance of 300 ft, the magnetic fields from many lines are similar to typical background levels in most homes. Thus, impacts of EMFs on terrestrial flora and fauna are of small significance at operating nuclear power plants, including transmission systems with variable numbers of power lines (NRC 1996). Since 1997, more than a dozen studies have been published that looked at cancer in animals that were exposed to EMFs for all or most of their lives (Moulder 2003). These studies have found no evidence that EMFs cause any specific types of cancer in rats or mice (Moulder 2003). Therefore, the incremental EMF impact posed by addition of new transmission lines for new nuclear units would be negligible.

Existing roads providing access to the proposed transmission-line corridors at the alternative sites would likely be sufficient for use in any expanded corridors; however, new roads would be required during the construction of new transmission-line corridors. Management activities (cutting and herbicide application) related to transmission-line corridors and related impacts on floodplains and wetlands in transmission-line corridors are recognized as being of minor significance at operating nuclear power plants, including those with transmission-line corridors of variable widths (NRC 1996). The review team assumes that the same vegetation and construction management of corridors currently used by PEF would be used in the establishment and maintenance of the new corridors. Under the Conditions of Certification for the State, PEF would also be required to retain existing vegetation whenever practicable and use BMPs that comply with the Florida State regulations (FDEP 2010a). Consequently, the incremental effects of the maintenance of transmission-line corridors and associated impacts on floodplains and wetlands posed by expanding existing corridors or the addition of a new transmission-line corridor for new nuclear units would be negligible.

To summarize, the potential effects of operating two new nuclear reactors at the Dixie site would be primarily associated with the maintenance of transmission-line corridors and increased traffic. In general, operational impacts on terrestrial resources would be expected to be minimal.

Cumulative Impacts

There are no past or current actions in the geographic area of interest that have influenced terrestrial resources in a way exactly similar to the building and operation of the proposed two new nuclear units at the Dixie site. However, terrestrial habitats throughout the geographic area of interest have been extensively altered by a history of forestry and agricultural practices as well as low density residential development.

Proposed future actions that could affect terrestrial resources in a way similar to development at the Dixie site would include the proposed expansion of SR-26 from US-19 in Gilchrist County to CR-26A in Alachua County (22 mi), located within 10-mi northeast of the Dixie site that would include expansion of the existing two-lane roadway to a four-lane divided highway. Transmission-line creation and/or upgrading throughout the designated geographical ROI and future urbanization would also be expected to occur. However, there are several areas within the geographical ROI that are managed for the benefit of wildlife, including but not limited to Manatee Springs State Park, Yellow Jacket Conservation Area, and Fowlers Bluff Conservation Area.

The other impact on terrestrial resources at the Dixie site would be the effect of global climate change on plants and wildlife. The impact of global climate change on terrestrial wildlife and habitat in the geographic area of interest is not precisely known. Global climate change would result in a rise in sea level and may cause regional increases in the frequency of severe weather, decreases in annual precipitation, and increases in average temperature (GCRP 2009). Such changes in climate could alter terrestrial community composition on or near the Dixie site through changes in species diversity, abundance, and distribution. Elevated water temperatures, droughts, and severe weather phenomena may adversely affect or severely reduce terrestrial habitat. Specific predictions of habitat changes in this region due to global climate change are inconclusive at this time. However, because of the regional nature of climate change, the impacts related to global climate change would be similar for all of the alternative sites.

Summary Statement

Impacts on terrestrial ecology resources are estimated based on the information provided by PEF and the review team's independent review. Past, present, and reasonably foreseeable future activities in the geographic area of interest could affect terrestrial ecology in ways similar to the building of the proposed two units at the LNP site. The Dixie site and some of the associated transmission-line corridors are natural habitats that would be substantially altered by development and maintenance activities, noticeably affecting the level and movement of terrestrial wildlife populations in the surrounding landscape. Other anticipated development projects would further alter wildlife habitats and migration patterns in the surrounding landscape. The review team therefore concludes that the cumulative impacts on baseline conditions for terrestrial ecological resources would be MODERATE. This determination is based upon the extent of expected wetland loss and habitat fragmentation from ongoing and planned development projects, continued widespread manipulation of habitats for commercial forest management, and anticipated losses of habitat for important species. The incremental impacts from building and operating the Dixie project would be a significant contributor to the moderate cumulative impact, primarily because of a loss or modification of habitats that support wildlife, wetlands, and important species. Although incremental impacts on terrestrial resources could be noticeable near the Dixie project site, these impacts would not be expected to destabilize the overall ecology of the regional landscape.

9.3.3.4 Aquatic Resources for the Dixie Site

The following impact analysis includes impacts from building activities and operations on aquatic ecology resources. The proposed Dixie County alternative site has no existing infrastructure associated with development of a nuclear power plant. This greenfield site is adjacent to the Suwannee River, which is proposed as the water source for cooling and discharge. Water flow in the Suwannee River is managed by the SRWMD and has a multi-tiered minimum-flow-level program designed to maintain the quality of the unique freshwater springs system throughout the middle and Lower Suwannee River basin. The recommended minimum flow for the Lower Suwannee River is 6600 cfs for May–October, and 7600 cfs from November–April. PEF maintains that there would be adequate flow to supply water through a closed-cycle cooling design for a two-unit plant. However, under drought conditions, the Suwannee River may not be able to provide sufficient water, and PEF acknowledges that building of a reservoir would be required to ensure consistent water supply (PEF 2009a). The geographic area of interest considered includes the Suwannee River watershed from the Gulf of Mexico up to Fanning Springs, Florida, because it and the associated transmission-line corridors are the area most likely to be affected by new nuclear units.

The Suwannee River is classified by the State of Florida as an Outstanding Florida Water system. There are several State parks that could be affected by the proposed action. Dixie County natural areas include Fanning Springs State Park and Manatee Springs State Park, both of which have freshwater habitat used by Florida manatees seeking freshwater refuge. The offshore area from the mouth of the Suwannee River is part of the Big Bend Seagrasses Aquatic Preserve, which extends from the St. Marks River in Wakulla County to the mouth of the Withlacoochee River in Levy County. The preserve includes more than 55,000 ac of uplands in Taylor and Dixie Counties, referred to as the Big Bend marsh buffer (FDNR 1988).

The potential impacts on aquatic biota from building and operation of the proposed units at the Dixie site are assumed to be primarily to organisms inhabiting the Suwannee River and the immediate offshore habitat of the Gulf of Mexico.

Commercially and Recreationally Important Species

While no commercial fisheries exist for the Suwannee River, commercial fisheries allowed near the mouth of the Suwannee in the Gulf of Mexico include black mullet, red grouper, sea bass (*Centropristis* sp.), gag grouper (*Mycteroperca microlepis*), grunts, blue crab, and stone crab. Recreational species include these commercial species as well as sunfish species, catfish species, and largemouth bass (*Micropterus salmoides*) (Save our Suwannee, Inc., no date). Commercial species not previously described in Section 2.4.2 are described here.

<u>Sea Bass</u> (*Centropristis* sp.) are in the same family as groupers, and they spawn offshore from January through July. Larvae develop offshore, then move to onshore habitats and begin feeding on small fish, crustaceans, and shellfish. Sea bass associate with bottom structures such as reefs and rubble (ASMFC 2005). Landings of this species for Dixie County in 2008 exceeded 35,000 lb (FFWCC 2009a).

Non-Native and Nuisance Species

Water hyacinth (*Eichhornia crassipes*) and hydrilla (*Hydrilla verticillata*) are two common invasive aquatic plant species that have been noted in the Suwannee River, but are largely under control (Hoyer et al. 2005; FDEP 2002a). These species are managed by the State of Florida and should not be affected by power plant operations.

Critical Habitats

Critical habitats for the threatened gulf sturgeon occurs on the Gulf Coast of Florida in the Suwannee River and immediate offshore area and are described further under the Federally and State-listed species subheading for gulf sturgeon (68 FR 13370). The nearshore areas off Dixie County in the Gulf of Mexico are designated by the Gulf of Mexico Fisheries Management Council as essential fish habitat Ecoregion 2, which extends from Tarpon Springs north to Pensacola Bay, Florida (GMFMC 2004). Essential fish habitat has been designated by NMFS for the nearshore Gulf of Mexico area at the mouth of the Suwannee River, upstream to Little Lake City, Florida, for species and life stages listed in Section 2.4.2, Table 2-15. There are no habitat areas of particular concern near the Dixie site.

Federally and State-Listed Species

Federally and State-listed aquatic species that may occur near the Dixie County site and along existing transmission-line corridors include the endangered Florida manatee, green sea turtle, leatherback sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, smalltooth sawfish, and the threatened gulf sturgeon and loggerhead sea turtle. Detailed species information is provided in Section 2.4.2.3.

<u>Florida Manatee</u> (Trichechus manatus latirostris)

The Florida manatee northwest Florida population, which includes Citrus and Levy Counties, constitutes approximately 12 percent of the total manatee population. This subpopulation of manatees has the greatest concentration in the Crystal River area, where they are protected under the ESA, Marine Mammal Protection Act of 1972, as amended (16 USC 1361, et seq.), and the Florida Manatee Sanctuary Act. In the winter, manatees migrate to warmer waters near the coast and are known to occur in the Suwannee River in Manatee Springs State Park (FDEP 2002b) and Fanning Springs State Park (FDEP 2009c).

<u>Sea Turtles</u>

Four species of sea turtle are listed as Federally and State endangered, with the loggerhead sea turtle listed at both Federal and State levels as threatened. All sea turtles have certain life-history similarities in that females swim ashore to sandy beaches and deposit eggs in nesting pits that are covered to allow incubation. Juveniles hatch, struggle out of the sandy nest and make their way to their respective ocean habitats. Although there are no sandy coastline habitats in the area of the Suwannee River, juvenile and adult sea turtle life stages have been found in the offshore Gulf of Mexico area. Sea turtle sightings offshore of the Suwannee River have been documented since 1999.

Gulf Sturgeon (*Acipenser oxyrinchus desotoi*)

The current range of the gulf sturgeon is limited to the Mississippi River east to the Suwannee River, Florida, where the Suwannee River supports the largest subpopulation of gulf sturgeon (Carr et al. 1996). Critical habitat for Florida is designated for 182 mi of the Suwannee River, 12 mi of the northern Withlacoochee River where it branches off to the north of the Suwannee River, and 211 mi^2 of estuarine/marine area of Suwannee Sound that is north of Cedar Key (68 FR 13370). Gulf sturgeon show a high homing fidelity (site-specific) spawning behavior based on gene flow between river drainages (Stabile et al. 1996). Male gulf sturgeon mature in 7 to 9 years and females in 8 to 12 (Huff 1975). Adults spend 8 to 9 months in river habitat, near springs in the Suwannee River, and move to estuarine or Gulf of Mexico waters during the coolest months to feed (FWS and GSMFC 1995). Spawning occurs in the Suwannee River when temperatures range between 17 to 22°C in late March to mid-April and the substrate is characterized as clean gravel-cobble mix over rock with strong, persistent laminar flows and eddies that created reversed or diminished bottom currents (Sulak and Clugston 1998). Young-of-the-year sturgeon disperse widely downstream of spawning habitats within the river inhabiting open sandy areas away from shorelines and vegetation (Sulak and Clugston 1998). Timing and location of spawning grounds in the Suwannee River are not well documented, but it is believed that females seek out gravel or rock bottom habitats associated with freshwater springs (FWS and GSMFC 1995). Because specific spawning locations and habitat usage by gulf sturgeon within the Suwannee River are largely unknown, the critical habitat designation includes the entire Suwannee River.

Smalltooth Sawfish (*Pristis pectinata*)

Observations of smalltooth sawfish north of Port Charlotte are rare, but three sightings along the coastal Dixie County region have been documented since 2002, notably in the mouth of the Suwannee River (FMNH 2009). However, adverse impacts are unlikely because these fish would avoid activities occurring in these areas.

Building Impacts

Cooling-water intake and discharge structures on the Swannee River in addition to a cooling-water reservoir would be required at the Dixie County site. Installation of a new intake and discharge would result in the temporary displacement of aquatic biota within the vicinity of both structures. It is expected that these biota would return to the area after installation is complete. Sedimentation due to disturbances of the river bank and bottom during installation activities could affect local benthic populations. Impacts on aquatic organisms would be temporary and largely mitigable through the use of BMPs. However, as the Suwannee River is considered critical habitat for the gulf sturgeon, some loss of critical habitat may occur through dredging or installation activities associated with intake and discharge structures. Building impacts of a cooling-water reservoir may be significant depending on the siting of the reservoir. During the review team's site visit, observations of the proposed site via public roads indicated that there are streams present that are either perennial or seasonal. Offsite transmission-line corridors would cross two streams, and one open waterbody (CH2M Hill 2009). These aquatic resources have not been examined for diversity of aquatic biota, but nonetheless, still represent aquatic habitat that would likely be affected by the building of facilities for the site. The use of good management practices and BMPs during building activities could result in minimal impacts on the gulf sturgeon, which occurs in the vicinity of the proposed intake and discharge locations for the Dixie County site in the Suwannee River (CH2M Hill 2009). Consultation with FDEP and FWS would likely be required for in-water work associated with designated critical habitat for the gulf sturgeon and presence of manatees. PEF would comply with the Standard Manatee Conditions for In-Water Work (FDEP 2010a) for building activities in the Suwannee River to prevent impacts on manatees in the vicinity of intake and discharge installation activities. Due to the upriver location of the Dixie site, it is unlikely that there would be impacts on the smalltooth sawfish or sea turtles.

New transmission-line infrastructure would be required for a new two-unit facility. Currently no existing transmission-line corridors are located within the immediate vicinity of the Dixie greenfield site, and new corridors would need to be established. Likely transmission-line corridors identified by PEF appear to follow those identified for LNP without the need for an LNP-to-CREC corridor, and additional corridors in Columbia, Dixie, Gilchrist, Madison, and Suwannee Counties (CH2M Hill 2009). PEF anticipates transmission-line corridors would cross 13 streams and 140 open waterbodies and should have minimal impact on aquatic resources (CH2M Hill 2009).

Operational Impacts

Impingement and entrainment of organisms from the Suwannee River and inshore Gulf of Mexico and from a manmade reservoir would be the most likely impacts on aquatic populations that could occur from operation of two new nuclear units at the Dixie County site. Assuming a closed-cycle cooling system, a maximum through-screen intake velocity of 0.5 ft/sec or less, and an intake flow of less than or equal to 5 percent of the mean annual flow which meets the EPA's Phase I regulations for new facilities (66 FR 65256), the anticipated impacts on aquatic populations from entrainment and impingement are expected to be minimal. Thermal discharges from operations may result in increased use of habitat by manatees near the point of discharge to the Suwannee River and decrease some habitat suitable for Gulf sturgeon. Plant outages that result in cold shock could affect manatees and other aquatic biota that become habituated to power plant thermal discharges. However, it is unlikely that both units would be shut down at the same time. Operational impacts associated with water quality and discharge cannot be determined without additional detailed analysis. However, based on the review team's experience with other facilities, the review concludes that with proper design the impacts on aquatic resources from operation of two new nuclear units at the Dixie County site would likely be minimal with FDEP NPDES compliance.

The review team also concludes that operational impacts on aquatic biota from maintenance of the transmission-line corridors would also be minimal assuming that appropriate BMPs are used.

Cumulative Impacts

Cumulative impacts on aquatic resources within the Suwannee River basin include the operation of dairy farms and small businesses that discharge wastewater to the Suwannee River watershed within 10 mi of the Dixie site. These dairy operators and businesses have active NPDES permits for discharge.

Anthropogenic activities such as residential or industrial development near the vicinity of the nuclear facility can present additional constraints on aquatic resources. Future activities may include shoreline development (i.e., removal of habitat), increased water needs, and increased discharge of effluents into the Suwannee River. The effects of continued dairy practices could result in additional habitat loss and/or degradation due to water use using surface waters and groundwater withdrawal, point and non-point source pollution, siltation, and bank erosion. The review team is also aware of the potential for global climate change affecting aquatic resources. The impact of global climate change on aquatic organisms and habitat in the geographic area of interest is not precisely known. Global climate change would result in a rise in sea level and may cause regional increases in the frequency of severe weather, decreases in annual precipitation, and increases in average temperature (GCRP 2009). Such changes in climate could alter aquatic community composition on or near the Dixie site through changes in species diversity, abundance and distribution. Elevated water temperatures, droughts, and severe weather phenomena may adversely affect or severely reduce aquatic habitat, but specific predictions on aquatic habitat changes in this region due to global climate change are inconclusive at this time. The level of impact resulting from these events would depend on the intensity of the perturbation and the resiliency of the aquatic communities.

Summary Statement

Impacts on aquatic ecology resources are estimated based on the information provided by PEF, the State of Florida, and the review team's independent review. The review team concludes that the impacts from building intake and discharge structures for two new nuclear units at the Dixie site would be noticeable but not destabilizing to the critical habitat within the Suwannee

River for the threatened gulf sturgeon. The review team also concludes that the aquatic impacts from operation of two new units would be minimal. Therefore, the review team concludes that the cumulative impacts of building and operating two new reactors on the Dixie site combined with other past, present, and future activities on most aquatic resources in the Suwannee River would be MODERATE. This is because of the potential for impact on gulf sturgeon and on designated critical habitat for gulf sturgeon, the loss of aquatic habitat, particularly during low flow conditions in the river due to the consumptive loss of water from closed-cycle cooling, and unspecified impacts related to the construction and operation of a cooling reservoir. Impacts related to the cooling reservoir could be minimized through proper siting and the use of BMPs during construction. The use of a cooling reservoir would partially mitigate the effects of consumptive water loss on aquatic habitat during low river flow. The incremental contribution of building and operating the two new reactors at the Dixie site to the cumulative impacts within the ROI would not likely result in destabilization of aquatic resources or populations but would significantly contribute to noticeable impacts on aquatic resources and populations.

9.3.3.5 Socioeconomics

The following impact analysis includes direct, indirect, and cumulative impacts from building activities and operations at the Dixie site, which is located in a remote rural area on the lower Suwannee River in Dixie County, Florida. The analysis considers other past, present, and reasonably foreseeable future actions that affect socioeconomics, including other Federal and non-Federal projects listed in Table 9-13 and approximately 340 mi of transmission lines. For the analysis of socioeconomic impacts at the Dixie site, the geographic area of interest is considered to be the region described by a 50-mi radius centered on the Dixie site. The review team gave special consideration to Dixie, Gilchrist, Lafayette, and Levy Counties, because that is where the review team expects socioeconomic impacts to be the greatest. In evaluating the socioeconomic impacts of site development and operation at the Dixie site, the review team undertook a reconnaissance survey of the site using readily obtainable data from the Internet or published sources.

The Dixie site is a greenfield site in eastern Dixie County. The review team drew upon USCB 2000 data to find the available total construction workforce within the host county, adjacent counties, and any nearby counties with a major population center within a reasonable commuting distance from the site. For the Dixie site, this included Dixie, Gilchrist, Lafayette, Taylor, Levy, Suwannee, and Alachua Counties. In 2000 the total construction workforce in these counties was 10,035 workers. Based on this availability, the review team assumed that 75 percent of the 3300-person workforce involved in building the two-unit plant, or 2475 workers, would migrate into the area.

The review team identified Dixie County and four counties near Dixie County (Gilchrist, Lafayette, Alachua, and Levy) as the primary Economic Impact Area (EIA) for the Dixie County site on the basis of expected effects of in-migrating workers and families. All of these counties, except Alachua, are rural, with populations in 2000 ranging between about 7000 people in Lafayette County to about 35,500 people in Levy County. Much of the population in Alachua County resides in the greater Gainesville metropolitan area (2000 population of 95,447 people). The majority of the population in the remaining four counties resides in unincorporated settlements or rural areas. The largest incorporated communities in the four rural counties of the EIA are Williston and Chiefland in Levy County and Cross City in Dixie County; each with a population of close to 3000 people in 2008. Large portions of Dixie, Lafayette, and Levy Counties are year-round or seasonal marshland or commercial forests, which are generally only sparsely populated.

The review team expects that some of the in-migrating workers would choose to reside in Alachua County because of the amenities available in the large city of Gainesville. Because Suwannee and Taylor Counties offer no attractions that would encourage a longer commute, the review team expects few in-migrating workers would locate in Suwannee or Taylor County. The review team focused on effects of the building-phase workforce because the operations workforce would be smaller and, following after the larger building-related workforce cause expected smaller socioeconomic impacts. Table 9-16 provides some socioeconomic data for the five counties.

Table 9-16. Socioeconomic Data for the Dixie Site EIA

Data Category	Dixie	Gilchrist	Lafayette	Levy	Alachua	Data source
Population						
1980	7751	5767	4035	19,870	151,369	(1a)
1990	10,585	9667	5578	25,923,	181,596	(1a)
2000	13,827	14,437	7022	34,450	217,955	(1)
Projected 2010	15,244	17,866	8260	40,694	243,916	(2)
Median Household Income (1999)	$26,082	$30,328	$30,651	$26,959	$31,426	(3)
Vacant Housing Units	2157	885	518	2703	7604	(1)
Total Housing Units	7362	5906	2660	16,570	95,113	(3)

Table 9-16. (contd)

Data Category	Dixie	Gilchrist	Lafayette	Levy	Alachua	Data source
Workforce						
Employed	4612	5756	2540	12,935	105,293	(3)
Construction	492	682	184	1397	5234	(1)
Total Schools[(a)]	2 A-B, 1 B, 1 C	2 A-B, 2 C	1 A-B-C, 1 A-B	1 A, 1 A-B-C, 4 A-B, 3 B-C, 2 B, 2 C	2 A, 7 B, 3 A-B-C, 24 A-B, 2 B-C, 5 C	(4)(
Number of Schools Failing Student-Teacher Ratio	0	0	0	0	0	(4)
Police	Sheriff Dept – 13 positions	Sheriff Dept – 9 positions	Sheriff Dept – # positions	Sheriff Dept and police depts. in Inglis, Williston, Chiefland, Cedar Key	Sheriff Dept and police depts. in Gainesville, Alachua, High Springs, Santa Fe Comm. College, and Univ of Florida	(5)(4)
Emergency Services	6 fire stations; 2 EMS stations	EMS department	County rescue 24/7; 1-4 units	EMS from the 14 fire stations; 8 paid and 183 volunteer firefighters	EMS and fire rescue departments	(6)
Population						
White	89.7	91.6	80.1	87.1	73.5	
African-American	9.2	7.3	14.7	11.2	19.3	
Hispanic	1.7	2.8	9.1	3.9	5.7	
Low-Income	19.1	14.1	17.5	18.6	22.8	(3)

Table 9-16. (contd)

(a) A-elementary school; B-middle school ;C-high school
Sources:
(1a) USCB 1990
(1) USCB 2000b
(2) 2010 projection assuming 2000-2008 growth rate (from USCB 2009) extends to 2010
(3) USCB 2000c
(4) FDOE 2009a
(5) Dixie: Dixie Sheriff 2009
Gilchrist: Gilchrist Sheriff 2009
Lafayette: Lafayette Sheriff 2009
Levy: Section 2.5.2.6
Alachua: Alachua County Florida 2010
(6) Dixie: Dixie EM 2009
Gilchrist – Gilchrist EM 2009
Lafayette: Lafayette EM 2009
Levy: Section 2.5.2.6
Alachua: Alachua County Florida 2010
EMS = emergency management services

For purposes of this analysis the review team assumed there would be 619 in-migrants into Alachua County and the remaining 1856 in-migrating workers would be distributed among the four rural counties of the EIA as follows: 34 percent to Dixie County (639 workers); 14 percent to Gilchrist County (262 workers); 8 percent to Lafayette County (154 workers); and 43 percent to Levy County (801 workers). The review team further assumed that all in-migrating workers would bring families; this is unlikely but contributes to the provision of an upper bound on the population increase associated with the project. The review team used the 2.49-person average Florida family size in 2000 to project the distribution of new jobs and population in the EIA due to in-migrating workers, as listed in Table 9-16.

Physical and Aesthetics Impacts

With the exception of the need to construct a new access road to the Dixie site, many of the physical impacts of building and operation on workers and the public would be the same as those described for the LNP site. People who work or live around the site could be exposed to noise, fugitive dust, and gaseous emissions from building activities. Building workers and personnel working onsite could be the most affected. Air-pollution emissions are expected to be controlled by applicable BMPs and Federal, State, and local regulations. During station operation, standby diesel generators used for auxiliary power would have air-pollution emissions. It is expected that these generators would see limited use and, if used, would be used for only short time periods. Applicable Federal, State, and local air-pollution requirements would apply to all fuel-burning engines. At the site boundary for most sites, the annual average exposure from gaseous emission sources is anticipated to not exceed applicable regulations during normal operations. The impacts of station operations on air quality are expected to be minimal. As with building impacts, potential offsite receptors during operations are generally located well away from the site boundaries.

Residential and commercial areas are located away from the site boundaries, applicable air-pollution regulations would have to be met by PEF, and applicable BMPs would be put in place, including during the construction and use of the site access road. Therefore, based on information provided by PEF and the review team's independent review of reconnaissance-level information, the review team concludes that the physical impacts of building and operating the station would have minimal impact on workers and the local public around the Dixie site.

Building activities and station operations are not expected to affect any offsite buildings. Most buildings are well removed from the site boundaries. Because this is a greenfield site, there are no onsite buildings to be affected by shock and vibration from pile-driving and other related activities. No long-term physical impacts on structures, including any residences near the site boundaries, would be expected. Therefore, based on consideration of reconnaissance-level information, the review team concludes that the physical impacts of station building and operation on offsite buildings would be minor.

As the estimated 340 mi of transmission lines are put in place and the buildings and cooling towers associated with the new reactors reach their final heights and begin operating, they would add an industrial landscape that is visible to viewers, with a noticeable aesthetic impact. In places requiring the clearing of new transmission-line corridors, aesthetic impacts would be noticeable but not destabilizing, depending on the proximity of viewers and the nature of vegetation remaining between them and the corridors. Given the general characteristics of the area, there would likely be vegetative screening around the site that would potentially mitigate the aesthetic impacts at the reactor site.

Demographic Impacts

Table 9-17 lists the estimated project-related population migrating into the EIA at peak workforce levels and the population increase in each county between 1990 and 2000 and between 2000 and 2010. As seen in Table 9-17, the EIA has experienced population growth at least as large as the predicted increase from the proposed new units. For instance, Dixie County experienced a 30.6-percent increase in population between 1990 and 2000. The review team estimates that the proposed project would add an additional 9.5 percent to the projected 2010 population for Dixie County, or less than 1 percent per year over the decade of construction. Therefore the review team determined that the project related demographic impacts for the five counties would be minor.

Table 9-17. Projected Distribution of Workers and Associated Population Increase in the EIA

County	Percent Population Increase 1990-2000[a]	Projected Percent Increase 2000–2010[b]	Workers In-Migrating to Construct Dixie Plant	Civilian Workforce in 2007[c]	Population of In-Migrating Workers and Family Members	Population of Workers and Families: as a Percent of Projected 2010 Population	Population of Workers and Families: as a Percent of Projected 2010 Population + In-Migrants
Dixie	30.6	10.3	639	5547	1592	10.4	9.5
Gilchrist	49.3	23.8	262	7810	653	3.7	3.5
Lafayette	25.9	17.6	154	2879	382	4.6	4.4
Levy	32.9	18.1	801	16,744	1995	4.7	4.5
Alachua	20	11.8	619	126,432	1541	0.6	0.6

(a) Based on USCB data, as reported in PEF 2007b.
(b) Calculated as 1.25 times percent change 2000-2008 shown in USCB 2009, i.e., assumes rate of change for first eight years would continue through last two years of the decade.
(c) Fedstats for Florida and Florida Counties. Compiled from the Bureau of Economic Analysis (BEA 2010).

Economic Impacts

The review team determined that the impact of jobs associated with building the plant would have no noticeable effect on total employment and income in Alachua County. However, the review team determined that the impact of jobs associated with building the plant would have a noticeable beneficial effect on total employment in the four rural counties, with likely short-term noticeable effects in Dixie County during the period of peak workforce when the in-migrating workers are projected to be about 11.5 percent of the 2007 civilian workforce in the county. The direct jobs filled by local residents would add to the project's effect on employment, as would the indirect jobs created as a result of the multiplier effect, as described in Sections 4.4.3 and 5.4.3. This peak in employment would be temporary, transitioning to the lower employment effects of plant operations, when approximately 541 operations jobs (70 percent of operations jobs) are expected to be filled by in-migrating operations workers and a smaller number of local residents are expected to fill the associated indirect jobs. Consequently, the review team concludes that the proposed project would have a noticeable, beneficial, but temporary impact on employment in the four rural counties of the EIA during the years of peak workforce, followed by a minor, beneficial long-term impact during operations.

State and local taxes would be governed by Florida law. The review team assumed that tax revenues generated from sales and use taxes associated with the building and operation of a plant at the Dixie site would be approximately the same as those evaluated for the LNP site in Sections 4.4.3.3 and 5.4.3.3, with a similar minor impact on revenues for the EIA and the region, along with a similar delay in substantial property tax payments to Dixie County until the commencement of operations. The review team concluded that increased property taxes from the two units following reassessment for improvements and for its use as a utility would have a substantial beneficial impact on Dixie County. The review team found that additional property taxes on new houses built by in-migrating workers would constitute a small percentage increase in the local tax base in the EIA; thus the impact of both building and operations on residential property tax revenues would be minor.

Housing

The review team compared the 2000 figures for vacant housing in the EIA listed in Table 9-16 with the number of in-migrating workers projected for peak building years listed in Table 9-17. The housing figures do not include RV parks, campgrounds, or hotels, and thus provide a lower bound of what would be available to construction workers. The review team divided the projected increase in population without the project between 2000 and 2010 by 2.49 (Florida average family size) to estimate the number of housing units required to accommodate that population increase.

The U.S. Census Housing Profile (USCB 2000b; BEA 2010) for each of the five counties in the EIA estimated the following:

- Dixie County – a total housing stock of 7362 units with a rental vacancy rate of 29 percent (approximately 2157 housing units were unoccupied at the time of the survey).
- Gilchrist County – a total housing stock of 5906 units with a rental vacancy rate of 15 percent (approximately 885 housing units were unoccupied at the time of the survey).
- Lafayette County –a total housing stock of 2660 units with a rental vacancy rate of 19 percent (approximately 518 housing units were unoccupied at the time of the survey).
- Levy County – a total housing stock of 16,570 units with a rental vacancy rate of 16 percent (approximately 2703 housing units were unoccupied at the time of the survey).

- Alachua County – a total housing stock of 95,113 units with a rental vacancy rate of 8 percent (approximately 7604 housing units were unoccupied at the time of the survey).

The review team expects that the in-migrating workforce could be absorbed into the existing housing stock in the EIA without a measureable impact. Based on the information provided by PEF and the review team's independent evaluation, the review team concludes that housing impacts of building and operating two nuclear units at the Dixie site would not be noticeable.

Public Services

In discussions with county personnel (Dixie County 2009a, b; Gilchrist County 2009; Lafayette County 2009; Taylor County 2009), the review team learned that, while all counties welcome additional development and expect that they could manage it, some public services in the four rural counties of the EIA are currently over, at, or near capacity. Levy County is over capacity for fire-protection services. Dixie County is near or at capacity at the sheriff's department, but has plans to expand for future growth, as in the past, and the department is about to add another deputy. Dixie County is also near or at capacity in the management of roads and streets. There are no capacity issues for fire protection or emergency medical response. For general healthcare, Dixie County residents use resources in Gainesville for serious medical problems, and this practice is expected to continue. Water and wastewater are generally handled through wells and residential septic systems in Dixie County, with no capacity issues. Gilchrist County can handle present demands for police and emergency services, but might need to add a deputy and another emergency management service (EMS) station and vehicle if 200 families were to move in; capacity is adequate for healthcare, with people using primary care providers within the county and going to Gainesville or Chiefland for other needs; water and wastewater are generally provided with wells and septic systems, with no capacity issues currently. Lafayette County is not at capacity for any services presently, and would add to law enforcement, fire-protection services (all volunteer currently), and EMS as needed; the county is currently seeing development of a new prison that will bring in 150 people, which will be an exercise in responding to new growth. Demands on the planning and permitting infrastructure in these four counties may increase substantially for a short period in response to efforts to rapidly expand housing availability.

The review team assumed that the counties and communities in the EIA for the Dixie site, like those for the LNP site, have planned to meet needs for public services based on forecast population increases that did not include the presence of a workforce associated with constructing and operating a nuclear plant. The review team based its analysis of potential impacts on public services on the level of population increase represented by in-migrant workers during peak building years added to forecasted population growth without the proposed project. In addition, the review team took into consideration that the EIA would not receive a significant increase in property tax revenues during the period of peak demand, and that Dixie

County would be the only major property tax recipient once the proposed units went into operation. Consequently, the review team expects impacts on public services during peak building years would be noticeable and adverse in Dixie County, particularly on law enforcement and road management, and all of the communities near the proposed site and minor in the rest of the EIA, with the exception of Levy County, where a noticeable adverse impact on fire-protection services is expected. Once the project transitions to operations, the impacts on public services are expected to moderate, in part because of the reduction in in-migrant population and in part because the counties and communities will have expanded capacity to address peak building-phase demand. The public service providers in the four rural counties of the EIA may find it more difficult to respond effectively because the demand for service would increase rapidly and substantially, persist for several years, but then decline substantially as the project-related workforce rises and falls.

Transportation

Roads closest to the proposed Dixie site include US-19/98/27A/SR55 (US-19), SR-349, and SR-51. US-19 is a four-lane divided rural highway that crosses Dixie County from northwest to east-southeast, providing access to the metropolitan areas of Tallahassee (northwest) and Tampa (south). SR-349, extending from US-19 to the north county boundary in the northeast part of the county and SR-51, running north-south along the Steinhatchee River, are two-lane, undivided minor arterials. Dixie County has assigned a LOS standard of “B” to US-19 and “D” to the State routes and its county roads (Dixie County 2006). CR-349 extends south and southwest from the intersection of SR-349 and US-19 to the coast at Suwannee; other county roads extend northeast and southwest from US-19 farther west along the highway. Dixie County classifies the county roads as undivided minor arterials or undivided major collectors. Traffic volumes in 2008 on SR-349 ranged from 2111 to 6400; volumes on SR-51 in Taylor and Lafayette Counties ranged from 309 to 3000; and volumes on US-19 ranged from 4700 to 12200 (FDOT 2008). PEF has indicated that an access road would need to be constructed at the Dixie site.

US-19 would be the main artery carrying workers from western Dixie County and the three adjacent counties, as well as from Gainesville and Taylor Counties and other places in nonadjacent counties. The review team considered the impact of building-related traffic in terms of the likelihood that it would reduce the LOS along US-19 to be lower than the assigned standard “B.” The review team assumed 2281 trips daily (following LNP site analysis in Section 4.4.4.1), split 65 percent to/from the southeast and 35 percent to/from the northwest, based on the assumed distribution of in-migrating worker residence discussed in Table 9-17. At morning shift change, this would add an additional 1977 cars to the total flow on US-19, 499 incoming from northwest, 926 from southeast; and 359 outgoing to the southeast, 193 to the northwest. The highest 2008 AADT count on US-19 in Dixie County was at the eastern county line, at the bridge over the Suwannee River, with 6200 cars going northwest and 6000 cars going southeast. Morning flow of building workers would add 926 cars to those going northwest from the county line toward the plant site and 359 cars leaving the county toward the southeast. This increase of about 15 percent of current flow to the northwest could change LOS at the bridge. In addition, there are five road intersections with US-19 within 2 mi of the bridge and additional traffic on these roads feeding into US-19 might affect LOS at the intersections. While additional analysis would be needed, the review team concludes that building-related traffic during peak workforce years could have a noticeable adverse effect on segments of US-19 and at intersections with State and county roads within Dixie County, especially during the period of peak onsite workforce.

Education

Table 9-16 provides data about schools in the four rural counties of the EIA. All schools met the State teacher-student ratio classroom requirements in 2007–2008. The review team assumed that school districts in these counties, like those for the LNP site, would address short-term gains in student population with mobile classrooms and that the preschool through 12th grade (PK–12) public schools would be funded according to the Florida equalized funding formula (FDOE 2009b). The review team assumed that students would accompany each in-migrating worker family in the average of the ratios of students per household from counties in the LNP site listed in Table 2-35. The estimated numbers of new students in each of the four rural counties of the EIA during peak workforce years are listed in Table 9-18.

Table 9-18. Students from In-Migrating Families at Peak Workforce Years

County	In-Migrating Worker Households	Grades PK–3 Students[(a)]	New Rooms	Grades 4–8 Students[(b)]	New Rooms	Grades 9–12 Students[(c)]	New Rooms
Dixie	639	101	6	52	2	58	2
Gilchrist	262	41	2	21	1	24	1
Lafayette	154	24	1	12	1	14	1
Levy	801	127	7	65	3	73	3
Alachua	619	98	6	50	2	56	2

Source: Table 4-14 and State of Florida 2002
(a) 0.158 per household; 18 students per teacher required by State law
(b) 0.081 per household; 22 students per teacher required by State law
(c) 0.091 per household; 25 students per teacher required by State law
PK = preschool

The review team found that the impact on the four Dixie County schools would require up to 10 additional classrooms in total, an average of over 2 classrooms for each of the 4 schools (note that the affected schools cover different ranges of grades). The review team found that the addition of up to13 classrooms in Levy County, 4 classrooms in Gilchrist County, and 3 classrooms in Lafayette County would amount to an average of about 1 additional classroom per school. For Alachua County, 10 additional classrooms among 43 schools would mean less than one-quarter of the schools would require an additional classroom. These school districts would also need to be adding capacity to deal with the students associated with the increase in population that is forecast to occur even without the proposed project, as discussed previously in the section on population. The review team concluded that the impact on public schools at peak impact would be more noticeable in Dixie County than in the other rural counties where the impact would be minor. As with public service impacts, the schools may find it more difficult to respond effectively to the demand for student services when it increases rapidly and substantially, persists for several years, but then decline as it does with the proposed project.

Recreation and Aesthetics

PEF notes that much of the economy of Dixie County is dependent on ecotourism by users of a national wildlife refuge (the Lower Suwannee National Wildlife Refuge), Manatee Springs State Park, the Fanning Springs State Park, and numerous other State and local parks and trails (PEF 2009a). Because the exact footprint of the site is not determined, specific impacts on specific recreational facilities from site structures and the intake and discharge structures are not known but, based on the considerations discussed for the LNP site, the review team anticipates that adverse impacts of building units at the Dixie site would have minor impacts on use of the recreational facilities from which activities would be visible or audible. The increased population in the four rural counties of the EIA may increase use of local recreational areas, which is expected to have negligible impact on either the sites or the recreational experience, given the number, geographic distribution, and variety of recreational locations available. The impact of the transmission lines and corridors is expected to have a noticeable aesthetic impact in places where vegetation does not screen them from viewers.

Summary of Socioeconomics

Physical impacts on workers and the general public include impacts on existing buildings, transportation, aesthetics, noise levels, and air quality. Social and economic impacts span issues of demographics, economy, taxes, infrastructure, and community services. Based on information provided by PEF and its own independent evaluation, the review team finds that the socioeconomic effects of building two units at the Dixie site would be minor with the following exceptions. There would be noticeable adverse, but not destabilizing, effects on transportation, education, and public services (law enforcement and road management) in Dixie County and on fire-protection services and transportation in Levy County during the peak building phase that would persist until the community has responded to the growth and local funding is adjusted after the units are operating, after which the tax effects are expected to be noticeable/substantial and positive on Dixie County and minor elsewhere in the five-county local area. Traffic congestion is expected to have a noticeable, though intermittent and temporary, impact on US-19 near the Dixie/Levy County border. The transmission lines and corridors would have a noticeable adverse impact on aesthetics.

Cumulative Impacts

In addition to assessing the incremental socioeconomic impacts from the building and operation of two nuclear units on the Dixie site, the review team considers other past, present, and reasonably foreseeable future actions that could contribute to the cumulative socioeconomic impacts on the region, including other Federal and non-Federal projects. For the analysis of cumulative socioeconomic impacts at the Dixie site, the geographic area of interest is considered to be the 50-mi region centered on the Dixie site (the region) with special consideration of Alachua, Dixie, Gilchrist, Lafayette, and Levy Counties because that is where the review team expects socioeconomic impacts to be the greatest (Economic Impact Area, or EIA). Table 9-13 identifies the projects that have contributed and will continue to contribute to the demographics, economic climate, and community infrastructure of the region. Collectively these projects will contribute to an overall trend toward urbanization and generally will result in increased populations and economic activities.

Within the wider region, the residential population is concentrated around the city of Gainesville to the east, which serves as the area's economic center. Lafayette County has the smallest population of the four rural counties of the EIA (Dixie, Gilchrist, Lafayette, and Levy Counties). Within the region, the planned expansion of SR-26, the proposed Tarmac King Road Limestone Mine, the potential closing of coal-fired units at CREC, and continued urbanization are the future actions identified for the region that would have the most noticeable socioeconomic effects on the four rural counties of the EIA.

The review team expects that improved road access to the regional urban center of Gainesville would contribute to and accelerate the population and economic growth in Dixie, Gilchrist, Lafayette, and northwestern Levy Counties, adding to the ongoing gradual urbanization trends evident in the region. This road expansion project has not been scheduled and is not expected to be completed during the building of the proposed nuclear units.

The potential closure of coal-fired units at CREC and subsequent loss of operations jobs would moderate these growth effects. Considering this combination of ongoing and proposed projects and project terminations, the review team determined that cumulative socioeconomic effects of building new units at the Dixie site and the actions identified in Table 9-13 would not differ noticeably from the project effects analyzed above. Thus, the review team determined that cumulative socioeconomic impacts of the proposed project and other past, present, and reasonably foreseeable projects would be SMALL, with the following exceptions attributable to building and operating the Dixie site: Dixie County would experience MODERATE, but temporary and not destabilizing, effects on transportation, education, and public services (law enforcement and road management) during the peak building phase that would persist until operations commence, when these impacts would be SMALL and the tax impacts are expected to be LARGE and positive on Dixie County and minor elsewhere among the four rural counties of the EIA. Finally, the aesthetic impacts of the transmission lines and corridors are expected to be MODERATE and long-term along their viewsheds. The Dixie nuclear project would be a significant contributor to the MODERATE adverse effects on infrastructure and the LARGE beneficial tax effect identified.

9.3.3.6 Environmental Justice

The following impact analysis includes environmental justice impacts from building activities and operations as well as the cumulative impacts from other past, present, and reasonably foreseeable future actions that could have environmental justice effects, including other Federal and non-Federal actions listed in Table 9-13. For the analysis of environmental justice impacts at the Dixie site, the geographic area of interest is the region within a 50-mi radius centered on the Dixie site. The region includes the urban area of Gainesville in Alachua County and four rural counties: Dixie, Gilchrist, Lafayette, and Levy. The land use in the vicinity of the site is scattered residential, farming, and commercial forestry.

The review team determined that from an environmental justice perspective there is a potential for minority and low-income populations to experience disproportionately high and adverse impacts. The review team used the approach in identifying minority and low-income populations of interest and assessing environmental justice impacts described in Sections 2.6, 4.5, and 5.5. Figure 9-2 shows the distribution of minority populations by census block group within the region. The closest block group with an aggregate minority population of interest is approximately 12 mi to the southeast in Levy County. Several additional block groups with aggregate minority populations of interest are more distant from the proposed site but still within the region. Figure 9-3 shows the distribution of block groups with low-income populations of interest within the region. The closest block group with a low-income population of interest is located approximately 12 mi to the southeast of the proposed site (this is the same block group with an aggregate minority population of interest discussed above). Some additional block groups with low-income populations of interest are at a farther distance from the proposed site. There is some overlap in the block groups with minority and low-income populations of interest.

The review team investigated the presence of unique characteristics or practices in minority or low-income communities that could result in different socioeconomic impacts from the building and operating of the Dixie site compared to the general population. Dixie County Environmental Health Division personnel informed the review team that they are not aware of subsistence use of resources in the county, and think that they would know if such behavior were present (Dixie County 2009c). Likewise, the County Manager indicated there was no need for county residents to fish or hunt for subsistence (Dixie County 2009d). During their independent review of environmental justice impacts at the Dixie site, the review team determined that some subsistence fishing or hunting could take place outside the national wildlife refuge mentioned above, because this area of Florida is well known for its hunting, fishing, and agricultural resources and for its high levels of participation in these activities by residents and visitors alike. Such subsistence activities would possibly be affected during the building phase. The review

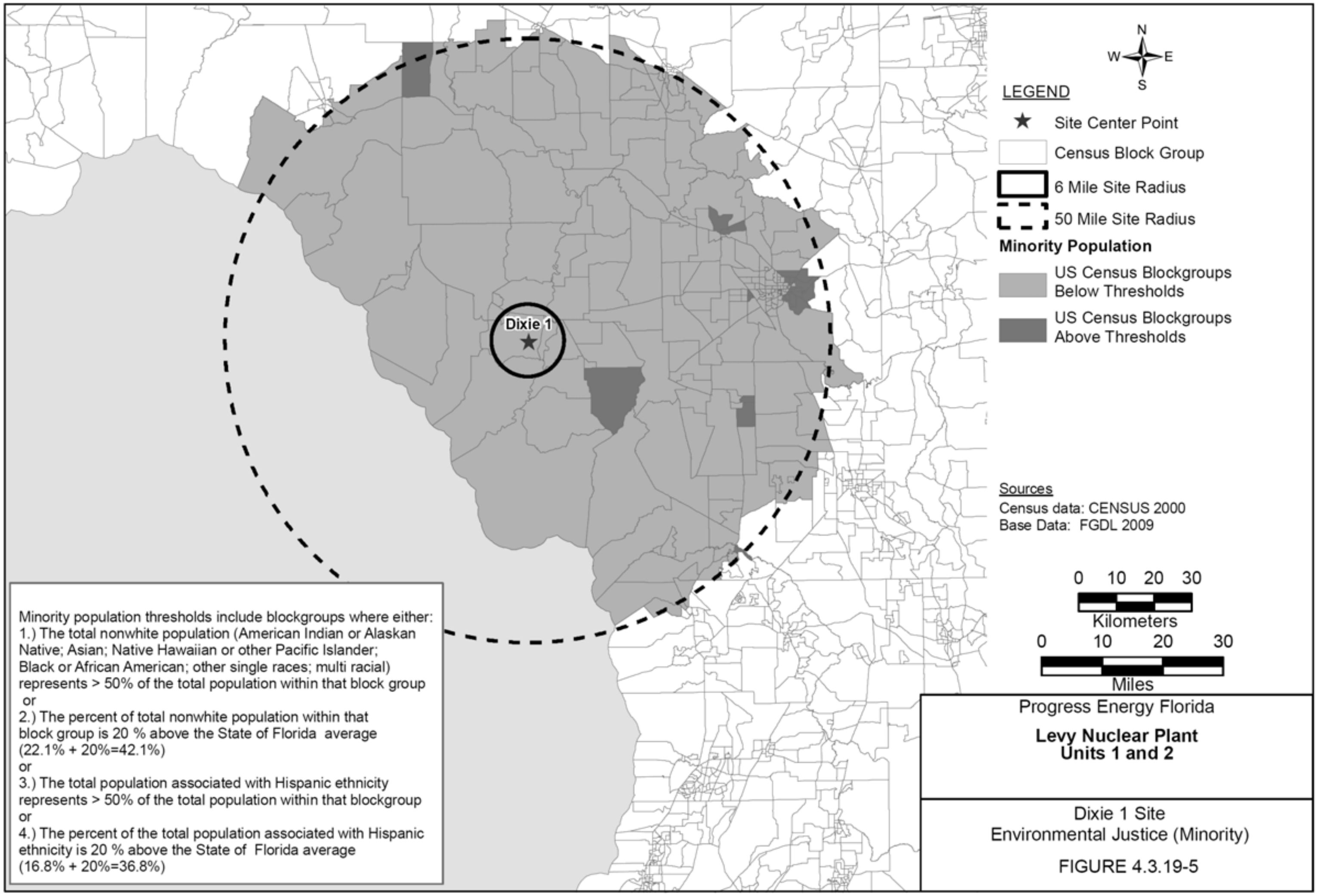

Figure 9-2. Dixie County Minority Populations (PEF 2009d)

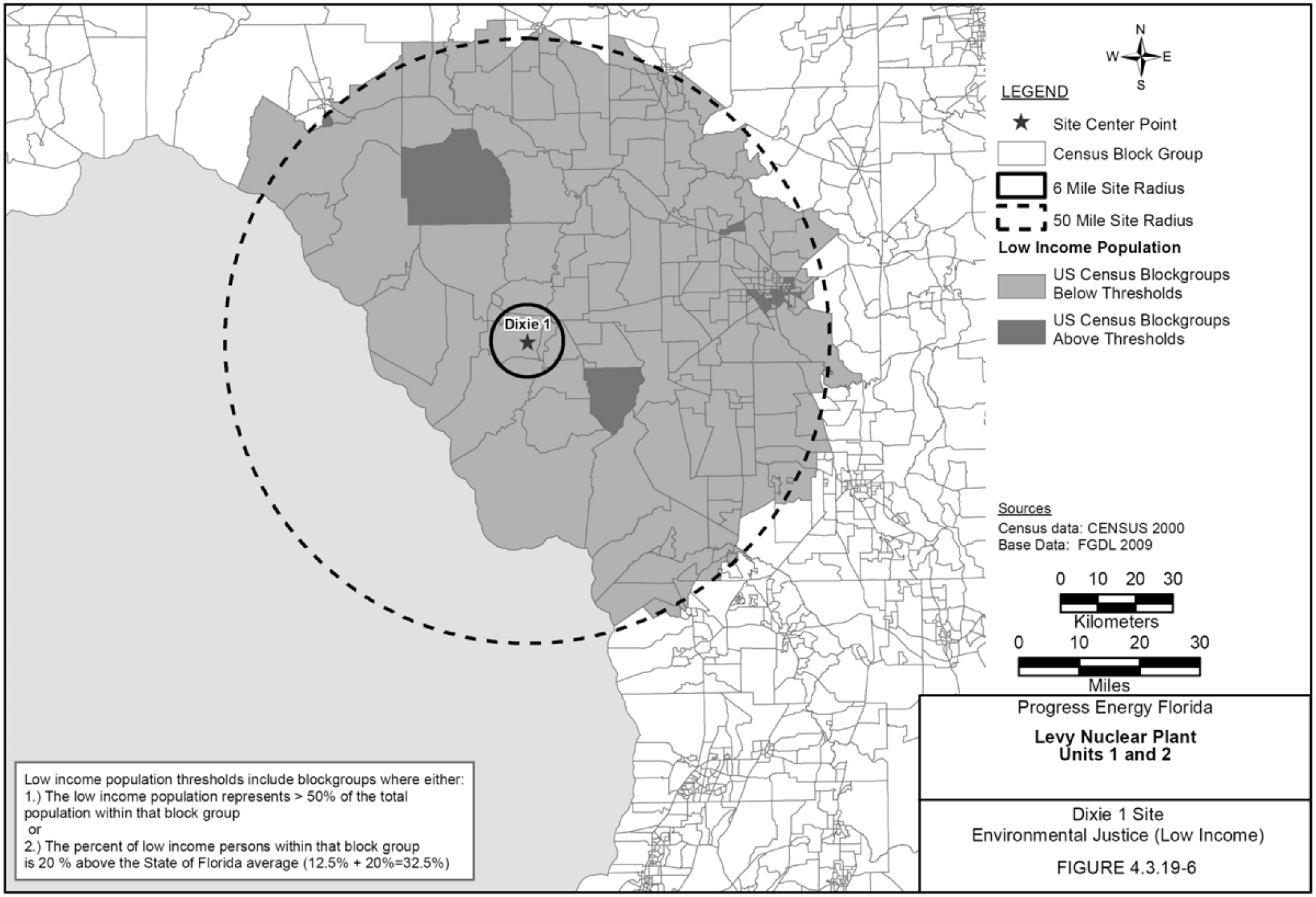

Figure 9-3. Dixie County Low-Income Populations (PEF 2009d)

team determined that an area south of US-19 with a significant low-income population parallels the Suwannee River and is north of the protected refuge (EPA 2009b). This area was not revealed by the census block group analysis but its population may rely on subsistence fishing and be affected by building or operation activities.

Physical effects from building activities (noise, fugitive dust, air emissions, traffic) would not affect any populations at the distances of the closest populations of interest because physical effects attenuate with distance, topography, and intervening foliage. None of the minority or low-income populations of interest is located within 12 mi of the site, which is primarily woodland.

In places requiring the clearing of new transmission-line corridors, aesthetic impacts would be noticeable but not destabilizing, depending on the proximity of viewers and the nature of vegetation remaining between them and the corridors. Given the general characteristics of the area, there would likely be vegetative screening around the site that would potentially mitigate the aesthetic impacts at the reactor site. The review team determined that the minority and low-income populations would not experience disproportionately high and adverse aesthetic impacts from the project.

Minority and low-income populations would experience the noticeable, but relatively short-term and localized adverse effects on public services, transportation, and education, as discussed in Section 9.3.3.5. As shown on Figure 9-2 and Figure 9-3, the closest minority and low-income populations of interest are well to the southeast of the affected commuting routes and therefore would not receive a disproportionately high and adverse transportation impact. For other socioeconomic categories, the review team found no evidence of unique characteristics or practices among minority or low-income populations that would result in disproportionately high and adverse impacts when compared to the general public.

The operation of the proposed nuclear power plant at the Dixie site would have no physical impact on minority or low-income populations because of their distance from the site. The review team found no evidence of unique characteristics or practices among minority or low-income populations that would result in their receiving disproportionately high and adverse impacts to demographics, economics, community services and infrastructure, or transportation when compared to the general public.

Because the review team found no disproportionate adverse impacts on minority or low-income populations from building and operating the Dixie project, the review team concludes that environmental justice impacts would be minor.

Cumulative Impacts

The review team did not identify any environmental pathways by which disproportionately high and adverse impacts could affect minority or low-income populations or communities. Therefore the review team concludes that the environmental justice impacts on minority and low-income populations associated with the building and operation of two new units at Dixie in combination with the other projects and activities identified in Table 9-13 would range from minor to noticeable as discussed above, in proportion to the effects on majority populations, and would not be disproportionately high and adverse for the minority and low-income populations. Therefore, the review team concluded that the environmental justice impacts would be SMALL.

9.3.3.7 Historic and Cultural Resources

The following cumulative impact analysis includes building and operating two new nuclear generating units at the Dixie site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect historic and cultural resources, including the other Federal and non-Federal projects listed in Table 9-13. For the analysis of cultural impacts at the Dixie site, the geographic area of interest is considered to be the APE for this site. This includes the direct effects APE, defined as the area physically affected by the site-development and operation activities at the site and transmission lines. The indirect effects APE is defined as the area visually affected and includes an additional 0.5-mi radius APE around the transmission-line corridors and a 1-mi radius APE around the cooling towers.

Reconnaissance activities in a cultural resource review have particular meaning. Typically, the activities include preliminary field investigations to confirm the presence or absence of cultural resources. However, in developing this EIS, the review team relied upon reconnaissance-level information to perform its alternative site evaluation in accordance with ESRP 9.3 (NRC 2000). Reconnaissance-level information is data that are readily available from agencies and other public sources. It can also include information obtained through visits to the site area. To identify the historic and cultural resources at the Dixie site, the following information was used:

- PEF ER (2009a)
- National Register of Historic Places database (NPS 2010)
- Florida Historical Markers Program (FDOS 2010)
- NRC Alternative Sites Visit October 14–17, 2008 (NRC 2009).

Historically, the Dixie site and vicinity were largely undisturbed and likely contained intact archaeological sites associated with the past 10,000 years of human settlement. Over time, the area has been disturbed by low-impact development, including agriculture, commercial forestry, and low-density residential development (PEF 2009a). In its ER, PEF states that potentially significant cultural resources are located within Dixie County and that cultural resource investigations would be required before siting a new reactor at this location. PEF also states that consultation with the SHPO would occur if any significant historic, cultural, or archaeological resources are identified and that appropriate mitigation measures would be put in place before construction and operation (PEF 2009a).

A search of the National Register revealed two sites listed in the Dixie County, including the City of Hawkinsville shipwreck and the Garden Patch Archaeological Site (NPS 2010). A search of the Florida Historical Markers Program revealed seven historical markers listed in Dixie County, including Old Town – one of the largest Native American villages in Florida – and Fort Duval (FDOS 2010).

Building Impacts

To accommodate building two new nuclear generating units on the Dixie site, PEF would need to clear approximately 300 ac for the main power plant site as would be needed for the LNP site and 1282 ac for the reservoir (PEF 2009a). If the Dixie site were chosen for the proposed project, identification of cultural resources would be accomplished through cultural resource surveys and consultation with the SHPO, Tribes, and interested parties. The results would be used in the site-planning process to avoid cultural resources impacts. If significant cultural resources were identified by these surveys, the review team assumes that PEF would develop protective measures in a manner similar to that for the LNP site, and therefore the impacts would be minimal. If direct effects on significant cultural resources could not be avoided, land clearing, excavation, and grading activities could potentially destabilize important attributes of historic and cultural resources.

There are no existing transmission-line corridors connecting to the Dixie site. Section 9.3.3.1 describes the proposed transmission-line corridors associated with this site. Visual impacts from transmission lines may result in significant alterations of the visual landscape within the geographic area of interest. If the Dixie site were chosen for the proposed project, the review team assumes that PEF would conduct its transmission-line-related cultural resource surveys and procedures in a manner similar to that for the LNP site described in Section 4.6. In addition, the review team assumes the State of Florida’s Conditions of Certification regarding transmission-line siting and building activities would apply, and therefore the impacts would be minimal. If direct effects on significant cultural resources could not be avoided, land clearing, excavation, and grading activities could potentially destabilize important attributes of historic and cultural resources.

Operations Impacts

Impacts on historic and cultural resources from the operation of two new nuclear generating units at the Dixie site would include those associated with the operation of new units and maintenance of transmission lines. The review team assumes that the same procedures currently used by PEF, including the State of Florida’s Conditions of Certification, would be used for onsite and offsite maintenance activities. Consequently, the incremental effects of the maintenance of transmission-line corridors and operation of the two new units and associated impacts on the cultural resources would be negligible for the physical and visual APEs.

Cumulative Impacts

Past actions in the geographic area of interest that have similarly affected historic and cultural resources include rural development and agricultural development and activities associated with these land-disturbing activities such as road development. Table 9-13 lists past, present, and reasonably foreseeable projects and other actions that may contribute to cumulative impacts on historic and cultural resources in the geographic area of interest. Projects from Table 9-13 that may fall within the geographic area of interest for cultural resources include future urbanization, such as new or expanded roads.

Long linear projects such as new or expanded roads may intersect the proposed transmission-line corridors. Because cultural resources can likely be avoided by long linear projects, impacts on cultural resources would be minimal. If building associated with such activities results in significant alterations (both physical alteration and visual intrusion) of cultural resources in the transmission-line corridors, then cumulative impacts on cultural resources would be greater.

Cultural resources are nonrenewable; therefore, the impact of destruction of cultural resources is cumulative. Based on the information provided by PEF and the review team's independent evaluation, the review team concludes that the cumulative impacts from building and operating two new nuclear generating units on the Dixie site and other projects would be SMALL. This impact-level determination reflects no known cultural resources that could be affected; however, if the Dixie site were to be developed then cultural resource surveys and evaluations would need to be conducted and PEF would assess and resolve adverse effects of the undertaking. Adverse effects could result in greater cumulative impacts.

9.3.3.8 Air Quality

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affect air quality, including the shutdown of two coal-fired units at CREC, and other Federal and non-Federal projects listed in Table 9-13. The geographic area of interest for the Dixie site is Dixie County, which is in the Jacksonville (Florida)-Brunswick (Georgia) Interstate Air Quality Control Region (40 CFR 81.91).

The emissions related to building and operating a nuclear plant at the Dixie site would be similar to those at the LNP site. The air quality status for Dixie County as set forth in 40 CFR 81.310 reflects the effects of past and present emissions from all pollutant sources in the region. Dixie County is classified as being in attainment for all NAAQSs.

The atmospheric emission related to building and operating a nuclear plant at the LNP site in Levy County, Florida, are described in Chapters 4 and 5. Emissions of criteria pollutants were found to have a SMALL impact. In Chapter 7, the cumulative impacts of criteria pollutant emissions at the LNP site were evaluated and also determined to have a SMALL impact.

Cumulative Impacts

Reflecting on the projects listed in Table 9-13, all industrial projects listed in the table would have *de minimis* impacts. The impact of closing two coal-fired units at CREC on criteria pollutants at the Dixie site are not considered because the CREC is located outside of the geographic area of interest for this site. Given the small amount of emissions from the projects, it is unlikely that the air quality in the region would degrade to the extent that the region would be declared to be in nonattainment for any of the NAAQSs.

The air quality impact of the Dixie site development would be local and temporary. The distance from building activities to the site boundary would be sufficient to generally avoid significant air quality impacts. There are no land uses or projects, including the aforementioned sources, that would have emissions during site development that would, in combination with emissions from the Dixie site, result in a degradation of air quality in the region.

Releases from the operation of two new units at the Dixie site would be intermittent and made at low altitudes with little or no vertical velocity. The air quality impacts of current emissions near the Dixie site are included in the baseline air quality status. The cumulative impacts from emissions of effluents from the Dixie site and other sources would not be noticeable.

The cumulative impacts of greenhouse gas emissions related to nuclear power are discussed in Section 7.6. The impacts of the emissions are not sensitive to the location of the source. Consequently, the discussion in Section 7.6.2 is applicable to a nuclear power plant located at the Dixie site. The review team concludes that the national and worldwide cumulative impacts of greenhouse gas emissions are noticeable. The review team further concludes that the cumulative impacts would be noticeable, with or without the greenhouse gas emissions of the project at the Dixie site or the potential shutdown of the fossil-fuel units at CREC.

Cumulative impacts on air quality resources are estimated based on the information provided by PEF and the review team's independent evaluation. Other past, present, and reasonably foreseeable future activities exist in the geographic areas of interest (local for criteria pollutants and global for greenhouse gas emissions) that could affect air quality resources. The cumulative impacts on criteria pollutants from emissions from the Dixie site and other projects would not be noticeable. The national and worldwide cumulative impacts of greenhouse gas emissions are noticeable, with or without the greenhouse gas emissions from the Dixie site. The review team concludes that cumulative impacts from construction, preconstruction, and operations, and other past, present, and reasonably foreseeable future actions on air quality resources in the geographic area of interest would be SMALL for criteria pollutants and MODERATE for greenhouse gas emissions. The incremental contribution of impacts on air quality resources from building and operating two new units at the Dixie site would be insignificant for both criteria pollutants and greenhouse gas emissions.

9.3.3.9 Nonradiological Health

The following analysis assesses impacts from building activities and operations for the Dixie site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect nonradiological health, including the other Federal and non-Federal projects listed in Table 9-13. Impacts from building activities that have the potential to affect the health of members of the public and workers include exposure to dust and vehicle exhaust, occupational injuries, noise, and increased traffic associated with the transport of construction materials and personnel to and from the site. The operation-related activities that have the potential to affect the health of members of the public and workers include exposure to etiological agents, noise, EMFs, and impacts from the transport of workers to and from the site.

Most of the nonradiological health impacts of building and operation (e.g., air emissions, noise, occupational injuries) would be limited to areas within approximately 2 mi from the site, which applies to the analysis for the Dixie site. Occupational injuries would occur only within the boundaries of the site, and noise from construction and operation has likewise been assessed as minimal for offsite receptors beyond a 2-mi radius. For nonradiological health impacts associated with transmission lines, the geographic area of interest would be the transmission-line corridor. If the facility were built and operated at the Dixie alternative site, the Suwannee River would serve as the source and discharge receptor of cooling water. In addition, a reservoir would need to be built to assure an adequate cooling-water supply.

Building Impacts

Nonradiological health impacts on construction workers and members of the public from building two new nuclear units at the Dixie site would be similar to those evaluated in Section 4.8 for the LNP site. The impacts include noise, construction vehicle exhaust, dust, occupational injuries, and transportation accidents, injuries, and fatalities. A detailed noise study has not been performed for the Dixie site, but it is likely that noise from building at the site, except for rare, high-noise activities such as pile-driving, would comply with State and local noise ordinances and that the overall noise impact associated with building would be minimal. Fugitive dust and vehicle emissions during building would be controlled by good management practices and compliance with Federal, State, and local air quality regulations. The incidence of construction worker accidents would be the same as that for the LNP site, the only difference being potential injuries associated with cooling-water reservoir construction.

Analyses described in Section 9.3.3.5 indicate that the traffic impacts in the vicinity of the Dixie site would be noticeable during peak building activities and could be mitigated by implementation of a suitable traffic-management plan. Owing to the rural nature of the Dixie site, there is little potential for cumulative traffic impacts with other projects, and additional injuries and fatalities from traffic accidents involving transportation of materials and personnel for building of a new nuclear power plant at the Dixie site would be similar to those estimated in Section 4.8.3 for building at the LNP site.

Because all of the past, present, or potential future construction projects identified in Table 9-13 are relatively distant (greater than 10 mi) from the Dixie site, it does not appear that combined nonradiological health impacts from construction at the Dixie site and other projects would occur. Cumulative impacts of building at the Dixie site would therefore be minimal.

Operational Impacts

Noise, air emissions, and occupational injuries from the operation of two new nuclear units at the Dixie site would be similar to those evaluated in Section 5.8 for the LNP site. Occupational health impacts on workers (e.g., falls, electric shock or exposure to other hazards) at the Dixie site would be the same as those evaluated for workers at two new units operating at the LNP site. The cooling-system discharge from the facility could encourage the growth of etiologic organisms in the Suwannee River. Etiological agent growth could be reduced by the use of biocides in the cooling systems, thermal discharge would be restricted by NPDES permit limitations, and exposure to impaired water would be limited by controls on access to the discharge zone (fencing, signage, and other security measures). However, because discharge may amount to a significant proportion of minimum flows in the river, and because the Suwannee River is already impaired due to contamination with nitrates and other pollutants (Hallas and Magley 2008; USGS 2004), the effect of blowdown discharge to the river could have a noticeable effect on the growth of etiological agents. Exposure to etiological agents in the cooling-water reservoir would not pose an additional health risk as long as access to the reservoir is limited by virtue of its being within the controlled and fenced site boundaries.

Noise and EMF exposure from operations would be monitored and controlled in accordance with applicable OSHA regulations. Although no detailed noise modeling has been performed for the Dixie site, it is likely that noise impacts would be similar to those predicted for operations at the LNP site. The effects of EMF on human health in the transmission-line corridors would be controlled and minimized by conformance with NESC criteria and adherence to the standards for transmission systems regulated by the FDEP. Nonradiological impacts of traffic associated with the operations workforce would therefore be less than the impacts during building (minimal).

A number of the projects and activities identified in Table 9-13 (commercial farms and dairies, minor permitted municipal discharges) might also affect water quality in the Suwannee River, which has been identified as being impaired by nutrients and was included on Florida's Verified List of Impaired Waters (Hallas and Magley 2008). The impairment is due to nitrate contamination from fertilizers, animal wastes, and atmospheric deposition (USGS 2004). Releases from the two new nuclear units at the Dixie site (which would be limited by NPDES permits) would have little impact on nitrate levels in the river. Although, as noted above, blowdown discharge may result in increased water temperature that could facilitate the growth of etiological agents.

The review team is also aware of the potential climate changes that could affect human health; recent analyses of these issues (GCRP 2009) have been considered in the preparation of this EIS. Projected changes in the climate for the region include an increase in average temperature and a decrease in precipitation, which may alter the presence of microorganisms and parasites in surface water. While the overall impacts of climate change may not be insignificant (see Section 7.7), the effect of, or contribution to, climate change impacts by the operation of two new units at the Dixie site is likely to be minor. In its analysis of climate change impacts the review team did not identify additional data that would alter its conclusion regarding the presence of etiological agents or change in the incidence of waterborne diseases associated with operation of a nuclear facility at the Dixie site.

Summary

The assessment of impacts on nonradiological health from building and operation of the two new units at the Dixie alternative site is based on the information provided by PEF and the review team's independent evaluation. The review team concludes that nonradiological health impacts on workers and the public resulting from building two new units and associated transmission lines at the Dixie alternative site would be minimal. The review team also expects that the nonradiological health impacts to workers and the public from the operation of two new nuclear units at the Dixie site would be minimal, except for potential growth of etiological agents in the Suwannee River from the influence of the cooling-system blowdown discharges during droughts or low-flow periods. These effects could be reduced if the blowdown were discharged to the cooling reservoir, rather than directly to the river. Exposure to etiological agents could be increased if access to the cooling reservoir is not limited by physical and administrative controls. Based on these findings, the review team concludes that cumulative impacts on nonradiological health from related past, present, and future actions in the geographic area of interest and building and operations of two nuclear units at the Dixie alternative site risks would be SMALL to MODERATE. The severity of impacts would depend on the design characteristics of the facility, which have not been fully defined. If exposure to water heated by thermal discharge is not limited by administrative of physical controls, the contribution from building and operations at the Dixie site could be a significant contributor to the nonradiological health impacts.

9.3.3.10 Radiological Impacts of Normal Operations

The following impact analysis includes radiological impacts from building activities and operation for two additional nuclear units at the Dixie site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health, including other Federal and non-Federal projects listed in Table 9-13. As described in Section 9.3.3, the Dixie site is a greenfield site. The geographic area of interest is the area within the 50-mi radius of the Dixie site. There are no major facilities that result in regulated exposures to the public or biota within 50 mi of the Dixie site. However, there are likely to be hospitals and industrial facilities with 50 mi of the Dixie site that use radioactive materials.

The radiological impacts of building and operating two AP1000 units at the Dixie site include direct radiation and liquid and gaseous radioactive effluents. These pathways produce low doses to people and biota offsite, well below regulatory limits. The impacts are expected to be similar to those estimated for the LNP site. The NRC staff concludes that the dose from direct radiation and effluents from hospitals and industrial facilities that use radioactive material would be an insignificant contribution to the cumulative impact around the Dixie site. This conclusion is based on the radiological monitoring programs conducted around currently operating nuclear power plants.

Based on the information provided by PEF and the NRC staff's independent analysis, the NRC staff concludes that the cumulative radiological impacts from building and operating the two proposed AP1000 units and other past, present, and reasonably foreseeable projects and actions in the geographic area of interest around the Dixie site would be SMALL.

9.3.3.11 Postulated Accidents

The following impact analysis includes radiological impacts from postulated accidents from operations for two nuclear units at the Dixie site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health from postulated accidents, including the other Federal and non-Federal projects listed in Table 9-13. The geographic area of interest considers all existing and proposed nuclear power plants that have the potential to increase the probability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the Dixie site. As described in Section 9.3.3, the Dixie site is a greenfield site within 50 mi of the existing CREC power plant site; there is one nuclear facility at the CREC site. There are no proposed reactors that have the potential to increase the probability-weighted consequences from a severe accident at any location within 50 mi of the Dixie site.

As described in Section 5.11.1, the NRC staff concludes that the environmental consequences of DBAs at the LNP site would be minimal for AP1000 reactors. DBAs are addressed specifically to demonstrate that a reactor design is robust enough to meet the NRC safety criteria. The AP1000 design is independent of site conditions and the meteorological conditions of the Dixie and LNP sites are similar; therefore, the NRC staff concludes that the environmental consequences of DBAs at the Dixie site would be minimal.

Assuming the meteorology, population distribution, and land use for the Dixie site are similar to the LNP site, risks from a severe accident for an AP1000 reactor located at the Dixie site are expected to be similar to those analyzed for the LNP site. These risks for the LNP site are presented in Tables 5-17 and 5-18 and are well below the median value for current-generation reactors. In addition, estimates of average individual early fatality and latent cancer fatality risks are well below the Commission's safety goals (51 FR 30028). For the existing plant within the geographic area of interest, namely CREC Unit 3, the Commission has determined that the probability-weighted consequences of severe accidents are SMALL (10 CFR Part 51, Appendix B, Table B-1). The planned 20-percent power uprate at CREC Unit 3 will only be approved by the NRC if the probability-weighted consequences of severe accidents would continue to meet NRC's regulatory requirements. Therefore, the impact would continue to be SMALL. On this basis, the NRC staff concludes that the cumulative risks of severe accidents at any location within 50 mi of the Dixie site would be SMALL.

9.3.4 Highlands Site

This section covers the review team's evaluation of the potential environmental impacts of siting a new two-unit nuclear power plant at the Highlands alternative site (hereafter Highlands site) in central Florida. The site is located in a rural area in Highlands and Glades Counties southwest of the Kissimmee River. The Kissimmee River would be the source for water for plant cooling and other plant uses, and construction of a new water-storage reservoir would likely be required. Highlands is a greenfield site not currently owned by PEF (PEF 2009a). Conceptual routes of the transmission lines necessary to connect the Highlands site to the electrical grid are located in Osceola, Polk, Hardee, Highlands, and Glades Counties.

The following sections include a cumulative impact assessment conducted for each major resource area. The specific resources and components that could be affected by the incremental effects of the proposed action if implemented at the Highlands site and other actions in the same geographic area were considered. This assessment includes the impacts of NRC-authorized construction and operations and impacts of preconstruction activities. Also included in the assessment are past, present, and reasonably foreseeable future Federal, non-Federal, and private actions that could have meaningful cumulative impacts when considered together with the proposed action if implemented at the Highlands site. Other actions and projects considered in this cumulative analysis are described in Table 9-19.

Table 9-19. Past, Present, and Reasonably Foreseeable Future Projects and Other Actions Considered in the Cumulative Analysis of the Highlands Site

Project Name	Summary of Project	Location	Status
Energy Projects			
Operation and decommissioning of St. Lucie Plant Units 1 and 2	Two 839-MW(e) combustion engineering reactors	Within 50 mi	Operational (NRC 2010b). In 2003, the operating licenses were renewed for an additional 20 years, or to 2036 for Unit 1 and 2043 for Unit 2.
Florida Gas Transmission Company, LLC (FGT) Phase VIII Expansion Project	Construction and expansion of natural-gas pipelines, new compressor, meter, regulator stations, and other appurtenant facilities	Various Counties in Alabama and Florida, including Highlands County. Route passes within 5 mi of the Highlands site and collocated with U.S. Highway 70.	Completion expected by 2011 (FERC 2010; Panhandle Energy 2010).
Other Actions/Projects			
Transportation Projects			
Florida High-Speed Rail	Construction of a high-speed rail corridor. Phase 1 of Florida's High Speed Rail Program.	Along U.S. Highway 4 corridor from Tampa to Orlando	Proposed (FDOT 2010b)
Mining Projects			
Daniel Shell Pit	Excavation pit.	Within 20 mi	Operational (EPA 2010i)

Table 9-19. (contd)

Project Name	Summary of Project	Location	Status
Parks, Forests and Reserves			
Commercial forest management	Managed forests for timber production.	Throughout region	Operational
Parks, forests, and reserves	Several parks, recreation, and conservation areas are located within the 50-mi region. Examples of such areas include Kissimmee Prairie Preserve State Park, and Paradise Run.	Throughout region	Currently managed by various local, State, and Federal agencies and organizations. Development likely limited in these areas.
Everglades Restoration	Multi-agency Comprehensive Plan for multiple restoration projects	Central and Southern Florida	Multiple projects underway (CERP 2010).
Lake Okeechobee Regulation	USACE management of Okeechobee Lake levels.	Lake Okeechobee and estuaries	Revised regulation schedule implemented in 2008 (USACE 2010b).
Brighton Reservation	35,280-ac reservation managed by Seminole Indian Tribe	Within 20 mi	Operational (Seminole Tribe of Florida 2010)
Taylor Creek Nubbins Slough Conservation Area	A reservoir-assisted stormwater-treatment area as part of the Comprehensive Everglades Restoration Plan.	Within 40 mi	Operational. Managed by SFWMD (FDEP 2010c; SFWMD 2010)
Lake Okeechobee Water Retention/Phosphorus Removal	Critical restoration consists of two components, the Isolated Wetlands Restoration and two constructed treatment wetlands known as Stormwater Treatment Areas.	Within 40 mi	Operational. Managed by SFWMD and USACE (FDEP 2010d)
Minor water dischargers	NPDES permitted dischargers including in the town of Okeechobee, Kissimmee Oaks Ranch, Butler Oaks Farm, B-4 Dairy, and other locations.	Throughout region.	Operational
Other Actions/Projects			
Various hospitals and industrial facilities that use radioactive materials	Medical isotopes	Within 50 mi	Operational in nearby cities and towns

Table 9-19. (contd)

Project Name	Summary of Project	Location	Status
Future urbanization	Construction of housing units and associated commercial buildings; roads (such as the proposed widening of SR-70 and SR-710), bridges, and railroads; construction of water- and/or wastewater-treatment and distribution facilities and associated pipelines, as described in local land-use planning documents.	Throughout region.	Construction would occur in the future, as described in State and local land-use planning documents (FDOT 2010c, d).

9.3.4.1 Land Use and Transmission Lines

The following analysis includes impacts from building and operating two nuclear units at the Highlands site, along with the necessary transmission lines to connect them to the grid. The analysis also considers other past, present, and reasonably foreseeable future actions that affect land use, including the other Federal and non-Federal projects listed in Table 9-19. For this analysis, the geographic area of interest for considering cumulative impacts is the area within a 25-mi radius of the Highlands site and the transmission-line corridors. The review team determined that a 25-mi radius would represent the smallest area that would be directly affected because it includes the primary communities (such as Okeechobee, Lake Placid, Parker Island, and Placid Lakes) that would be affected by the proposed project if it were located at the Highlands site.

The Highlands site is located in two Florida counties – Highlands County and Glades County. Historically, both Highlands and Glades Counties were known for agriculture. Existing land use in the geographic area of interest is mostly agriculture, including both citrus orchards and cattle ranches. The area is relatively flat, but has the potential for flooding (PEF 2009a). The Highlands site is not subject to the Coastal Zone Management Act because the site is not located within one of the designated Florida coastal zone counties. There are many parks and conservation areas in the region, as well as a Seminole Indian reservation.

Zoning changes would be needed to accommodate building and operation of a nuclear power plant at the Highlands site. Like the LNP site, the footprint of new power-generating units would be approximately 627 ac, with about 150 ac of additional land needed for temporary facilities and laydown yards. In addition, PEF indicates that a 1291-ac reservoir would be needed at the Highlands site to provide cooling water during periods of low flow of the Kissimmee River (PEF 2009d; CH2M Hill 2009). Construction of these facilities would result in a permanent land-use change from agriculture to a transportation, communications, and utilities land-use category. Additional land-use impacts include possible additional growth and land conversions to accommodate new workers and services. Because the workforce would be dispersed over larger geographic areas in the labor supply region, the impacts from land conversion for residential and commercial buildings induced by new workers relocating to the local area can be absorbed into the wider region. Therefore, the review team concludes that such impacts would be minimal.

There are no existing transmission lines or transmission-line corridors in the geographic area of interest around the Highlands site. New transmission lines would need to be constructed to connect the site to existing transmission lines. The transmission lines would run through counties designated under the Florida Coastal Management Program. Any expansion of these transmission-line corridors would require review under the procedures established under the Florida Coastal Management Program. Procedures for siting new transmission lines in Florida are discussed in Section 4.1.2. The review team assumes that the conditions of certification issued to PEF by the FDEP would apply at all of the alternative sites.

The review team estimated the linear run of the expected transmission-line corridors by referring to PEF Figure 3.3.3-12 (PEF 2009d), which depicts the potential routing of corridors needed to connect the Highland units to the grid. The figure suggests that 200 mi of transmission-line corridor would be needed. For purposes of land-use impact analysis, the review team made the assumption that 10 ac/mi would be disturbed, based on the LNP case where 1790 ac are expected to be disturbed over the 180 mi of corridor, as discussed in Section 4.1.2. The review team concludes that this assumption is reasonable because siting in Florida is a relatively rigorous process (Site Certification Application process), and the applicant would be bound by permit conditions resulting from that process, which would force it to use existing corridors to the extent practicable. The review team expects the SCA process would be consistently applied anywhere transmission lines are proposed in Florida. Therefore, the review team concludes that about 2000 ac of land would be disturbed to construct the transmission-line corridors for the Highlands site. Similar to the case at the LNP site, the review team concludes that land-use impacts from developing about 200 mi of new transmission-line corridors to connect new units at the Highlands site would be noticeable, but not destabilizing, and additional mitigation beyond the measures and conditions identified would not be warranted.

Cumulative Impacts

Future urbanization could contribute to additional decreases in open areas, forests, and wetlands and generally result in some increased residential and industrialized areas. However growth would likely be limited since the Highlands County Commissioners voted to pursue a “Rural Land Stewardship” program to maintain the rural character of the county (Atlantic Blue 2007). Increased urbanization, especially long linear projects such as new or expanded roads or pipelines, would also contribute to the loss of open or forested areas and increase fragmentation of habitats along or near the transmission lines. Due to the extent of new transmission lines that would be built, the review team expects that the corridors would have a noticeable impact on the local area. Florida Gas Transmission Company proposes to expand its liquefied natural gas (LNG) pipeline in the vicinity, passing near the Highlands site and collocated with US-70. This project would have limited impacts on land use because a small incremental amount of land would be converted to a new land use, and it would be adjacent to the current road. The Florida High Speed Rail project would intersect the potential transmission-line corridor where the corridor crosses Interstate 4, near Winston, Florida. However, the review team expects cumulative impacts would be minimal because both projects likely would be using existing public rights-of-way that already have been established and modified for current uses. Development would likely be limited in the nearby parks and conservation areas and the Seminole Indian reservation. Therefore, the incremental impacts associated with increased urbanization would be minimal.

Global climate change could increase temperature and reduce precipitation, which could result in reduced crop yields and livestock productivity (GCRP 2009), which, in turn, may change portions of agricultural and ranching land uses in the geographic area of interest. In addition, global climate change could increase sea level and storm surges in the geographic area of interest (GCRP 2009), thereby changing land use through inundation and loss of coastal wetlands and other low-lying areas. However, existing State and national forests, parks, reserves, and managed areas would help preserve wetlands and forested areas to the extent that they are not affected by sea-level rise. Because other projects identified in Table 9-19 that are within the geographic area of interest would be consistent with applicable land-use plans and control policies and would occur in dispersed locations, the review team considers their contribution to the cumulative land-use impacts to be relatively minor and manageable.

In the State of Florida's Conditions of Certification (FDEP 2010a), CREC Unit 1 and 2, two coal-fired plants, would stop operating by December 31, 2020, as long as PEF completes the licensing process, construction activities, and commences commercial operation of LNP Units 1 and 2 within a timely manner. If the Highlands site were selected, the review team expects the same condition would apply. If CREC Units 1 and 2 are shut down, land use at the units likely would remain industrial. Depending on economic conditions, PEF sells 60 to 95 percent of the coal plant ash to cement and building materials manufacturers, with the remainder going to Citrus Central Landfill in Lecanto, Florida. With the closure of CREC Units 1 and 2, this source of ash no longer would be available locally. The review team expects land-use impacts associated with the shutdown of Units 1 and 2 would be minimal.

Because detailed information concerning the routing of the possible new transmission-line corridors is not known at this time, a complete evaluation of potential land-use impacts cannot be made. Based on the information provided by PEF and the review team’s in independent review, the review team concludes that the land-use impacts of building and operating two new nuclear reactor units at the Highlands site and other projects would be MODERATE. The proposed project would be a significant contributor to the MODERATE impacts due to the substantial amount of land that would be needed for the proposed power plant, reservoir, and transmission infrastructure.

9.3.4.2 Water Use and Quality

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affect water use and quality, including the other Federal and non-Federal projects listed in Table 9-19. The Highlands site is located in rural Highlands County in Florida near the Kissimmee River. PEF has indicated that the development of this site for two nuclear units would require the building of a water reservoir on the Highlands site supplied with water from the Kissimmee River (PEF 2009a).

The geographic area of interest for the Highlands site is considered to be the drainage basin of the Kissimmee River upstream and downstream of the site because this is the resource that would be affected if the proposed project were located at the Highlands site. For groundwater, the ROI is limited to the alternative site because PEF has indicated no plans for use of groundwater to build and operate the plant (CH2M Hill 2009).

PEF indicates that the primary source of water for the site would be the Kissimmee River. Groundwater is considered an unavailable or unreliable resource for large quantities of cooling water at all of the alternative sites; in addition, permitting large groundwater withdrawals for industrial use is generally inconsistent with State policy (CH2M Hill 2009). This analysis therefore assumes that groundwater would not be used during building or operation of the two units at this site and that all water needs would be met with surface water from the Kissimmee River.

Surface water is available at the site from the Kissimmee River. Historical flow data for October 1948 through September 1951, and October 1962 through September 1964, are available for the Kissimmee River near Fort Basinger, Florida (USGS 2010c, d). The USGS has recently begun to measure flow again at this site and data from May 2009 to the present are available on its website. Mean annual flow for the historic record ranged from 566 cfs in 1963 to 2878 cfs in 1949 with the lowest monthly flow reported as 276.8 cfs in January 1963.

Building Impacts

The review team assumes that the surface-water use for building activities at the Highlands site would be identical to the proposed groundwater use for the LNP site. During building, the total maximum usage is projected to be 550,000 gpd (0.85 cfs) and the projected average estimated maximum groundwater usage 275,000 gpd (0.43 cfs) (see Table 3-2). This assumes that surface water would be used at the Highlands site for potable and sanitary use as well as various building related activities. This surface-water withdrawal rate is less than the potential operation withdrawal. This surface-water withdrawal rate is inconsequential when compared to the historic average monthly flow in the Kissimmee River, being less than 1 percent of the discharge for even the lowest month reported (January 1963). The review team concludes that the impact of surface-water use for building the potential units at the Highlands site would be minimal because withdrawal is small compared to the average monthly flow and withdrawal from the river would be temporary and limited to the building period.

As stated above, the review team assumed that no groundwater would be used to build the units at the Highlands site. The review team also assumes that the impact of dewatering the excavations needed for building two units at the site would be managed through the installation of diaphragm walls and grouting as is proposed for the LNP site. Therefore, because there would be no groundwater use and the impact of dewatering would be controlled, the review team determined that there would be little or no impact on groundwater resources.

Surface-water quality would most likely be affected by surface-water runoff during site preparation and the building of the facilities. FDEP would require PEF to develop an E&SCP and a SWPPP (PEF 2009a). These plans would be developed before initiation of site-disturbance activities and would identify measures to be used during site-preparation activities to mitigate erosion and control stormwater runoff (PEF 2009a).

The plans would identify BMPs to control the impacts of stormwater runoff. The review team anticipates that PEF would construct new detention/infiltration ponds and drainage ditches to control delivery of sediment from the disturbed area to onsite waterbodies. Sediment carried with stormwater from the disturbed area would settle in the detention ponds and the stormwater would infiltrate into the shallow aquifer. Implementation of BMPs should minimize impacts on surface-waterbodies near the Highlands site. Therefore, the surface-water-quality impacts near the Highlands site would be temporary and minimal.

While building new nuclear units at the Highlands site, groundwater quality may be affected by leaching of spilled effluents into the subsurface. The review team assumes that the BMPs PEF has proposed for the LNP site would be in place during building activities and therefore the review team concludes that any spills would be quickly detected and remediated. In addition, groundwater impacts would be limited to the duration of these activities, and therefore, would be temporary. The review team reviewed the general BMPs that could be expected to be required at such a site (FDEP 2010a). Because any spills related to building activities would be quickly remediated under BMPs, and the activities would be temporary, the review team concludes that the groundwater-quality impacts from building at the Highlands site would be minimal.

Operational Impacts

The Highlands site was identified by PEF as needing a cooling-water storage reservoir to meet plant cooling needs during periods of low flow. The review team assumed that the cooling-water system for the proposed units, if they were to be built and operated at the Highlands alternative site, would be similar to that proposed at the LNP site; specifically, the cooling water system would use cooling towers and blowdown would be discharged to the Kissimmee River. The cooling-water reservoir would provide capacity for times when adequate water from the river may not be available. PEF did not provide details of the cooling-water intake and effluent discharge locations. However, it is standard practice for power plants to design cooling-water intake and effluent discharge locations such that recirculation of discharged effluent to the intake does not occur. The reservoir was sized assuming the plant would operate on four cycles of concentration. The total cooling-water requirements would be 45 Mgd (31,250 gpm) and storage of a 90-day supply of water would be needed. In determining the acreage needed to achieve this amount of storage PEF assumed the reservoir would have an effective depth of 10 ft. PEF indicates that the resulting reservoir size would be 1291 ac (PEF 2009d; CH2M Hill 2009).

PEF indicates that the water needed to operate two units would be approximately 40,000 gpm or 89 cfs. As indicated in Chapter 3, evaporative losses from cooling two units would be approximately 28,000 gpm (62 cfs). A withdrawal of 89 cfs represents 16 percent of the mean annual flow of the Kissimmee River during the year with the lowest flow on record and 32 percent of the flow during the month with the lowest mean monthly discharge. Consumptive use of 62 cfs represents 11 percent of the lowest mean annual flow and 22 percent of the lowest mean monthly flow. Based on the indication that the water needed to operate two units at the Highlands site would represent a significant portion of the flow in the river, the review team determined that the operational surface-water-use impact of potential the plant at the Highlands site would be noticeable but not destabilizing.

As stated above, the review team assumed that no groundwater would be used to operate the units at the Highlands site. Therefore, because there would be no groundwater use, the review team determined that there would be no impact on groundwater resources during operations.

During the operation of two new nuclear units at the Highlands site, impacts on surface-water quality could result from stormwater runoff, discharges of treated sanitary and other wastewater and blowdown from cooling towers into the receiving waterbody. PEF did not provide the blowdown rate at the Highlands site. The review team conservatively assumed that the blowdown rate would be the same as that at the LNP site, 57,923 gpm (129 cfs). This assumption is conservative because the proposed plant at the Highlands site would use freshwater from the Kissimmee River rather than more saline water at the LNP site, requiring less frequent and smaller blowdown discharge. FDEP would require PEF to develop a SWPPP (PEF 2009a). These plans would identify measures to be used to control stormwater runoff

(PEF 2009a). The blowdown would be regulated by FDEP pursuant to 40 CFR Part 423 and all discharges would be required to comply with limits established by FDEP in a NPDES permit.

During the operation of the two units at the Highlands site, impacts on groundwater quality could result from potential spills. Spills that might affect the quality of groundwater would be prevented and mitigated by BMPs. Because BMPs would be used to mitigate spills and no intentional discharge to groundwater should occur, the review team concludes that the groundwater-quality impacts from operation of two nuclear units at the Highlands site would be minimal.

Cumulative Impacts

In addition to water-use and water-quality impacts from building and operations activities, cumulative analysis considers past, present, and reasonably foreseeable future actions that affect the same water resources.

For the cumulative analysis of impacts on surface water, the geographic area of interest for the Highlands site is considered to be the drainage basin of the Kissimmee River upstream and downstream of the site because this is the resource that would be affected by the proposed project. For groundwater, the ROI is limited to the alternative site because PEF has indicated no plans for use of groundwater to build and operate the plant. Actions that have past, present, and future potential impacts on water supply and water quality near the Highlands site include existing agriculture and existing and future urbanization in the region.

The GCRP has compiled the state of knowledge in climate change. This compilation has been considered in the preparation of this EIS. The projections for changes in temperature, precipitation, droughts, and increasing reliance on aquifers within the Kissimmee Basin are similar to those at other alternative sites in Florida. Such significant changes in climate would result in adaptations to both surface-water and groundwater management practices and policies that are unknown at this time.

Cumulative Water Use

Surface-water use during the building and operation of two units at the Highlands site would be dominated by water use for operations. PEF indicates that a reservoir would be needed to provide cooling water during periods of low flow. A withdrawal of 89 cfs represents 16 percent of the mean annual flow during the year with the lowest flow on record and 32 percent of the flow during the month with the lowest mean monthly discharge. Consumptive use of 62 cfs represents 11 percent of the lowest mean annual flow and 22 percent of the lowest mean monthly flow. Based on the indication that the water needed to operate two units at the Highlands site would represent a significant portion of the flow in the river, the review team determined that the operational surface-water-use impact of the proposed plant at the Highlands site would be noticeable.

The impacts of the other projects listed in Table 9-19 are considered in the analysis included above or would have little or no impact on surface-water use. The projects believed to have little impact are excluded from the analysis either because they are too distant from the Highlands site, use relatively little or no surface water, or have little or no discharge to surface water. Some projects (for example park and forest management) are ongoing, and changes in their operations that would have large impacts on surface water use appear unlikely.

Therefore, the review team concludes that cumulative impacts on surface-water use would be MODERATE. Building and operating the proposed plant at the Highlands site would be a significant contributor to these water-use impacts.

As stated above, the review team assumed that no groundwater would be used to build or operate the units at the Highlands site and that groundwater impacts from dewatering would be controlled with diaphragm walls and grouting. Therefore, the review team determined that the Highlands site by itself would have minimal impact on groundwater resources.

The impacts of the other projects listed in Table 9-19 are considered elsewhere in this analysis or else would have little or no impact on groundwater use. The projects believed to have little impact are excluded from the analysis either because they are too distant from the Highlands site, or use relatively little or no groundwater. Some projects (for example park and forest management) are ongoing, and changes in their operations that would have large impacts on groundwater use appear unlikely.

Therefore, the review team concludes that cumulative impacts on groundwater use would be SMALL.

Cumulative Water Quality

Point and non-point sources have affected the water quality of the Kissimmee River upstream and downstream of the site. Water-quality information presented above for the impacts of building and operating the proposed new units at the Highlands site would also apply to evaluation of cumulative impacts. The Kissimmee River appears on Florida's list of impaired waters because of the presence of nutrients, fecal coliform, depressed dissolved oxygen, copper, un-ionized ammonia, and mercury in fish tissue (FDEP 2010e); therefore, the review team concluded that the cumulative impact on surface-water quality of the receiving waterbody would be MODERATE. As mentioned above, the State of Florida requires an applicant to develop a SWPPP (PEF 2009a). The plan would identify measures to be used to control stormwater runoff (PEF 2009a). The blowdown would be regulated by EPA pursuant to 40 CFR Part 423 and all discharges would be required to comply with limits established by FDEP in a

NPDES permit. Such permits are designed to protect water quality. Therefore, the review team concluded that building and operating the proposed units at the Highlands site would not be a significant contributor to these impacts on surface-water quality, because industrial and wastewater discharges from the proposed units would comply with NPDES permit limitations and any stormwater runoff from the site during operations would comply with the SWPPP (PEF 2009a).

The review team also concludes that with the implementation of BMPs, the impacts of groundwater quality from building and operating two new nuclear units at the Highlands site would likely be minimal. Therefore, the cumulative impact on groundwater quality would be SMALL.

The impacts of other projects listed in Table 9-19 are either considered in the analysis included above or would have little or no impact on surface-water and groundwater quality.

9.3.4.3 Terrestrial and Wetland Resources

Site Description

The following impact analysis includes direct, indirect, and cumulative impacts from construction and preconstruction activities and operations on terrestrial and wetland resources. The analysis also considers past, present, and reasonably foreseeable future actions that affect those resources, including the other Federal and non-Federal projects and those projects listed in Table 9-19. For the analysis of terrestrial ecological impacts at the Highlands site, the geographic area of interest is considered to be a 20 mi-wide area centered on the Highlands site and the associated offsite and transmission-line corridors. This 20-mi radius is expected to encompass the locations of possible development projects potentially capable of substantially influencing terrestrial ecological resources on and close to the Highlands project site. This geographical area of influence generally coincides with those defined for hydrology and aquatic ecology, both of which are closely interrelated with the terrestrial ecology of this setting. This area includes watersheds providing direct runoff from the Highlands site to the lower Kissimmee River basin and the northern portion of Lake Okeechobee, as well as the Lake Whales Ridge district and the watersheds through which the transmission lines would be routed.

The Highlands site is a greenfield site located in the Eastern Florida Flatwoods ecoregion in a remote rural area near the Kissimmee River (EPA 2010l). Land use on the site and in the vicinity is predominantly agricultural, with significant farming operations and citrus groves present. Habitats present on the site are typical of the Eastern Florida Flatwoods ecoregion and include freshwater marshes and wet prairies with some mixed wetland hardwoods. Freshwater marsh vegetation communities from a range of hydroperiods include species such as arrowhead (*Sagittaria* spp.) and pickerelweed (*Pontederia lanceolata*), combinations of saw grass (*Cladium* spp.), cattails (*Typha* spp.), bulrushes (*Scirpus* spp.), maidencane (*Panicum hemitomon)*, beakrush (*Rhynchospora spp*), spikerush (*Eleocharis* spp.), bladderwort (*Utricularia* spp.), white water lily (*Nymphaea odorata*), floating hearts (*Nymphoides aquatica*), and yellow cow lily (spatterdock, *Nuphar luteum*). Wet prairie vegetation communities include sparse short saw grass (*Cladium jamaicense*), beak rush (*Rhynchospora* spp.*)*, black sedge (*Schoenus nigricans*), wire grass (*Aristida stricta*), and dwarf cypress (*Taxodium* spp.). Mixed wetland hardwood communities in this part of Florida can include species such as oaks (*Quercus virginiana, Q. falcata*, and *Q. alba*) beech (*Fagus grandifolia*), hickory (*Carya* spp.) and needle-leaved evergreens, such as loblolly pine and spruce pine (*Pinus glabra*) (FWS 2007).

The proposed associated transmission-line corridors would begin in the Eastern Florida Flatwoods ecoregion and cross the Central Florida Ridges and Uplands and Southwestern Florida Flatwoods ecoregions. Vegetation community types in the Central Florida Ridges and Uplands ecoregion include sand hill vegetation such as turkey oak, bluejack oak, and longleaf pine forests with common understory species of running oak, gopher apple, and bluestem and panicum grasses (USDA 2006). One of the proposed transmission-line corridors passes directly through the Lake Whales Ridge district, that contains some of the largest tracts of sandhill communities left in Florida, which provides habitat for many endemic plant species. Vegetation community types in the Southwestern Florida Flatwoods ecoregion include forests dominated by slash pine, longleaf pine, cabbage palm, and live oak with typical understory species of saw palmetto, gallberry, and grasses such as bluestems and wiregrasses (USDA 2006).

Important Species

Common wildlife, including important species, associated with the above-mentioned ecoregions that may occur on the Highlands site and associated transmission-line corridors include recreationally important species such as Florida white-tailed deer, bobcat, feral hog, squirrel, northern bobwhite, and mourning dove, as well as skunk, raccoon, and several species of woodpecker. Various bird, reptile, and amphibian species also have the potential to reside on the Highlands site and associated transmission-line corridors (USDA 2006; FNAI 2009).

No site-specific surveys have been conducted for threatened and endangered species on the site and in the vicinity, offsite corridors or the associated transmission-line corridors. Table 9-19 lists all Federally and State-listed species that could occur on the Highlands site and vicinity, within offsite corridors, and in the counties crossed by the transmission-line corridors. Some of these species may at times be found on or in the vicinity of the Highlands site and associated offsite corridors. Counties crossed by the likely transmission-line corridors for the Highlands site include Highlands, Glades, Osceola, Polk, and Sumter Counties. PEF has stated that on-the-ground field surveys would be conducted before commencement of ground-disturbing activities on the site and in the offsite corridors and transmission-line corridors as required by the FDEP (PEF 2009a; CH2M Hill 2009; FDEP 2010a).

Building Impacts

Impacts from building two nuclear units and supporting facilities on wildlife habitat would be unavoidable. Activities that would affect wildlife include land clearing and grading (temporary and permanent), filling and or draining of wetlands, increased human presence, heavy equipment operation, traffic, noise, avian collisions, and fugitive dust. These activities would likely displace or destroy wildlife that inhabits the areas of disturbance. Some wildlife, including important species, would perish or be displaced during land clearing for the above activities as a consequence of habitat loss, fragmentation, and competition for remaining resources. Less mobile animals, such as reptiles, amphibians, and small mammals, would be at greater risk of incurring mortality than more mobile animals, such as birds, many of which would be displaced to adjacent communities. Undisturbed land adjacent to areas of disturbance could provide habitat to support displaced wildlife, but increased competition for available space and resources could affect population levels. Wildlife would also be subjected to impacts from noise and traffic, and birds could be injured if they collide with tall structures. The impact on wildlife from noise is expected to be temporary and minor. The creation of new transmission-line corridors could be beneficial for some species, including those that inhabit early successional habitat or use edge environments, such as white-tailed deer, northern bobwhite, eastern meadowlark, and the gopher tortoise. Birds of prey, such as red-tailed hawks would likely exploit newly created hunting grounds. Forested wetlands within the corridors would be converted to and maintained in an herbaceous or scrub-shrub condition that could provide improved foraging habitat for waterfowl and wading birds. However, fragmentation of forests could adversely affect species that are dependent on large tracts of continuous forested habitat.

To accommodate the building of two nuclear units on the Highlands site, PEF would need to clear approximately 441 ac of terrestrial habitats for the nuclear facility and approximately 329 ac for associated offsite structures and corridors, and an additional 1291 ac of land would need to be cleared and excavated to accommodate a reservoir (see Table 9-20 and Table 9-21) (CH2M Hill 2009).

Table 9-20. Summary of Impacts by Land-Use Class for the Highlands Site

Land-Use Class (FLUCFCS) (acreage)	Onsite	Reservoir	Offsite Corridors (Except Transmission)	Transmission Corridors[(a)]
Urban and Built Environment (% of area)	0 (0%)	0 (0%)	19 (6%)	1766 (27%)
Agriculture	436 (99%)	1156 (90%)	263 (80%)	3004 (46%)
Upland Nonforested	0 (0%)	0 (0%)	7 (2%)	410 (6%)
Upland Forested	0 (0%)	0 (0%)	10 (3%)	351 (5%)
Water	0 (0%)	0 (0%)	5 (2%)	28 (<1%)

Table 9-20. (contd)

Land-Use Class (FLUCFCS) (acreage)	Onsite	Reservoir	Offsite Corridors (Except Transmission)	Transmission Corridors[(a)]
Wetlands	6 (1%)	135 (10%)	17 (5%)	558 (9%)
Barren Lands	0 (0%)	0 (0%)	8 (2%)	4 (<1%)
Transportation, Communication and Utilities	0 (0%)	0 (0%)	0 (0%)	395 (6%)

Source: CH2M Hill 2009
(a) Acreages for transmission lines are total acres available, not acres affected.

Table 9-21. Total Terrestrial Habitat Impacts for the Highlands Site

Impact Areas	Acres
Onsite Impact Areas	441
Reservoir Impact Areas	1291
Transmission-Line Corridor Areas	6516[(a)]
Offsite Impact Areas	329
Total Impact Areas	**2061 (plus portion of 6516-ac transmission corridor)**

Source: CH2M Hill 2009
(a) Transmission line acreage is total acres available in the transmission-line corridor, not acres affected.

Based upon FLUCFCS land-use data, approximately 6 ac of wetlands would be affected on the site during building (CH2M Hill 2009). Approximately 17 ac of wetlands would be affected in the offsite corridors (CH2M Hill 2009). Approximately 135 ac of wetlands would be affected to accommodate the reservoir (CH2M Hill 2009). PEF states that the nuclear facility would be sited to avoid wetlands whenever possible, and potential impacts on wetlands near building zones would be minimized through the use of established BMPs (PEF 2009a). Under Federal and State permitting requirements, PEF would be obligated to mitigate any unavoidable construction impacts on jurisdictional wetlands and listed species (FDEP 2010a).

New transmission system infrastructure would be needed to support a nuclear power facility at the Highlands site, which includes approximately 200 mi of transmission lines (estimates made by measuring the approximate distance of hypothetical corridors provided in CH2M Hill 2009; see assumptions in Section 9.3.4.1). There are no existing transmission lines or transmission-line corridors present on the site. PEF has assumed that transmission lines would be collocated within existing transmission-line corridors to the extent possible, thereby minimizing potential terrestrial impacts. In addition, transmission-line corridors, towers, and access road would be situated to avoid critical or sensitive habitats and species to the extent possible. Transmission-line corridor width would be dependent on the size, voltage, and whether existing corridors could be used, and would vary from 55 ft to 460 ft wide. These widths were used in the analysis of the hypothetical routes for each alternative site to determine land-use cover types

(CH2M Hill 2009). The transmission-line corridors for the Highlands site would consist of approximately 6516 ac, of which approximately 558 ac would be wetlands, and approximately 351 ac would be forested habitat (CH2M Hill 2009). Some portion of the total 351 ac of forested habitat and 558 ac of wetland habitat present in the corridors would be affected; however, because actual routes have not been determined, impacts to forests and wetlands cannot be quantified. Under Federal and State permitting requirements, PEF would be obligated to mitigate any unavoidable construction impacts on jurisdictional wetlands and listed species. PEF stated that all land clearing associated with the nuclear facility, offsite structures, and transmission-line creation would be conducted according to Federal, State, and local regulations, permit requirements, existing procedures, and established BMPs (PEF 2009a; FDEP 2010a).

Building two new nuclear reactors at the Highlands site, including offsite corridors (except transmission corridors) and a reservoir would result in a loss of approximately 2061 ac of terrestrial habitat. Clearing land within the 6,516-ac transmission-line corridor would also result in a loss of an undetermined additional amount of forested terrestrial habitat and increase habitat fragmentation along the corridor. Other sources of impacts on terrestrial resources such as noise, increased risk of collision and electrocution, and displacement of wildlife would likely be temporary and result in minimal impacts on the resource. Because of the extent of unavoidable terrestrial habitat loss, building the two new units and associated offsite facilities, including transmission lines, would noticeably alter the available terrestrial habitat in the landscape surrounding the Highlands site.

Operational Impacts

Impacts on terrestrial ecological resources, including important species, from operation of two new nuclear units at the Highlands site include those associated with transmission system structures, maintenance of transmission-line corridors, and operation of the cooling towers. Also, during plant operation, wildlife would be subjected to impacts from increased traffic.

Impacts on crops, ornamental vegetation, and native plants from cooling-tower drift cannot be evaluated in detail in the absence of information about the specific location of cooling towers at each alternative site. Similarly, bird collisions with cooling towers cannot be evaluated in the absence of information about the specific location of cooling towers at the site. The impacts of cooling-tower drift and bird collisions for existing power plants were evaluated in NUREG-1437 (NRC 1996) and found to be of minor significance for nuclear power plants in general, including those with various numbers and types of cooling towers. On this basis, the review team concludes, for the purpose of comparing the alternative sites, that the impacts of cooling-tower drift and bird collisions with cooling towers resulting from operation of new nuclear units would be minor.

Outdoor noise levels on the Highlands site are predicted to range from 90 dBA near the loudest equipment to 65 dBA in areas more distant from major noise sources (PEF 2009a). Noise modeling predicts not perceptible to slight increases in noise from plant operations at the site boundary (PEF 2009a). Except in areas immediately adjacent to major noise sources, expected noise levels would be below the 60- to 65-dBA threshold at which birds and red foxes (a surrogate for small and medium-sized mammals) are startled or frightened (Golden et al. 1980). Thus, noise from operating cooling towers at the Highlands site would not be likely to disturb wildlife beyond the site boundary. Consequently, the review team concludes that the impacts of cooling-tower noise on wildlife would be minimal.

An evaluation of specific impacts resulting from building of transmission lines and transmission-line corridor maintenance cannot be conducted in any detail due to the lack of information, such as the specific locations of new rights-of-way that could result from transmission system upgrades. However, in general, impacts associated with transmission-line operation consist of bird collisions with transmission lines, EMF effects on flora and fauna, and habitat loss due to corridor maintenance. The impacts associated with transmission-line corridor maintenance activities include alteration of habitat, including but not limited to wetland and floodplain habitat, due to cutting and herbicide application.

Transmission lines and associated structures pose a potential avian collision hazard. Direct mortality resulting from birds colliding with tall structures has been observed (Erickson et al. 2005). Factors that appear to influence the rate of avian impacts with structures are diverse and related to bird behavior, structure attributes, and weather. Migratory flight during darkness by flocking birds has contributed to the largest mortality events. Tower height, location, configuration, and lighting also appear to play a role in avian mortality. Weather, such as low cloud ceilings, advancing fronts, and fog also contribute to this phenomenon. Waterfowl may be particularly vulnerable due to their low, fast flight and flocking behavior (EPRI 1993). Bird collisions with transmission lines are recognized as being of minor significance at operating nuclear power plants, including those with transmission-line corridors with variable numbers of power lines (NRC 1996). Accordingly, although additional transmission lines would be required for new nuclear units at the alternative sites, increases in bird collisions would be minor and these would likely not be expected to cause a measurable reduction in local bird populations. PEF would also be required to have an Avian Protection Plan in compliance with State certification guidelines (FDEP 2010a). Consequently, the incremental number of bird collisions posed by the addition of new transmission lines for new nuclear units would be negligible.

EMFs are unlike other agents that have an adverse impact (e.g., toxic chemicals and ionizing radiation) in that dramatic acute effects cannot be demonstrated and long-term effects, if they exist, are subtle (NRC 1996). A careful review of biological and physical studies of EMFs did not reveal consistent evidence linking harmful effects with field exposures (NRC 1996). At a distance of 300 ft, the magnetic fields from many lines are similar to typical background levels in most homes. Thus, impacts of EMFs on terrestrial flora and fauna are of small significance at operating nuclear power plants, including transmission systems with variable numbers of power lines (NRC 1996). Since 1997, more than a dozen studies have been published that looked at cancer in animals that were exposed to EMFs for all or most of their lives (Moulder 2003). These studies have found no evidence that EMFs cause any specific types of cancer in rats or mice (Moulder 2003). Therefore, the incremental EMF impact posed by the addition of new transmission lines for new nuclear units would be negligible.

Existing roads providing access to the existing transmission-line corridors would likely be sufficient for use in any expanded corridors; however, new roads would be required during the development of new transmission-line corridors. Management activities (cutting and herbicide application) related to transmission-line corridors and related impacts on floodplains and wetlands in transmission-line corridors are recognized as being of minor significance at operating nuclear power plants, including those with transmission-line corridors of variable widths (NRC 1996). The review team assumes that the same vegetation and construction management of corridors currently used by PEF would be used in the establishment and maintenance of the new corridors. Under the Conditions of Certification for the State, PEF would also be required to retain existing vegetation whenever practicable and use BMPs that comply with the Florida State regulations (FDEP 2010a). Consequently, the incremental effects of the maintenance of transmission-line corridors and associated impacts on floodplains and wetlands posed by expanding existing corridors or the addition of a new transmission-line corridor for new nuclear units would be negligible.

To summarize, the potential effects of operating two new nuclear reactors at the Highlands site would be primarily associated with the maintenance of transmission-line corridors and increased traffic. Operational impacts on terrestrial resources would be expected to be minimal.

Cumulative Impacts

There are no past or current actions in the geographic area of interest that have influenced terrestrial resources in a way similar to the building and operation of the proposed two new nuclear units at the Highlands site. However, terrestrial habitats throughout the geographic area of interest have been extensively altered by a history of forestry and agricultural practices as well as low density residential development.

Proposed reasonably foreseeable future actions that would affect terrestrial resources in a way similar to development at the Highlands site would include transmission-corridor creation and/or upgrading throughout the designated geographical ROI, and future urbanization would also be expected to occur. However, there is an area within the geographical ROI that is managed for the benefit of wildlife – the Brighton Indian Reservation, located near the Highlands site.

The other impact on terrestrial resources at the Highlands site would be the effect of global climate change on plants and wildlife. The impact of global climate change on terrestrial wildlife and habitat in the geographic area of interest is not precisely known. Global climate change would result in a rise in sea level and may cause regional increases in the frequency of severe weather, decreases in annual precipitation and increases in average temperature (GCRP 2009). Such changes in climate could alter terrestrial community composition on or near the Highlands site through changes in species diversity, abundance and distribution. Elevated water temperatures, droughts, and severe weather phenomena may adversely affect or severely reduce terrestrial habitat. Specific predictions of habitat changes in this region due to global climate change are inconclusive at this time. However, because of the regional nature of climate change, the impacts related to global climate change would be similar for all of the alternative sites.

Summary Statement

Impacts on terrestrial ecology resources are estimated based in the information provided by PEF and the review team's independent review. Past, present, and future activities in the geographic area of interest could affect terrestrial ecology in ways similar to the building of the proposed two units at the LNP site. The Highlands site is predominantly agricultural land and citrus groves, but, a large portion of the associated transmission-line corridors would cross natural habitats that would be substantially altered by development and maintenance activities noticeably affecting the level and movement of terrestrial wildlife populations in the surrounding landscape. Other anticipated development projects would further alter wildlife habitats and migration patterns in the surrounding landscape. The review team therefore concludes that the cumulative impacts on baseline conditions for terrestrial ecological resources would be MODERATE. This determination is based upon the extent of expected wetland loss and habitat fragmentation from ongoing and planned development projects, continued widespread manipulation of habitats for commercial agricultural management, and anticipated losses of habitat for important species. The incremental impacts from building and operating the Highlands project would be a significant contributor to the moderate cumulative impact, primarily because of a loss or modification of habitats that support wildlife, wetlands, and important species. Although incremental impacts on terrestrial resources could be noticeable near the Highlands project site, these impacts would not be expected to destabilize the overall ecology of the regional landscape.

9.3.4.4 Aquatic Resources for the Highlands Site

The following impact analysis includes impacts from building activities and operations on aquatic ecology resources. The proposed Highlands site has no existing infrastructure associated with development of a nuclear power plant. This greenfield site is adjacent to the Kissimmee River, which would be the water source for cooling and discharge. Water flow in the Kissimmee River is managed by the South Florida Water Management District (SFWMD). PEF maintains that because the Kissimmee River is being restored to its original river bed, the building of a reservoir would be required to ensure consistent water supply (PEF 2009a). The geographic area of interest includes the lower Kissimmee River basin from Chandler Slough south and including the northern portions of Lake Okeechobee as the area most likely to be affected by new nuclear units, as well as associated transmission-line corridors.

The Kissimmee River provides almost one-half of the inflow to Lake Okeechobee. The previously channelized river is currently under restoration, which is required for successful restoration of the Everglades as part of the Lake Okeechobee watershed. Originally feeding floodplain wetlands, the Kissimmee River was channelized for flood control to discharge excess water to Lake Okeechobee. Currently, the canal is being filled in specific areas to improve flow velocities and divert water flow to the original floodplains (Audubon of Florida 2005).

There are no sanctuaries or preserves that could be affected by locating the proposed units at the Highland site. The nearest managed area is the North Fork St. Lucie aquatic preserve east of Highlands County in St. Lucie and Martin Counties; the preserve protects 5000 ac of surface-water area on the St. Lucie River.

Commercially Important Species

While there is no commercial fishing in the Kissimmee River, Lake Okeechobee supports a small commercial fishery for catfish and black mullet (see Section 2.4.2). White catfish (*Ameiurus catus*), yellow bullhead (*A. natalis*), brown bullhead (*A. nebulosus*), and channel catfish (*Ictalurus punctatus*) have been documented in Lake Okeechobee. Spawning ranges from spring to mid-summer, and these primarily nocturnal fish feed on benthic invertebrates and other fish (Rohde et al. 1994).

Recreationally Important Species

The Kissimmee River and Lake Okeechobee support a diverse recreational freshwater fishery. Largemouth bass and black crappie (*Pomoxis nigromaculatus*) represent the most popular, although some saltwater species are routinely caught near the Franklin and St. Lucie locks on Lake Okeechobee (FFWCC 2009b).

Non-Native and Nuisance Species

Water hyacinth, water lettuce *(Pistia stratiotes*), alligatorweed *(Alternanthera philoxeroides)*, and hydrilla are common invasive aquatic plant species that have been noted in the Kissimmee River basin and Lake Okeechobee that are controlled by the Kissimmee River restoration, and Lake Okeechobee restoration efforts in cooperation with FDEP/Florida Fish and Wildlife Conservation Commission's Invasive Plant Management Program (FDEP 2008). Torpedograss (Panicum repens) and melaleuca (*Melaleuca quinquenervia*) are also spreading rapidly in the marsh areas of Lake Okeechobee due to drought conditions and the lowering of the lake level. Exotic animals that have been introduced into Lake Okeechobee include tilapia (*Tilapia aurea)*, Asiatic clam (*Corbicula fluminea*), and water flea (*Daphnia lumholtzii*) (SFWMD 2000). Power plant operations are not expected to have an impact on the presence or spread of these species.

Critical Habitats

No critical habitat has been designated by the FWS or National Oceanic and Atmospheric Administration in the vicinity of the Highlands site.

Federally and State-Listed Species

There are no Federally and/or State-listed aquatic species that may occur near the Highlands site. Federally and/or State-listed species may occur along transmission-line corridors, but their occurrence cannot be determined at this time because specific details regarding placement of transmission infrastructure are not available.

Based on the assumption that BMPs would be in use during building, site, vicinity, and transmission preparation, building and operation activities are not expected to result in impacts on Federally or State-listed species.

Building Impacts

New cooling-water intake and discharge structures in addition to a cooling-water reservoir would be required at the Highlands site. Preparation of a reservoir with intake and discharge structures would not result in impacts on aquatic resources from building activities. However, installation of a makeup-water intake structure on the Kissimmee River for fill water and a separate discharge to the Kissimmee River to receive discharge would result in the temporary displacement of aquatic biota within the vicinity of both structures on the Kissimmee River. It is expected that these biota would return to the area after installation is complete. Sedimentation due to disturbances of the river bank and bottom during installation could affect local benthic populations. However, the impacts on aquatic organisms would be temporary and largely mitigable through the use of BMPs. The impacts of building a cooling-water reservoir may be significant depending on the siting of the reservoir. During the review team's site visit, observations of the proposed site via public roads indicated the presence of streams that are either perennial or seasonal. Offsite corridor preparations would cross 10 streams and 2 open waterbodies (CH2M Hill 2009). These aquatic resources have not been examined for diversity of aquatic biota, but nonetheless still represent aquatic habitat that would likely be affected by the building of facilities for the site. The use of BMPs during building activities could minimize impacts on aquatic biota located in water resources within the site building areas.

New transmission-line infrastructure would be required for a new two-unit facility. There are currently no existing transmission-line corridors in the immediate vicinity of the Highlands site and new corridors would need to be established. Transmission corridors appear to follow routes in Highlands, Osceola, Polk, and Sumter Counties (CH2M Hill 2009). PEF anticipates transmission-line corridors would cross 4 streams and 37 open waterbodies and should have minimal impact on aquatic resources (CH2M Hill 2009).

Operational Impacts

Impingement and entrainment of organisms from the Kissimmee River and from a constructed reservoir would be the most likely impacts on aquatic populations that could occur from operation of two new nuclear units at the Highlands site.

Assuming (1) a closed-cycle cooling system that meets the EPA's Phase I regulations for new facilities (66 FR 65256), (2) a maximum through-screen velocity of 0.5 fps at the cooling-water intake, and (3) an intake flow of less than or equal to 5 percent of the mean annual flow, then anticipated impacts on aquatic populations from entrainment and impingement are expected to be minimal. However, as discussed in Section 9.3.4.2, the withdrawal of water from the Kissimmee River needed to operate two new units would be 16 percent of the mean annual flow during the year with the lowest flow on record. During low-flow conditions, impingement and entrainment impacts may be noticeable. Operational impacts associated with water quality and discharge cannot be determined without additional detailed analysis. However, based on the review team's experience with other facilities, the review team concludes that with proper design the impacts on aquatic resources due to the blowdown discharge from operation of two new nuclear units at the Highlands site would likely be minimal with FDEP NPDES compliance.

The review team also concludes that operational impacts on aquatic biota from maintenance of the transmission-line corridors would also be minimal assuming that appropriate BMPs are used.

Cumulative Impacts

Cumulative impacts on aquatic resources within the Kissimmee River basin include the restoration activities associated with removing anthropogenic channelization and restoration to historic river flow, and Lake Okeechobee and Everglades restoration activities managed by USACE and SFWMD. All restoration activities are planned to increase the productivity and biodiversity within the Kissimmee-Okeechobee-Everglades ecosystems (SFWMD 2008). Restoration activities such as backfilling and channel carving to reconnect hydrological resources are managed through use of BMPs to minimize erosion and sedimentation (USACE 1996). Early restoration improvements have already demonstrated successful establishment of pre-channelized conditions and communities characteristic of free-flowing riverine habitats (SFWMD 2008).

Other impacts include operation of dairy farms, agriculture, and small businesses that discharge wastewater to the Kissimmee River basin within the geographic area of interest for the Highlands site. These dairy operators and businesses have active NPDES permits for discharge.

Anthropogenic activities, such as residential or industrial development near the vicinity of a nuclear facility, can present additional constraints on aquatic resources. Future activities may include shoreline development (i.e., removal of habitat), increased water needs, and increased discharge of effluents into the Kissimmee River. The effects of continued dairy practices and agriculture could result in additional habitat loss and/or degradation due to water use using surface waters and groundwater withdrawal, point and non-point source pollution, siltation, and bank erosion. The review team is also aware of the potential for global climate change to affect aquatic resources. The impact of global climate change on aquatic organisms and habitat in the geographic area of interest is not precisely known. Global climate change would result in a rise in sea level and may cause regional increases in the frequency of severe weather, decreases in annual precipitation, and increases in average temperature (GCRP 2009). Such changes in climate could alter aquatic community composition on or near the Highlands site through changes in species diversity, abundance, and distribution. Elevated water temperatures, droughts, and severe weather phenomena may adversely affect or severely reduce aquatic habitat, but specific predictions of aquatic habitat changes in this region due to global climate change are inconclusive at this time. The level of impact resulting from these events would depend on the intensity of the perturbation and the resiliency of the aquatic communities.

Summary Statement

Impacts on aquatic ecology resources are estimated based on the information provided by PEF, the State of Florida, and the review team's independent review. Properly siting associated transmission lines, avoiding habitat for protected species, minimizing interactions with waterbodies and watercourses along the corridors, and the using BMPs during intake and discharge installation, transmission-line corridor preparation, and tower placement would minimize building and operation impacts. There would be impacts associated with the loss of aquatic habitat, particularly during low flow conditions in the river, due to the consumptive loss of water from closed-cycle cooling. There also would be unspecified impacts related to the construction and operation of a cooling reservoir, however, these could be minimized through proper siting and the use of BMPs during construction. The use of a cooling reservoir would partially mitigate the effects of consumptive water loss on aquatic habitat during low river flow. The review team concludes that the cumulative impacts of building and operating two new reactors on the Highlands site combined with other past, present, and future activities on most aquatic resources in the Kissimmee River basin and Lake Okeechobee would be SMALL.

9.3.4.5 Socioeconomics

The following impact analysis includes direct, indirect, and cumulative impacts from building activities and operations at the Highlands site, which is located southwest of the Kissimmee River in a rural area of Highlands County, Florida. The analysis considers other past, present, and reasonably foreseeable future actions that affect socioeconomics, including other Federal and non-Federal projects listed in Table 9-19. For the analysis of socioeconomic impacts at the Highlands site, the geographic area of interest is the region within a 50-mi radius of the Highlands site (the region). In evaluating the socioeconomic impacts of site development and operation at the Highlands site, the review team undertook a reconnaissance survey of the site using readily obtainable data from the Internet or published sources.

The Highlands site is a greenfield site in central Florida. The review team drew upon USCB data (USCB 2000b, c) to find the available total construction workforce within the host county, adjacent counties, and nearby counties with a major population center within a reasonable commuting distance from the site. For the Highlands site, this included Highlands, Hardee, De Soto, Glades, Okeechobee, Polk, Martin, St. Lucie, and Palm Beach Counties. The total construction workforce employed in these counties in 2000 was 76,849 workers. Based on this availability, the review team assumed that up to 80 percent of the 3300-person workforce involved in building the two-unit plant, or 2640 workers, would be drawn from existing residents of the region, and that 20 percent, or 660 workers, would be in-migrants to the area. This 20 percent would include special trades needed for nuclear power plant production that may not be available in the region.

For the purposes of this analysis the review team assumed that about one-quarter or 165 of the in-migrating workers would be distributed about evenly among Polk, St. Lucie, Martin, or Palm Beach Counties, because they offer more urban amenities than the EIA. The review team assumed that the other 495 in-migrating workers would be distributed among Highlands County and the immediately adjacent Glades, De Soto, Hardee, and Okeechobee Counties, according to available housing. The review team considered this five-county area as the local area where most socioeconomic impacts would be expected to be the greatest (Economic Impact Area, EIA). The review team focused on effects of the workforce involved in building the two-unit plant because the operations workforce would be smaller, with expected smaller socioeconomic impacts. Table 9-22 provides some socioeconomic data for the EIA.

The review team assumed that all in-migrating workers would bring families; this is unlikely but provides an upper bound to the population increase associated with the project. The review team used the 2.49 average Florida family size to project the distribution of new jobs and population in the EIA due to in-migrating workers listed in Table 9-23.

Table 9-22. Socioeconomic Data for the Highlands Site EIA

Data Category	Highlands	Glades	De Soto	Hardee	Okeechobee	Data source
Population						
1980	47,526	5992	19,039	20,357	20,264	(1a)
1990	68,432	7591	23,865	19,499	29,627	(1)
2000	87,366	10,576	32,209	26,938	35,910	(1)
Projected 2010	103,201	11,330	34,423	29,362	41,476	(2)
Median Household Income (1999)	$30,160	$30,744	$30,714	$30,183	$30,456	(3)
Vacant Housing Units 2000	11,375	1938	2862	1654	2911	(1)
Total Housing Units						
2000	48,846	5790	13,608	9,820	15,504	(1)
2007	54,467	6067	14,478	10,482	16,512	(1)
Workforce						
Employed	30,051	3677	12,742	9901	14,169	(3)
Peak Project	2139	368	976	794	1352	(3)
Total Schools[(a)]	1A 4B 7 A-B 3C	2 A-B 2 B-C	1 A 1B 3A-B 1C 1B-C	0 A 2 B 5 A-B 1 C	1 A 1 B 4 A-B 2 C 1 A-B-C	(4)

Table 9-22. (contd)

Data Category	Highlands	Glades	De Soto	Hardee	Okeechobee	Data source
Number of Schools Failing Student-Teacher Ratio	0	0	0	1	0	(4)
Police	Sheriff Dept – 341 full-time and 18 part-time employees;	Sheriff Dept – 60+ employees; currently expanding; patrol division with 19 members	Sheriff Dept	Sheriff Dept – patrol division of 4 squads.	Sheriff Dept - 44 deputies	(5)
Emergency Services	EMS department, details not available	EMS and fire departments, details not available	Emergency operations center with 5 staff; 3 fire stations	EMS department and emergency ops center, details NA	EMS department and emergency operations center, details not available	(6)
Population						
White	84.7	78.3	74.5	72.1	81	(3)
Afr-American	9.8	10.8	12.7	8.9	8.3	(3)
Hispanic	12.1	15.1	24.9	35.7	18.6	(3)
Low-Income	15.2	15.2	23.6	24.6	16.0	(3)

(a) A-elementary school; B-middle school ;C-high school
Sources:
(1a) USCB 1990
(1) USCB 2000b
(2) 2010 projection assuming 2000-2008 growth rate (from USCB 2009) extends to 2010
(3) USCB 2000c
(4) FDOE 2009a
(5) Highlands Sheriff 2009, Glades Sheriff 2009, De Soto Sheriff 2009, Hardee Sheriff 2009, Okeechobee Sheriff 2009
(6) Highlands EM 2009, Glades EM 2009, De Soto EM 2009, Hardee EM 2009, Okeechobee EM 2009
EMS = emergency management services

Table 9-23. Projected Distribution of Workers and Associated Population Increase in the EIA

County	Percent Population Increase 1990-2000[(a)]	Projected Percent Increase 2000–2010 [(b)]	Workers In-Migrating to Build Dixie Plant	Civilian Workforce in 2007 [(c)]	Population of In-Migrating Workers and Families	Population of Workers and Families as a Percent of Projected 2010 Population	Population of Workers and Families as a Percent of Projected 2010 Population + In-Migrants
Highlands	27.7	18.1	271	40,340	676	0.66	0.65
Glades	39.3	7.1	46	4615	115	1.02	1.01
De Soto	35.0	6.9	68	14,046	170	0.49	0.49
Hardee	38.2	9.0	39	12,071	98	0.33	0.33
Okeechobee	21.2	15.5	69	16,512	173	0.42	0.42

(a) Based on USCB data, as reported in PEF 2007
(b) Calculated as 1.25 times percent change 2000–2008 shown in USCB 2009, i.e., assumes rate of change for first eight years would continue through last two years of the decade.
(c) BEA 2010

Physical and Aesthetics Impacts

The physical impacts on workers and the public of building and operating a two-unit plant at the Highlands site would be very similar to those described for the LNP site. People who work or live around the site could be exposed to noise, fugitive dust, and gaseous emissions from building activities. Building workers and personnel working onsite could be the most affected. Air-pollution emissions are expected to be controlled by applicable BMPs and Federal, State, and local regulations. During plant operations, standby diesel generators used for auxiliary power would have air-pollution emissions. These generators would see limited use for only short periods of time. Applicable Federal, State, and local air-pollution requirements would apply to all fuel-burning engines. At the site boundary, the annual average exposure from gaseous emission sources is anticipated to not exceed applicable regulations during normal operations. The impacts of plant operations on air quality are expected to be minimal. As with building impacts, potential offsite receptors of operations noise and emissions are generally located well away from the site boundaries.

The Highlands site is in a rural, agricultural area. Residential and commercial areas are located away from the site boundaries, applicable air-pollution regulations would have to be met by PEF, and applicable BMPs would be put in place during the construction and use of the site access road. Therefore, based on information provided by PEF and the review team's independent review of reconnaissance-level information, the review team concludes that the physical impacts of building and operating the two units at the Highlands site would be minimal on workers and the local public around the site.

Building activities and plant operations are not expected to affect any offsite buildings. Most buildings are well removed from the site boundaries. Because this is a greenfield site, there are no onsite buildings to be affected by shock and vibration from pile-driving and other related activities. No long-term physical impacts on structures, including any residences near the site boundaries, would be expected. Therefore, based on consideration of reconnaissance-level information, the review team concludes that the physical impacts of building and operating a two-unit nuclear plant on offsite buildings would be minor.

PEF reports that a reservoir may need to be created for water supply. Because its size and footprint are unknown, the review team cannot predict whether such a reservoir would affect aesthetics in the vicinity of the plant. However, there would likely be vegetative screening around the reservoir that would potentially mitigate the aesthetic impacts.

As the transmission lines to connect the site to the distribution grid are put in place and the buildings and cooling towers associated with the new reactors reach their final heights and begin operating, they would add a visible industrial landscape, with a noticeable aesthetic impact. In places requiring the clearing of new transmission-line corridors, aesthetic impacts would be noticeable but not destabilizing, depending on the proximity of viewers and the nature of vegetation remaining between them and the corridors. Given the general characteristics of the area, there would likely be vegetative screening around the site that would potentially mitigate the aesthetic impacts at the reactor site.

Demographic Impacts

Table 9-23 lists the estimated project-related population migrating into the EIA at peak workforce levels and the population increase in each county between 1990 and 2000 and between 2000 and 2010. As seen in the table, each county saw a greater population increase between 1990 and 2000 than is forecast for between 2000 and 2010; with the exception of Okeechobee County, where growth during the 1990s was a great deal higher. The proposed project would increase the population in each of the EIA by an estimated 1.01 percent or less over projected populations for 2010. Consequently, the review team found that the in-migrating population associated with building two new nuclear generating units would have a minor demographic impact in the EIA.

Economic Impacts

The review team determined that the impact of jobs associated with building the two units would have a minor effect on total employment in the EIA, with in-migrating workers projected at 1 percent or less of the 2007 civilian workforce in any county. The impact of approximately 541 new operations jobs (70 percent of operations workforce) within a 1-hour commute of the site would be minor on employment levels in the EIA. Due to the smaller economy of the Highlands EIA compared to the Levy EIA, and the smaller number of in-migrating workers at the period of peak workforce, the review team concludes that the expected number of indirect jobs and income created by building and operating the two-unit plant at the Highlands site due to the multiplier effect would be no greater than that estimated for the LNP site and that the combined direct and indirect economic effects would cause only a slight increase the counties' economies.

State and local taxes would be governed by Florida law. The review team assumed that tax revenues generated from sales and use taxes associated with building and operation of the proposed project at the Highlands site would be similar to those evaluated for the LNP site in Sections 4.4.3.2 and 5.4.3.2, with a minor impact on revenues in the EIA and region. The review team concluded that increased property taxes from a facility at the Highlands site during operations would have a substantial beneficial impact on Highlands County, but minimal impacts on the other counties in the EIA and region. The review team found that additional property taxes on new houses built by in-migrating workers would constitute a small percentage increase in the local tax base in the EIA. Therefore, the review team determined that the impact of both the building and operation of the proposed project on residential property tax revenues would be minor and beneficial everywhere in the region, with the exception of Highlands County, where property tax impacts would be substantial and beneficial.

Housing

The review team compared the 2000 figures for vacant housing in the EIA listed in Table 9-22 with the number of in-migrating workers projected for peak workforce years listed in Table 9-23. Table 9-22 housing figures do not include RV parks, campgrounds, or hotels, and thus provide a lower bound of what would be available to house workers. To estimate the baseline number of houses that would be needed in the EIA (i.e., without the hypothetical plant), the review team divided the projected non-project related increase in population by 2.49 (Florida average family size) and determined the vacant housing stock in the EIA could absorb both the in-migrating workers and the remainder of the projected population increase. In the EIA, less than 5 percent of the vacant housing present in 2000 would be needed to house in-migrating workers, assuming that each worker occupied a separate housing unit.

The U.S. Census Housing Profile (USCB 2000b) for the EIA estimated the following:

- Highlands County – a total housing stock of 48,846 units with a rental vacancy rate of 23 percent (approximately 11,375 housing units were unoccupied at the time of the survey).
- Glades County – a total housing stock of 5790 units with a rental vacancy rate of 33 percent (approximately 1938 housing units were unoccupied at the time of the survey).
- De Soto County – a total housing stock of 13,608 units with a rental vacancy rate of 21 percent (approximately 2862 housing units were unoccupied at the time of the survey).
- Hardee County – a total housing stock of 9820 units with a rental vacancy rate of 17 percent (approximately 1654 housing units were unoccupied at the time of the survey).
- Okeechobee County – a total housing stock of 15,504 units with a rental vacancy rate of 19 percent (approximately 2911 housing units were unoccupied at the time of the survey).

The review team expects that the in-migrating workforce could be absorbed into the existing housing stock in the EIA and the region without a measureable impact. Based on the information provided by PEF and the review team's independent evaluation, the review team concludes that housing impacts of building and operating two nuclear units at the Highlands site would not be noticeable.

Public Services

The review team assumed that the Highlands EIA, like the LNP EIA, have planned to meet needs for public services based on forecast population increases that did not include the presence of a workforce associated with constructing and operating a two-unit nuclear plant. The review team based its analysis of potential impacts on public services on the level of population increase represented by in-migrating workers and their families during peak workforce years, an estimated increase of 1.01 percent or less over projected populations for 2010, as shown in Table 9-23. Using this approach, the review team expects that impacts of the proposed project on county public services during peak workforce years would be minor in the EIA.

Transportation

Main roads in Highlands County include US-27, a multi-lane north-south road with LOS standard of "C"; SR-70, a two-lane east-west road across the southern third of the county with LOS standard of "C"; and SR-64, a two-lane road that extends west from US-27 into Hardee County in the northwest of the county with LOS standard of "C." These roads form part of the Strategic Intermodal System, for which the FDOT sets the standards (FDOT 2009a). SR-66/US-98, a two-lane east-west road across the northern third of the county, is not part of the Strategic Intermodal System and Highlands County has not set standards for this route.

Where US-98 turns north to join US-27 when it meets SR-66, it is subject to the LOS standard of “C” as part of the Strategic Intermodal System. For this analysis, the review team assigned the east-west SR-66/US 98 a LOS standard of “C,” consistent with other two-lane U.S. highways and State roads in the county.

One-way annual (2008) AADT counts for US-27 ranged from 14,500 to 17,000 around the intersection with SR-64; 10,500 in both directions around the intersection with SR-66/US-98; and 4500 to 4200 around the intersection with SR-70. One-way AADT counts for SR-70 ranged from 2100 to 1700 around the intersection with US-27; and 2100 to 2000 in the eastern side of the county. One-way AADT counts for SR-66 west of US-27 ranged from 2900 through 3100. One-way AADT counts for SR-64 west of US-27 ranged from 5200 to 5100 (FDOT 2008).

The review team determined that US-27, SR-70, SR-64, and SR-66/US-98 would be the main routes used by workers commuting to the plant site, with SR-70 linking to the site access road. The review team considered the impact of the traffic associated with the peak workforce and building-related activities in terms of likelihood that it would change the LOS along SR-70 to be lower than the assigned standard “C.” The review team assumed 2281 trips daily (following LNP site transportation analysis in Section 4.4.4.1), split 65 percent to/from the east and 35 percent to/from the west, based on the split of in-migrating worker residence discussed previously, combined with the split of commuters from Polk, Martin, St. Lucie, and Palm Beach Counties. At morning shift change, this would add 1977 cars to the total flow on SR-70, 924 incoming from the east, 498 from the west; and 357 outgoing to the east, 193 to the west. The incoming traffic from the east would increase the flow by almost 50 percent over the 2008 AADT for SR-70 in the east side of the county, but, according to FDOT’s generalized planning standards (FDOT 2009b), this total flow would not reduce the LOS below “C.” While more analysis would be required, once specific proposals for turn lanes, signals, and other modifications were made, the review team identified the potential that a noticeable, intermittent impact would be observed at the intersection of SR-70 with the site access road, analogous to that predicted for the LNP site. Given the lower number of commuters during operations, the review team believes the traffic-related impacts during operations would be minor.

Education

Table 9-22 provides data about schools in the EIA. All schools met the State teacher-student ratio classroom requirements in 2007–2008 with the exception of one school in Hardee County. The review team assumed that school districts in the EIA, like those for the LNP site, would address short-term gains in student population with mobile classrooms and that the PK-12 public schools would be funded according to the Florida equalized funding formula (FDOE 2009b). The review team assumed that students would accompany each in-migrating worker family in the average of the ratios of students per household from the LNP site counties listed in Table 2-35, resulting in the number of new students during peak workforce years listed in Table 9-24.

Table 9-24. Students from In-Migrating Families at Peak Workforce Years

County	In-Migrating Worker Households	Grades PK–3 Students[a]	New Rooms	Grades 4–8 Students[b]	New Rooms	Grades 9–12 Students[c]	New Rooms
Highlands	271	43	2	22	1	25	1
Glades	46	7	0	4	0	4	0
De Soto	68	11	1	6	0	6	0
Hardee	39	6	0	3	0	4	0
Okeechobee	69	11	1	6	0	6	0

Source: Table 4-14; State of Florida 2002
(a) 0.158 per household; 18 students per teacher required by State law
(b) 0.081 per household; 22 students per teacher required by State law
(c) 0.091 per household; 25 students per teacher required by State law
PK = preschool

The review team found that the addition of up to four classrooms in Highlands County and one classroom in De Soto and Okeechobee Counties would amount to less than one additional classroom per school, which would constitute a minor impact. Glades and Hardee counties would not need additional classrooms to accommodate project-related students and still meet applicable student/teacher ratios.

Recreation and Aesthetics

The economy in the Highlands EIA draws on its natural resources, including many lakes and parks. Because the exact footprint of the site is not determined, specific impacts on specific recreational facilities from site structures and the intake and discharge structures are not known. However, based on the considerations discussed for the LNP site, the review team anticipates that adverse impacts of building units at the Highlands site would have minor impacts on use of the recreational facilities from which activities would be visible or audible. Given the general characteristics of the area, there would likely be vegetative screening around the site that would potentially mitigate the aesthetic impacts. The increased population in the EIA may increase use of local recreational areas, which is expected to have negligible impact on either the sites or the recreational experience, given the number, geographic distribution, and variety of recreational locations available. In places requiring the clearing of new transmission-line corridors, aesthetic impacts would be noticeable but not destabilizing, depending on the proximity of viewers and the nature of vegetation remaining between them and the corridors.

PEF reports that a reservoir may need to be created for water supply. Because its size and footprint are unknown, the review team cannot predict whether such a reservoir would affect resources currently used for recreation or subsistence. However, there would likely be vegetative screening around the reservoir that would potentially mitigate the aesthetic impacts.

Summary of Socioeconomics

Physical impacts on workers and the general public include impacts on existing buildings, transportation, aesthetics, noise levels, and air quality. Social and economic impacts span issues of demographics, economy, taxes, infrastructure, and community services. In summary, based on information provided by PEF and its own independent evaluation, the review team finds that the socioeconomic impacts of building two units at the Highlands site would be minor with three exceptions. There would be noticeable adverse, but not destabilizing, effects on transportation in Highlands County near the site during construction and minor during operations. The tax impacts on Highlands County would be substantial and positive. The aesthetic impact of transmission lines would be noticeable.

Cumulative Impacts

In addition to assessing the incremental socioeconomic impacts from the building and operation of two nuclear units on the Highlands site, the cumulative impact assessment considers other past, present, and reasonably foreseeable future actions that could contribute to the cumulative socioeconomic impacts on a given region, including other Federal and non-Federal projects. For the analysis of cumulative socioeconomic impacts at the Highlands site, the geographic area of interest is the region within a 50-mi radius centered on the Highlands site (the region) with special consideration of Highlands, De Soto, Glades, Hardee, and Okeechobee Counties, because that is where the review team expects socioeconomic impacts to be the greatest (Economic Impact Area, EIA). Table 9-19 identifies the projects that have contributed and will continue to contribute to the demographics, economic climate, and community infrastructure of the region. Collectively these projects will contribute to a long-term and overall trend toward urbanization and its associated increase in population and economic activities.

The Highlands site is a greenfield site in a rural area. The EIA is within commuting distance of Tampa/St. Petersburg. Sebring and Avon Park in Highlands County are each communities of about 10,000 people, but the EIA is predominately rural. Within the region, the Avon Park Air Force Range and active residential, retirement, and recreational developments along with planned improvements to the areas transportation infrastructure are expected to result in continued urbanization that would have noticeable socioeconomic effects on the economy and residents of the EIA. The review team determined that cumulative socioeconomic effects of building new units at the Highlands site and the actions identified in Table 9-19 would not differ noticeably from the project effects analyzed above. Thus, the review team determined that the cumulative socioeconomic effects of the proposed project and other past, present, and reasonably foreseeable projects would be SMALL, with the following exceptions attributable to building and operating the Highlands site. Highlands County would experience MODERATE but short-term and spatially limited impacts on roads/traffic that would reduce to SMALL during operations, and LARGE beneficial impacts on tax receipts after the plant begins operations. The review team anticipates MODERATE long-term impacts on aesthetics along the transmission lines and corridors. Building nuclear units at the Highland site would be a significant contributor to the MODERATE impacts on roads/traffic. Building and operating nuclear units at the Highland site would be a significant contributor to MODERATE impacts on aesthetics along the transmission lines and corridors.

9.3.4.6 Environmental Justice

The review team used the approach to identify minority and low-income populations of interest described in Section 2.6. Figure 9-4 and Figure 9-5 show the distribution of minority and low-income populations of interest by census block group within the region. As seen in these figures, a number of block groups that meet the criteria for minority populations of interest are in the region, including areas to the northwest, south, and east of the Highlands site, and much of the southeastern quadrant of the region. The closest minority populations of interest are within 3 mi of the Highlands site. There are fewer block groups with low-income populations of interest in the region, most of which are coincidental with those with minority populations. There is a large area with low-income populations of interest to the southeast of the site, with isolated pockets elsewhere. The closest low-income populations of interest are 10 to 12 mi northeast of the Highlands site. The 35,280-ac Brighton Reservation, managed by the Seminole Indian Tribe, is located southeast of the Highlands site within the region. The 2000 census indicates that 566 people, predominately Native Americans, live on the reservation (USCB 2000b).

The review team investigated the presence of unique characteristics or practices in minority or low-income communities that could result in different socioeconomic impacts for the Highlands site compared to the general population. The review team found two potential sources of environmental justice impacts arising from unique characteristics and practices: proximity to transmission line corridors as a source or pathway to impacts, and subsistence fishing.

The review team identified two minority census block groups within 3 to 6 mi of the Highlands site but determined neither of these communities resided near a road that could be considered a potential commuting route for construction or operations workers. To the northwest from the center of the Highlands site is a line of identified census block groups with minority populations of interest. This line roughly follows a conceptual transmission-line route proposed by PEF that could impose adverse physical impacts on those communities during transmission-line construction. If the transmission lines from the site were to follow this conceptual path the impact on the minority populations could be considered disproportionate and adverse. Therefore the review team concludes there is a potential for a noticeable disproportionately high and adverse impact from transmission-line construction.

Highlands County Environmental Health Division and Community Services Division personnel were unable to provide information about subsistence activities in the county, but the Community Services Division noted that hunting is popular in the county. Personnel from the County Natural Resources Department said that perhaps one percent of the county population

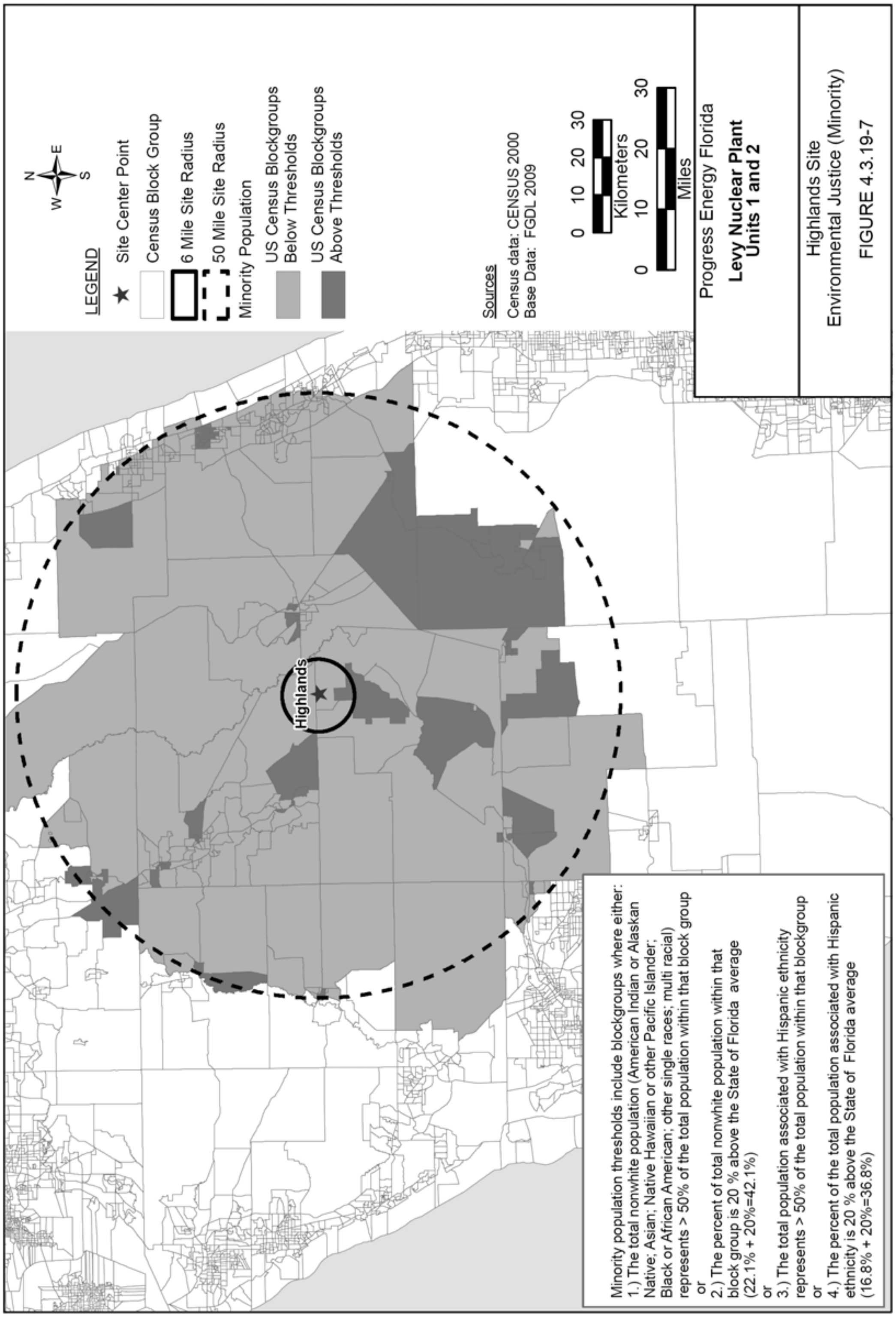

Figure 9-4. Highlands Site Minority Populations. (CH2M Hill 2009; PEF 2009d)

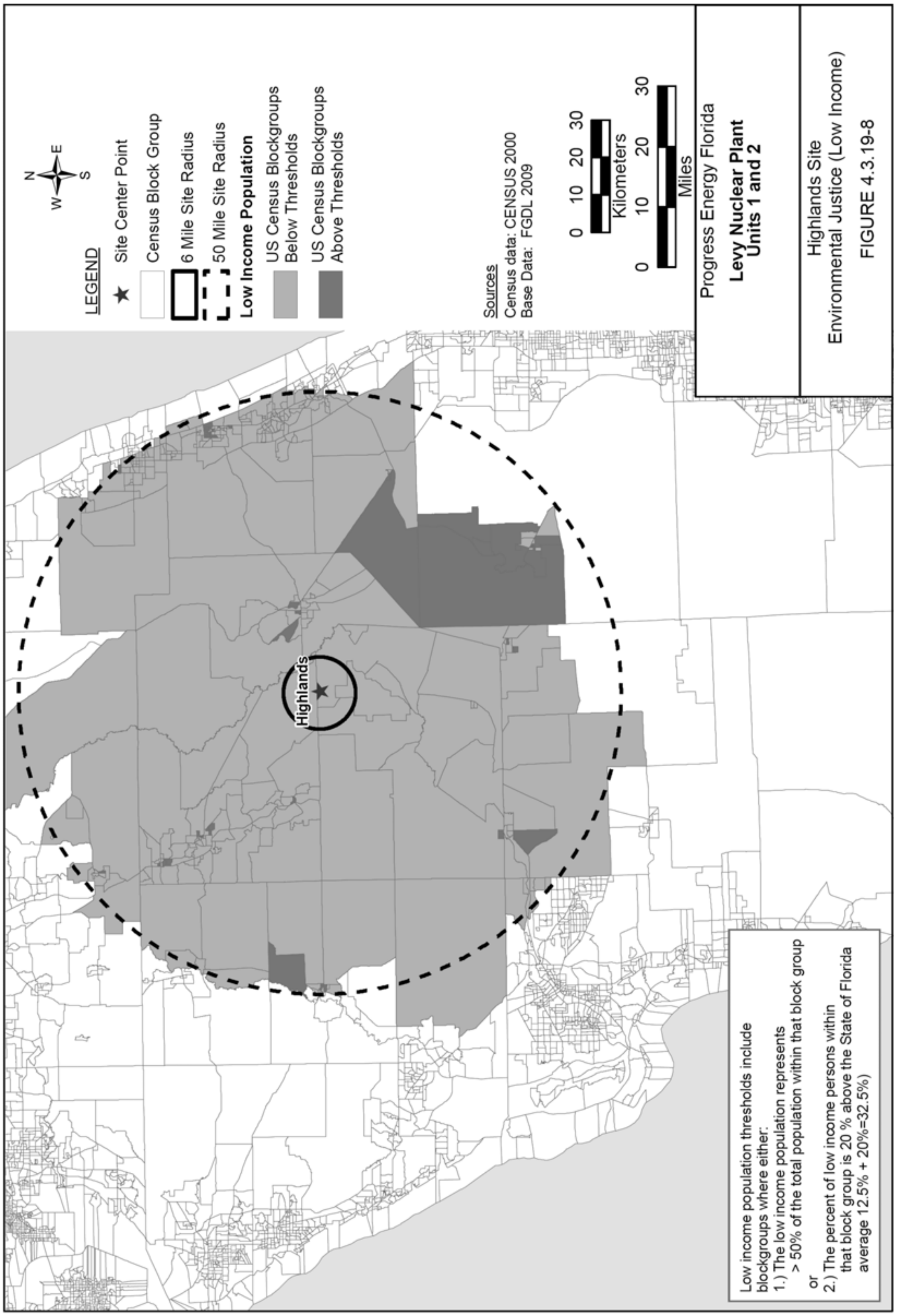

Figure 9-5. Highlands Site Low-Income Populations. (CH2M Hill 2009; PEF 2009d)

may engage in subsistence fishing. On average 100 to 150 people per day may rely on fishing for their protein source. They noted that 12 percent of county population receives food stamps. (Highlands County 2009). The review team assumes that subsistence fishing activities might be affected during portions of the building phase, perhaps requiring that fishermen use different locations. In the absence of specific information about effects on local lakes and streams that are used for subsistence fishing, the review team concludes that there may be disproportionately high and adverse effects on minority and low-income populations that engage in subsistence fishing, possibly extending to the Native American residents of the Brighton Reservation in Glade County.

The review team concludes that the physical effects of building activities (noise, fugitive dust, air emissions, traffic) would not impose disproportionately high and adversely affects on minority or low-income populations because the effects would be attenuated by distance and intervening foliage such that even the closest population of interest would not experience adverse effects. Therefore, the review team determined the physical environmental justice impacts from building and operations would be minor.

The review team concluded that environmental justice impacts would be potentially noticeable on subsistence fishing populations and on minority communities along the proposed transmission-line corridor.

Cumulative Impacts

The review team determined the building and operation of a proposed nuclear power plant at the Highlands site would be unlikely to have a disproportionately high adverse impact on minority or low-income populations due to economic impacts, or impacts on community infrastructure; but could have a disproportionately high and adverse impact on minority or low-income populations living near transmission line corridors (aesthetics) or engaged in subsistence activities. The cumulative impact assessment considers other past, present, and reasonably foreseeable future actions that could contribute to the cumulative environmental justice impacts in the region, including other Federal and non-Federal projects. The review team did not find any activity listed on Table 9-19 that would have a cumulative environmental justice effect when placed in context with the hypothetical Highlands project. The review team concluded that, in addition to building and operating two new nuclear units at the Highlands site, the inclusion of other past, present, and reasonably foreseeable future projects would add only a minor impact on minorities or low-income populations. Therefore, the cumulative environmental justice impacts could be MODERATE, with the building and operating of two nuclear units at the Highlands site a significant contributor to the impact.

9.3.4.7 Historic and Cultural Resources

The following cumulative impact analysis includes building and operating two new nuclear generating units at the Highlands site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect historic and cultural resources, including the other Federal and non-Federal projects listed in Table 9-19. For the analysis of cultural impacts at the Highlands site, the geographic area of interest is considered to be the APE that would be defined for this site. This includes the direct effects APE, defined as the area physically affected by the site-development and operation activities at the site and transmission lines. The indirect effects APE is defined as the area visually affected and includes an additional 0.5-mi radius APE around the transmission-line corridors and a 1-mi-radius APE around the cooling towers.

Reconnaissance activities in a cultural resource review have particular meaning. Typically, the activities include preliminary field investigations to confirm the presence or absence of cultural resources. However, in developing this EIS, the review team relies upon reconnaissance-level information to perform its alternative site evaluation in accordance with ESRP 9.3 (NRC 2000). Reconnaissance-level information is data that are readily available from agencies and other public sources. It can also include information obtained through visits to the site area. To identify the historic and cultural resources at the Highlands site, the following information was used:

- PEF ER (2009a)
- National Register of Historic Places database (NPS 2010)
- Florida Historical Markers Program (FDOS 2010)
- NRC Alternative Sites Visit October 14–17, 2008 (NRC 2009).

Historically, the Highlands site and vicinity were largely undisturbed and likely contained intact archaeological sites associated with the past 10,000 years of human settlement. Over time, the area has been disturbed by mostly agricultural development (PEF 2009a). As described in Section 9.3.4.6, the Brighton Indian Reservation is located within the region but not within the geographical area of interest. In its ER, PEF states that an initial database search for potentially significant cultural resources in Highlands County did not identify any NRHP-listed sites in the vicinity of the Highlands site and that a cultural and archaeological resources investigation would be required before siting a new reactor at this location. PEF also states that consultation with the SHPO would occur if any significant historic, cultural, or archaeological resources are identified and that appropriate mitigation measures would be put in place before construction and operation.

A search of the NRHP database completed by the review team revealed 14 sites listed in Highlands County, including the Haines Elizabeth House and the Sebring Downtown Historic

District (NPS 2010), and 3 Historic Properties listed in Glades County, including Moore Haven Downtown Historic District, Moore Haven Residential Historic District, and Red Barn. A search of the Florida State Historical Markers Program completed by the review team revealed one historical marker in Highlands County – Fort Basinger built in 1837 during the Seminole Wars (FDOS 2010). In addition, a cultural resources inventory completed for an EIS for the Florida Gas Transmission Company, LLC Phase VIII Expansion Project has identified five archaeological sites and nine historic structures in a stretch of expansion area called Greenfield 3. This area crosses four counties, including Highlands, and runs along the border of Glades and Highlands Counties. Five of the nine historic structures are considered "potentially eligible" with Florida SHPO concurrence.

Building Impacts

To accommodate building two new nuclear generating units on the Highlands site, PEF would need to clear approximately 300 ac for the main power plant site (the same acreage needed for the LNP site) and 1282 ac for the reservoir (PEF 2009a). If the Highlands site were chosen for the proposed project, identification of cultural resources would be accomplished through cultural resource surveys and consultation with the SHPO, Tribes, and interested parties. The results would be used in the site-planning process to avoid cultural resources impacts. If significant cultural resources were identified by these surveys, the review team assumes that PEF would develop protective measures in a manner similar to those for the LNP site, and therefore the impacts would be minimal. If direct effects on significant cultural resources could not be avoided, land clearing, excavation, and grading activities could destabilize important attributes of historic and cultural resources.

There are no existing transmission-line corridors connecting to the Highlands site. Section 9.3.4.1 describes the proposed transmission-line corridors associated with this site. Visual impacts from transmission lines may result in significant alterations to the visual landscape within the geographic area of interest. If the Highlands site were chosen for the proposed project, the review team assumes that PEF would conduct its transmission line-related cultural resource surveys and procedures in a manner similar to that for the LNP site described in Section 4.6. In addition, the review team assumes the State of Florida's Conditions of Certification regarding transmission line siting and building activities would apply, and therefore the impacts would be minimal. If direct effects on significant cultural resources could not be avoided, land clearing, excavation, and grading activities could destabilize important attributes of historic and cultural resources.

Operations Impacts

Impacts on historic and cultural resources from the operation of two new nuclear generating units at the Highlands site would include those associated with the operation of new units and maintenance of transmission lines. The review team assumes that the same procedures currently used by PEF, including the State of Florida's Conditions of Certification, would be used for onsite and offsite maintenance activities. Consequently, the incremental effects of the maintenance of transmission-line corridors and operation of the two new units and associated impacts on the cultural resources would be negligible for the physical and visual APEs.

Cumulative Impacts

Past actions in the geographic area of interest that have similarly affected historic and cultural resources include rural development and agricultural development and activities associated with these land-disturbing activities such as road development. Table 9-19 lists past, present, and reasonably foreseeable projects and other actions that may contribute to cumulative impacts on historic and cultural resources in the geographic area of interest. Projects from Table 9-19 that are evaluated in the cultural resources cumulative analysis include future urbanization, the Florida High Speed Rail project, and the Florida Gas Transmission (FGT) Phase VIII Expansion project.

Long linear projects such as new or expanded roads, the Florida High-Speed Rail project, or the FGT Phase VIII Expansion may intersect the proposed transmission-line corridors. Because cultural resources can likely be avoided by long linear projects, impacts on cultural resources would be minimal. If building associated with such activities results in significant alterations (both physical alteration and visual intrusion) of cultural resources in the transmission-line corridors, then cumulative impacts on cultural resources would be greater.

Cultural resources are nonrenewable; therefore, the impact of destruction of cultural resources is cumulative. Based on the information provided by PEF and the review team's independent evaluation, the review team concludes that the cumulative impacts from building and operating two new nuclear generating units on the Highlands site and other projects would be SMALL. This impact-level determination reflects no known cultural resources that could be affected; however, if the Highlands site were to be developed then cultural resource surveys and evaluations would need to be conducted and PEF would assess and resolve the adverse effects of the undertaking. Adverse effects could result in greater cumulative impacts.

9.3.4.8 Air Quality

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affected air quality, including the shutdown of two coal-fired units at CREC, and other Federal and non-Federal projects listed in Table 9-19. The geographic area of interest for the Highlands site is Highlands and Glades Counties, which are in the Southwest Florida Intrastate Air Quality Control Region (40 CFR 81.97).

The emissions related to building and operating a nuclear plant at the Highlands site would be similar to those at the LNP site. The air quality status for Highlands County, as set forth in 40 CFR 81.310, reflects the effects of past and present emissions from all pollutant sources in the region. Highlands County is classified as being in attainment for all NAAQSs.

The atmospheric emissions related to building and operating a nuclear plant at the LNP site in Levy County, Florida, are described in Chapters 4 and 5. Emissions of criteria pollutants were found to have a SMALL impact. In Chapter 7, the cumulative impacts of criteria pollutants at the LNP site were evaluated and also determined to have a SMALL impact.

Cumulative Impacts

Reflecting on the projects listed in Table 9-19, all industrial projects listed in the table would have *de minimis* impacts. The impact of the closing of two coal-fired units at CREC on criteria pollutants at the Highlands site are not considered because the CREC is located outside of the geographic area of interest for this site. Given the small amount of emissions from this project, it is unlikely that the air quality in the region would degrade to the extent that the region would be declared to be in nonattainment for any of the NAAQSs.

The air quality impact of the Highlands site development would be local and temporary. The distance from building activities to the site boundary would be sufficient to generally avoid significant air quality impacts. There are no land uses or projects, including the aforementioned sources in Table 9-19, that would have emissions during site development that would, in combination with emissions from the Highlands site, result in a degradation of air quality in the region.

Releases from the operation of two new units at the Highlands site would be intermittent and made at low altitudes with little or no vertical velocity. The air quality impacts of current emissions near the Highlands site are included in the baseline air quality status. The cumulative impacts from emissions of effluents from the Highlands site and other sources would not be noticeable.

The cumulative impacts of greenhouse gas emissions related to nuclear power are discussed in Section 7.6. The impacts of the emissions are not sensitive to the location of the source. Consequently, the discussion in Section 7.6 is applicable to a nuclear power plant located at the Highlands site. The review team concludes that the national and worldwide cumulative impacts of greenhouse gas emissions are noticeable. The review team further concludes that the cumulative impacts would be noticeable, with or without the greenhouse gas emissions of the project at the Highlands site or the potential shutdown of the fossil-fuel units at CREC.

Cumulative impacts on air quality resources are estimated based on the information provided by PEF and the review team's independent evaluation. Other past, present, and reasonably foreseeable future activities exist in the geographic areas of interest (local for criteria pollutants and global for greenhouse gas emissions) that could affect air quality resources. The cumulative impacts on criteria pollutants from emissions from the Highlands site and other projects would not be noticeable. The review team concludes that the national and worldwide cumulative impacts of greenhouse gas emissions are noticeable. The review team further concludes that cumulative impacts from construction, preconstruction, and operations, and other past, present, and reasonably foreseeable future actions on air quality resources in geographic areas of interest would be SMALL for criteria pollutants and MODERATE for greenhouse gas emissions. The incremental contribution of impacts on air quality resources from building and operating two new units at the Highlands site would be insignificant for both criteria pollutants and greenhouse gas emissions.

9.3.4.9 Nonradiological Health

The following analysis assesses impacts from building activities and operations for the Highlands site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect nonradiological health, including the other Federal and non-Federal projects listed in Table 9-19. Impacts from building activities that have the potential to affect the health of members of the public and workers include exposure to dust and vehicle exhaust, occupational injuries, noise, and the increased traffic associated with the transport of construction materials and personnel to and from the site. The operation-related activities that have the potential to affect the health of members of the public and workers includes exposure to etiological agents, noise, EMFs, and impacts from the transport of workers to and from the site.

Most of the nonradiological health impacts associated with building and operation (e.g., air emissions, noise, occupational injuries) would be limited to areas within approximately 2 mi from the site. Occupational injuries would occur only within the boundaries of the site, and noise from construction and operation has likewise been assessed as minimal for offsite receptors beyond a 2-mi radius. For nonradiological health impacts associated with transmission lines, the geographic area of interest would be the transmission line corridor. If the facility were built and operated at the Highlands alternative site, the Kissimmee River would serve as the source and discharge receptor of cooling water. In addition, a reservoir would need to be built to assure an adequate cooling-water supply.

Building Impacts

Nonradiological health impacts on construction workers and members of the public from building two new nuclear units at the Highlands site would be similar to those evaluated in Section 4.8 for the LNP site. The impacts include noise, vehicle exhaust, dust, occupational injuries, and transportation accidents, injuries, and fatalities. A detailed noise study has not been performed for the Highlands site, but it is likely that noise impacts from building, except for rare, high-noise activities such as pile-driving, would comply with State and local noise ordinances and that the overall noise impact associated with building would be minimal. Fugitive dust and vehicle emissions during building would be controlled by good management practices and compliance with Federal, State, and local air quality regulations.

The incidence of construction worker accidents would be the same as that for the LNP site, the only difference being potential injuries associated with cooling reservoir construction.

Analyses in Section 9.3.4.5 indicated that noticeable but intermittent traffic impacts would be observed during peak building activities at the Highlands site at the intersection of SR-70 and the site access road. These impacts would be of the same magnitude as those predicted for building at the LNP site. Owing to the rural nature of the Highlands site, there is little potential for cumulative impacts with other projects, and additional injuries and fatalities from traffic accidents involving transportation of materials and personnel for building of a new nuclear power plant at the Highlands site would be similar to those estimated in Section 4.8.3 for building at LNP site.

Because all of the past, present, or potential future construction projects identified in Table 9-19 are distant (greater than 10 mi) from the Highlands site, combined nonradiological impacts from construction at the Highlands site and other projects would not occur. Cumulative impacts of building at the Highlands alternative site would therefore be minimal.

Operational Impacts

Noise, air emissions, and occupational injuries from the operation of two new nuclear units at the Highlands site would be similar to those evaluated in Section 5.8 for the LNP site. Occupational health impacts on workers (e.g., falls, electric shock, or exposure to other hazards) at the Highlands site would be the same as those evaluated for workers at two new units operating at the LNP site. The cooling-system discharge from the facility could encourage the growth of etiologic organisms in the Kissimmee River. Etiological agent growth could be reduced by the use of biocides in the cooling systems, thermal discharge would be restricted by NPDES permit limitations, and exposure to impaired water would be limited by controls on access to the discharge zone (fencing, signage, and other security measures). However, because discharge may amount to a significant proportion of minimum flows in the Kissimmee River, and because water quality in the river has been identified as impaired due to the of presence of nutrients, fecal coliform, depressed dissolved oxygen, un-ionized ammonia, and other pollutants (FDEP 2010e), the review team has concluded that the discharge of blowdown to the river could have a noticeable effect on the growth of etiological agents. Exposure to etiological agents in the cooling-water reservoir would not pose an additional health risk as long as access to the reservoir is limited by virtue of its being within the controlled and fenced site boundaries.

Noise and EMF exposure from operations would be monitored and controlled in accordance with applicable OSHA regulations. Although no detailed noise modeling has been performed for the Highlands site, it is likely that noise impacts would be similar to those predicted for operations at the LNP site. The effects of EMF on human health in the transmission-line corridors would be controlled and minimized by conformance with NESC criteria and adherence to the standards for transmission systems regulated by the FDEP. Nonradiological impacts of traffic associated with the operations workforce would therefore be less than the impacts during building (minimal).

A number of the projects and activities identified in Table 9-19 (stormwater discharges, minor permitted municipal discharges) might also affect water quality in the Kissimmee River near the Highlands site. However, these releases are unlikely to have significant cumulative impacts on water quality with a nuclear facility built at the Highlands site because all of the current and future projects are distant from the site. In addition, chemicals released from the nuclear facility would be limited by an NPDES permit to levels that would not adversely affect water quality, even in combination with the existing pollutant load in the Kissimmee River. As noted above, however, blowdown discharge may result in increased water temperature that could facilitate the growth of etiological agents.

The review team is also aware of the potential climate changes that could affect human health; recent analyses of these issues (GCRP 2009) have been considered in the preparation of this EIS. Projected changes in the climate for the region include an increase in average temperature and a decrease in precipitation, which may alter the presence of microorganisms and parasites in surface water. While the overall impacts of climate change may not be insignificant (see Section 7.7), the effect of, or contribution to, climate change impacts by the operation of two new units at the Highlands site is likely to be minor. In its analysis of climate change impacts, the review team did not identify any additional information that would alter its conclusion regarding the presence of etiological agents or change in the incidence of waterborne diseases associated with operation of a nuclear facility at the Highlands site.

Summary

The assessment of impacts on nonradiological health from building and operation of the two new units at the Highlands alternative site is based on the information provided by PEF and the review team's independent evaluation. The review team concludes that nonradiological health impacts on workers and the public resulting from building two new units and associated transmission lines at the Highlands site would be minimal. The review team also expects that the nonradiological health impacts to the workers and public from the operations of two new nuclear units at the Highlands site would be minimal, except for the potential growth of etiological agents in the Kissimmee River from the influence of blowdown discharges during droughts or low-flow periods. These effects could be reduced if the blowdown were discharged to the cooling reservoir, rather than directly to the river. Exposure to etiological agents could be increased if access to the cooling reservoir is not limited by physical and administrative controls. Based on these findings, the review team concludes that cumulative impacts on nonradiological health from related past, present, and future actions in the geographic area of interest and building and operations of two nuclear units at the Highlands site would be SMALL to MODERATE. The severity of impacts would depend on the design characteristics of the facility, which have not been fully defined. . If exposure to water heated by thermal discharge is not limited by administrative of physical controls, the contribution from building and operations at the Highlands site could be a significant contributor to the cumulative nonradiological health impacts.

9.3.4.10 Radiological Impacts of Normal Operations

The following impact analysis includes radiological impacts from building activities and operation for two additional nuclear units at the Highlands site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health, including other Federal and non-Federal projects listed in Table 9-19. As described in Section 9.3.4, the Highlands site is a greenfield site. The geographic area of interest is the area within a 50-mi radius of the Highlands site. There are no major facilities that result in regulated exposures to the public or biota within 50 mi of the Highlands site. However, there are likely to be hospitals and industrial facilities with 50 mi of the Highlands site that use radioactive materials. The St. Lucie Units 1 and 2 nuclear power plants are located approximately 50 mi from the Highlands site.

The radiological impacts of building and operating two AP1000 units at the Highlands site would include direct radiation and liquid and gaseous radioactive effluents. The cow-milk pathway doses at this site would be higher than at the LNP site because of the proximity of dairies, but doses would still be within regulatory limits. Releases of radioactive materials and all pathways of exposure would produce low doses to people and biota offsite, well below regulatory limits. The impacts are expected to be similar to those estimated for the LNP site. The NRC staff concludes that the dose from direct radiation and effluents from hospitals and industrial facilities that use radioactive material would be an insignificant contribution to the cumulative impact around the Highlands site. This conclusion is based on the radiological monitoring programs conducted around currently operating nuclear power plants.

The radiological impacts of existing St. Lucie Units 1 and 2 also include doses from direct radiation and liquid and gaseous radioactive effluents. These pathways result in low doses to people and biota offsite that are well below regulatory limits as demonstrated by the ongoing radiological environmental monitoring program conducted around the St. Lucie site.

Based on the information provided by PEF and the NRC staff's independent analysis, the NRC staff concludes that the cumulative radiological impacts from building and operating the two proposed AP1000 units and other past, present, and reasonably foreseeable projects and actions in the geographic area of interest around the Highlands site would be SMALL.

9.3.4.11 Postulated Accidents

The following impact analysis includes radiological impacts from postulated accidents from operations for two nuclear units at the Highlands site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health from postulated accidents, including the other Federal and non-Federal projects and those projects listed in Table 9-19. The geographic area of interest considers all existing and proposed nuclear power plants that have the potential to increase the probability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the Highlands site. The Highlands site is a greenfield site about 50 mi west of the existing St. Lucie power plant site; there are two nuclear facilities at the St. Lucie site. There are no proposed reactors that have the potential to increase the probability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the Highlands site.

As described in Section 5.11.1, the NRC staff concludes that the environmental consequences of DBAs at the LNP site would be minimal for AP1000 reactors. DBAs are addressed specifically to demonstrate that a reactor design is robust enough to meet the NRC safety criteria. The AP1000 design is independent of site conditions, and the meteorological conditions of the Highlands and LNP sites are similar; therefore, the NRC staff concludes that the environmental consequences of DBAs at the Highlands site would be minimal.

Assuming the meteorology, population distribution, and land use for the Highlands site are similar to the LNP site, risks from a severe accident for an AP1000 reactor located at the Highlands site are expected to be similar to those analyzed for the LNP site. These risks for the LNP site are presented in Tables 5-18 and 5-19 and are well below the median value for current-generation reactors. In addition, estimates of average individual early fatality and latent cancer fatality risks are well below the Commission's safety goals (51 FR 30028). For the existing plants within the geographic area of interest, namely St. Lucie Units 1 and 2, the Commission has determined that the probability-weighted consequences of severe accidents are SMALL (10 CFR Part 51, Appendix B, Table B-1). On this basis, the NRC staff concludes that the cumulative risks of severe accidents at any location within 50 mi of the Highlands site would be SMALL.

9.3.5 Putnam Site

This section covers the review team's evaluation of the potential environmental impacts of siting a new two-unit nuclear power plant at the Putnam alternative site (hereafter Putnam site) in northeastern Florida. The site is located in a rural area of Putnam County west of the St. Johns River. The St. Johns River would be the source for water for plant cooling and other plant uses, and construction of a new water-storage reservoir would be required. Putnam is a greenfield site not currently owned by PEF (PEF 2009a). Conceptual routes of transmission lines necessary to connect the Putnam site to the electrical grid are located in Ocala, Sumter, Lake, Deltona, Seminole, and Putnam Counties.

The following sections include a cumulative impact assessment conducted for each major resource area. The specific resources and components that could be affected by the incremental effects of the proposed action if implemented at the Putnam site and other actions in the same geographic area were considered. This assessment includes the impacts of the NRC-authorized construction and operations and impacts of preconstruction activities. Also included in the assessment are past, present, and reasonably foreseeable future Federal, non-Federal, and private actions that could have meaningful cumulative impacts when considered together with the proposed action if implemented at the Putnam site. Other actions and projects considered in this cumulative analysis are described in Table 9-25.

The geographic area of interest for cumulative impacts considers all existing and proposed nuclear power plants that have the potential to increase the probability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the Putnam site. An accident at a nuclear plant within 100 mi of the Putnam site could increase this risk. The Crystal River Nuclear Plant (CREC Unit 3) is within 100 mi of the Putnam site and is included in Table 9-25. Other nuclear plants in Florida, Alabama, and Georgia are more than 100 mi from the Putnam site and are therefore not included in the cumulative impact analysis.

1 **Table 9-25**. Past, Present, and Reasonably Foreseeable Projects and Other Actions
2 Considered in the Cumulative Analysis of the Putnam Alternative Site

Project Name	Summary of Project	Location	Status
Energy Projects			
Seminole Power Plant	Two 650-MW coal-fired generation units	Within 10 mi	Operational (SEC 2010)
Putnam Steam Power Plant	Two combined-cycle gas/oil units generating a total net 494 MW	Within 10 mi	Operational (EPA 2010j)
Operation and decommissioning of CREC Units 1–5	The CREC consists of five power-generating plants operated by PEF; four fossil-fuel plants and one nuclear plant. The fossil-fuel plants began operations in 1966, 1969, 1982, and 1984. The nuclear plant began operations in 1977.	Within 100 mi of the Putnam site in northern Citrus County	Operational. The State of Florida Siting Board's Conditions of Certification for LNP would require PEF to discontinue the operations of the two fossil-fuel units by December 31, 2020, assuming licensing, construction, and commencement of operation of LNP occurs in a timely manner (DOE/EIA 2010a; FDEP 2010a).
Renewal of the CREC nuclear Unit 3 operating license	Extension of operations of CREC Unit 3 for an additional 20-year period beyond the end of the current license term, which is valid through midnight December 3, 2016.	Within 100 mi of the Putnam site in northern Citrus County	Proposed. If granted, the license renewal would provide PEF the authority to continue operations through 2036. The draft Supplemental EIS for the license renewal is scheduled to be issued in 2010 (PEF 2008).

1

Table 9-25. (contd)

Project Name	Summary of Project	Location	Status
Uprate at CREC Unit 3	CREC Unit 3 is planning to request a power uprate or increase to the maximum power level at which the nuclear power plant may operate.	Within 100 mi of the Putnam site in northern Citrus County	Proposed. The application submitted to the State of Florida was approved in August 2008. A Federal application is expected to be submitted to the NRC in 2010 (PEF 2009f).
Mining Projects			
Surface mining	Excavation of sand, gravel, and other minerals, including the Grandin Sand Mine and the Keuka Sand Mine.	Throughout region	Operation and inactive
Parks and Conservation Areas			
Parks, forests, and reserves	Several parks, recreation, and conservation areas are located within the 50-mi region, for example the Ocala National Forest and the St. Johns River Blueway.	Throughout region	Currently managed by various local, State, and Federal agencies and organizations. Development likely limited in these areas (St. Johns County 2010).
Other Actions/Projects			
Minor water dischargers	NPDES-permitted dischargers including Putnam County Central Landfill, City of Palatka WWTP, E. Putnam County WW System, Hiawatha Condominiums WWTP, Georgia Pacific paper mill, and others.	Throughout region	Operational
Hard Rock Material	Concrete batch plant and ready-mixed concrete plant	Within 10 mi	Operational (EPA 2010k)
Various hospitals and industrial facilities that use radioactive materials	Medical and other industrial isotopes	Within 50 mi	Operational in nearby cities and towns
Future urbanization	Construction of housing units and associated commercial buildings; roads, bridges, and railroads, such	Throughout region	Construction would occur in the future, as described in State and

Table 9-25. (contd)

Project Name	Summary of Project	Location	Status
	as SR-20 improvements; construction of water- and/or wastewater-treatment and distribution facilities and associated pipelines, as described in local land-use planning documents.		local land-use planning documents (FDOT 2010a; Putnam County 2006).

WW = wastewater; WWTP = wastewater-treatment plant

9.3.5.1 Land Use and Transmission Lines

The following analysis includes impacts from building and operating two nuclear units at the Putnam site, along with the necessary transmission lines to connect them to the grid. The analysis also considers other past, present, and reasonably foreseeable future actions that affect land use, including the other Federal and non-Federal projects listed in Table 9-25. For this analysis, the geographic area of interest for considering cumulative impacts is the area within the 20-mi radius of the Putnam site and the associated transmission-line corridors. The review team determined that a 20-mi radius would represent the smallest area that would be directly affected because it includes the primary communities (such as Palatka, East Palatka, and Satsuma) that would be affected by the proposed project if it were located at the Putnam site.

The Putnam site is located in Putnam County, Florida. Historically, the geographic area of interest was known for forestry and agriculture. Existing land uses in the area include forestry, agriculture, and low-density residential. The Putnam site is not subject to the Florida Coastal Zone Management Act because the site is not located within one of the designated Florida coastal zone counties. The Ocala National Forest and the St. Johns River Blueway are located within the 50-mi region.

Zoning changes would be needed to accommodate building and operation of a nuclear power plant at the Putnam site. Like the LNP site, the footprint of new power-generating units would be approximately 627 ac, with about 150 ac of additional land needed for temporary facilities and laydown yards. In addition, PEF indicates that a 1291-ac reservoir would be needed at the Putnam site to provide cooling water during periods of low flow of the St. Johns River (PEF 2009d; CH2M Hill 2009). Construction of these facilities would result in a permanent land-use change from agriculture and forestry to a transportation, communications, and utilities land-use category. As shown in Table 9-25, there are coal-fired and combined-cycle gas/oil power plants, sand/gravel mines, and a concrete batch plant currently operating in the geographic area of interest around the Putman site.

Additional land-use impacts include possible additional growth and land conversions to accommodate new workers and services. Because the workforce would be dispersed over larger geographic areas in the labor supply region, the impacts from land conversion for residential and commercial buildings induced by new workers relocating to the local area can be absorbed into the wider region. Therefore, the review team concludes that such impacts would be minimal.

There are no existing transmission lines or transmission-line corridors in the geographic area of interest around the Putnam site. New transmission lines would need to be constructed to connect the site to existing transmission lines. The transmission lines would run through counties designated under the Florida Coastal Management Program. Any expansion of these transmission-line corridors would require review under the procedures established under the Florida Coastal Management Program. Procedures for siting new transmission lines in Florida are discussed in Section 4.1.2. The review team assumes that the conditions of certification issued to PEF by the FDEP would apply at all of the alternative sites.

The review team estimated the linear run of the expected transmission-line corridors by referring to PEF Figure 3.3.3-15 (PEF 2009d), which depicts the potential routing of corridors needed to connect the Putnam units to the grid. That figure suggests that 215 mi of transmission-line corridor would be needed. For purposes of land-use impact analysis, the review team made the assumption that 10 ac/mi would be disturbed, based on the LNP case where 1790 ac are expected to be disturbed over the 180 mi of corridor, as discussed in Section 4.1.2. The review team concludes that this assumption is reasonable because siting in Florida is a relatively rigorous process (Site Certification Application process), and the applicant would be bound by permit conditions resulting from that process, which would force it to use existing corridors to the extent practicable. The review team expects the SCA process would be consistently applied anywhere transmission lines are proposed in Florida. Therefore, the review team concludes that about 2150 ac of land would be disturbed to construct the transmission-line corridors for the Putnam site. Similar to the case at the LNP site, the review team concludes that land-use impacts from developing about 215 mi of new transmission-line corridors to connect new units at the Putnam site would be noticeable, but not destabilizing, and additional mitigation beyond the measures and conditions identified would not be warranted.

Cumulative Impacts

Future urbanization could contribute to additional decreases in open areas, forests, and wetlands and generally result in some increased residential and industrialized areas. However, growth would likely be limited since the population is projected to increase by approximately 1 percent per year during the period from 2000 to 2015 (Putnam County 2006). Increased urbanization, especially long linear projects such as new or expanded roads or pipelines also would contribute to the loss of open or forested areas and increase fragmentation of habitats along or near the transmission lines. Due to the extent of new transmission lines that would be built, the review team expects that the corridors would have a noticeable impact on the local area. Development would likely be limited in the nearby parks and conservation areas. Therefore, the incremental impacts associated with increased urbanization would be minimal.

Global climate change could increase temperature and reduce precipitation, which could result in reduced crop yields and livestock productivity (GCRP 2009), which, in turn, may change portions of agricultural and ranching land uses in the geographic area of interest. In addition, global climate change could increase sea level and storm surges in the geographic area of interest (GCRP 2009), thereby changing land use through inundation and loss of coastal wetlands and other low-lying areas. However, existing forests, parks, reserves, and managed areas would help preserve wetlands and forested areas to the extent that they are not affected by a rise in sea level. Because other projects identified in Table 9-25 that are within the geographic area of interest would be consistent with applicable land-use plans and control policies and would occur in dispersed locations, the review team considers their contribution to the cumulative land-use impacts to be relatively minor and manageable. Because detailed information concerning the routing of the possible new transmission-line corridors is not known at this time, a complete evaluation of potential land-use impacts cannot be made.

In the State of Florida's Conditions of Certification (FDEP 2010a), CREC Unit 1 and 2, two coal-fired plants, would stop operating by December 31, 2020, as long as PEF completes the licensing process, construction activities, and commences commercial operation of LNP Units 1 and 2 within a timely manner. If the Putnam site were selected, the review team expects the same condition would apply. If CREC Units 1 and 2 are shut down, land use at the units likely would remain industrial. Depending on economic conditions, PEF sells 60 to 95 percent of the coal plant ash to cement and building materials manufacturers, with the remainder going to Citrus Central Landfill in Lecanto, Florida. With the closure of CREC Units 1 and 2, this source of ash no longer would be available locally. The review team expects land-use impacts associated with the closure of CREC Units 1 and 2 would be minimal.

Based on the information provided by PEF and the review team’s own independent review, the review team concludes that the land-use impacts of building and operating two new nuclear reactor units at the Putnam site and other projects would be MODERATE. The proposed project would be a significant contributor to the MODERATE impact due to the substantial amount of land that would be needed for the proposed power plant, reservoir, and transmission infrastructure.

9.3.5.2 Water Use and Quality

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affect water use and quality, including the other Federal and non-Federal projects listed in Table 9-25. The Putnam site is located in rural Putnam County in Florida near the St. Johns River.

PEF has indicated that the development of this site for two nuclear units would require the building of a water reservoir on the Putnam site supplied with water from the St. Johns River (PEF 2009a).

The geographic area of interest for the Putnam site is considered to be the drainage basin of the St. Johns River upstream and downstream of the site because this is the resource that would be affected by the proposed project. For groundwater the ROI is limited to the alternative site because PEF has indicated no plans for use of groundwater to build and operate the plant (CH2M Hill 2009).

PEF indicates that the primary source of water for the site would be the St. Johns River. Groundwater is considered an unavailable or unreliable resource for large quantities of cooling water at all of the alternative sites; in addition, permitting large groundwater withdrawals for industrial use is generally inconsistent with State policy (CH2M Hill 2009). This analysis therefore assumes that groundwater would not be used during the building or operation of the two units at this site and that all water needs would be met with surface water from the St. Johns River.

Surface water is available at the site from the St. Johns River. Historical flow data for October 1992 through the present are available for the St. Johns River at Buffalo Bluff near Satusma Florida (USGS 2009). Mean monthly flow for the historic record ranges from 1840 cfs in May to 7445 cfs in November. Minimum monthly flows have fallen below 230 cfs at times.

Building Impacts

The review team assumes that the surface-water use for building activities at the Putnam site would be identical to the proposed groundwater use for the LNP site. During building at the LNP site the total maximum usage is projected to be 550,000 gpd (0.85 cfs) and the projected average estimated maximum groundwater usage is 275,000 gpd (0.43 cfs) (see Table 3-2). This assumes that surface water would be used at the Putnam site for potable and sanitary use as well as various building related activities. This surface-water withdrawal rate is inconsequential when compared to the historic flow in the St. Johns River. The review team concludes that the impact of surface-water use for building the potential units at the Putnam site would be minimal because withdrawal is small compared to the average monthly flow and withdrawal from the river would be temporary and limited to the building period.

As stated above, the review team assumed that no groundwater would be used to build the units at the Putnam site. The review team also assumes that the impact of dewatering the excavations needed for building two units at the site would be managed through the installation of diaphragm walls and grouting as is proposed for the LNP site. Therefore, because there would be no groundwater use and the impact of dewatering would be controlled, the review team determined that there would be little or no impact on groundwater resources.

Surface-water quality would most likely be affected by surface-water runoff during site preparation and the building of the facilities. FDEP would require PEF to develop an E&SCP and a SWPPP (PEF 2009a). These plans would be developed before initiation of site-disturbance activities and would identify measures to be used during site-preparation activities to mitigate erosion and control stormwater runoff (PEF 2009a).

The plans would identify BMPs to control the impacts of stormwater runoff. The review team anticipates that PEF would construct new detention/infiltration ponds and drainage ditches to control delivery of sediment from the disturbed area to onsite waterbodies. Sediment carried with stormwater from the disturbed area would settle in the detention ponds and the stormwater would infiltrate into the shallow aquifer. Implementation of BMPs should minimize impacts on surface-waterbodies near the Putnam site. Therefore, the surface-water-quality impacts near the Putnam site would be temporary and minimal.

While building new nuclear units at the Putnam site, groundwater quality may be affected by leaching of spilled effluents into the subsurface. The review team assumes that the BMPs PEF has proposed for the LNP site would be in place during building activities, and therefore the review team concludes that any spills would be quickly detected and remediated. In addition, groundwater impacts would be limited to the duration of these activities, and therefore, would be temporary. The review team reviewed the general BMPs that could be expected to be required at such a site (FDEP 2010a). Because any spills related to building activities would be quickly remediated under BMPs and the activities would be temporary, the review team concludes that the groundwater-quality impacts from building at the Putnam site would be minimal.

Operational Impacts

The Putnam site was identified by PEF as needing a cooling-water storage reservoir to meet plant cooling needs during periods of low flow. The review team assumed that the cooling water system for the proposed units, if they were to be built and operated at the Putnam site, would be similar to that proposed at the LNP site; specifically, the cooling water system would use cooling towers and blowdown would be discharged to the St. Johns River. The cooling-water reservoir would provide capacity for times when adequate water from the river may not be available. PEF did not provide details of the cooling-water intake and effluent discharge locations. However, it is standard practice for power plants to design cooling-water intake and effluent discharge locations such that recirculation of discharged effluent to the intake does not occur. The reservoir was sized assuming that the plant would operate on four cycles of concentration, that the total cooling-water requirements would be 45 Mgd (31,250 gpm) and that storage of a 90-day supply of water would be needed. In determining the acreage needed to achieve this amount of storage PEF assumed the reservoir would have an effective depth of 10 ft. PEF indicates that the resulting reservoir size would be 1291 ac (PEF 2009d; CH2M Hill 2009).

PEF indicates that the water needed to operate two units would be approximately 40,000 gpm or 89 cfs. As indicated in Chapter 3, evaporative losses from cooling two units would be approximately 28,000 gpm (62 cfs). A withdrawal of 89 cfs represents approximately 5 percent of the lowest mean monthly flow for the period of record. Flow in individual months has been much lower, which supports the need for a water reservoir on the Putnam site supplied with water from the St. Johns River. Minimum flows have been established for the St. Johns River (Fla. Admin. Code 40c-8). Minimum flows are specified for frequent high, average, and frequent low flow conditions of the river near DeLand, approximately 75 miles upstream of the Putnam site. The minimum flow values corresponding to frequent high, average, and frequent low flow conditions are 4600, 2050, and 1100 cfs, respectively. The withdrawal of 89 cfs would be 8 percent of the minimum recommended frequent low flow in the river. Based on the indication that the water needed to operate two units at the Putnam site would be less than 5 percent of the lowest mean monthly flow and 8 percent of the minimum recommended frequent low flow, the review team determined that the operational surface-water-use impact of a potential plant at the Putnam site would be minor.

As stated above, the review team assumed that no groundwater would be used to operate the units at the Putnam site. Therefore, because there would be no groundwater use, the review team determined that there would be no impact on groundwater resources.

During the operation of two new nuclear units at the Putnam site, impacts on surface-water quality could result from stormwater runoff, discharges of treated sanitary and other wastewater, and blowdown from cooling towers into the receiving waterbody. PEF did not provide the blowdown rate at the Putnam site. The review team conservatively assumed that the blowdown rate would be the same as that at the LNP site, 57,923 gpm (129 cfs). This assumption is conservative because the proposed plant at the Putnam site would use freshwater from the St. Johns River rather than more saline water at the LNP site, requiring less frequent and smaller blowdown discharge. FDEP would require PEF to develop a SWPPP (PEF 2009a), which would identify measures to be used to control stormwater runoff (PEF 2009a). The blowdown would be regulated by FDEP pursuant to 40 CFR Part 423 and all discharges would be required to comply with limits established by FDEP in a NPDES permit.

During the operation of two new nuclear units at the Putnam site, impacts on groundwater quality could result from potential spills. Spills that might affect the quality of groundwater would be prevented and mitigated by BMPs. Because BMPs would be used to mitigate spills and no intentional discharge to groundwater should occur, the review team concludes that the groundwater-quality impacts from operation of two nuclear units at the Putnam site would be minimal.

Cumulative Impacts

In addition to water-use and water-quality impacts from building and operations activities, cumulative analysis considers past, present, and reasonably foreseeable future actions that affect the same water resources.

For the cumulative analysis of impacts on surface water, the geographic area of interest for the Putnam site is considered to be the drainage basin of the St. Johns River upstream and downstream of the site because this is the resource that would be affected by the proposed project. For groundwater, the ROI is limited to the alternative site because PEF has indicated no plans for use of groundwater to build and operate the plant. Actions that have past, present, and future potential impacts on water supply and water quality near the Putnam site include the Seminole Power Plant and the Putnam Steam Power Plant (both located within 20 mi of the Putnam site), existing agriculture, and existing and future urbanization in the region.

The GCRP has compiled the state of knowledge in climate change. This compilation has been considered in the preparation of this EIS. The projections for changes in temperature, precipitation, droughts, and increasing reliance on aquifers within the St. Johns River drainage are similar to those at other alternative sites in Florida. Such significant changes in climate would result in adaptations to both surface-water and groundwater management practices and policies that are unknown at this time.

Cumulative Water Use

PEF indicates that the water needed to operate two units would be approximately 40,000 gpm or 89 cfs. As indicated in Chapter 3, evaporative losses from cooling two units would be approximately 28,000 gpm (62 cfs). PEF indicates that a reservoir would be needed to provide cooling water during periods of low flow. A withdrawal of 89 cfs represents approximately 5 percent of the lowest mean monthly flow for the period of record. Flow in individual months has been much lower, which supports PEF’s statement that a water reservoir on the Putnam site supplied with water from the St. Johns River would be needed

Based on the indication that the water needed to operate two units at the Putnam site would be less than 5 percent of the lowest mean monthly flow and 8 percent of the minimum recommended frequent low flow, the review team determined that the operational surface-water-use impact of a potential plant at the Putnam site would be minor.

The impacts of the other projects listed in Table 9-25 are considered in the analysis included above or would have little or no impact on surface-water use. The effects of withdrawals by large existing surface water users (such as by the two power generating stations mentioned above, and local agricultural and municipal users) are already reflected in historical streamflow data provided by the USGS. Other projects, that would have little impact, are excluded from the analysis either because they are too distant from the Highlands site, or use relatively little or no surface water, or have little or no discharge to surface water. Some projects (for example park and forest management) are ongoing, and changes in their operations that would have large impacts on surface water use appear unlikely. As stated above, minimum flows have been established for the St. Johns River (Fla. Admin. Code 40c-8). A withdrawal of 89 cfs would be 8 percent of the minimum recommended frequent low flow in the river. Therefore, the review team concludes that cumulative impacts on surface-water use would be MODERATE. Building and operating the proposed units at the Putnam site would not be a significant contributor to the cumulative impact on surface water use of St. Johns River.

As stated above, the review team assumed that no groundwater would be used to build or operate the units at the Putnam site and that groundwater impacts from dewatering would be controlled with diaphragm walls and grouting. Therefore the review team determined that there would be minimal impact on groundwater resources. The impacts of the other projects listed in Table 9-25 are considered in this analysis or would have little or no impact on groundwater use. Therefore, the review team concludes that cumulative impacts on groundwater use would be SMALL.

Cumulative Water Quality

Point and non-point sources have affected the water quality of the St. Johns River upstream and downstream of the site. The FDEP, under the Federal Water Pollution Control Act (Clean Water Act) Section 305(b), prepares a statewide Water Quality Inventory. The FDEP also identifies impaired waterbodies during this process and lists them on the 303(d) List. The 303(d) List of Waters reports on streams and lakes identified as being impaired for one or more pollutants and that do not meet one or more of the water-quality standards. The lower St. Johns River appears on Florida's list of impaired waters because of the presence of nutrients, fecal coliform, depressed dissolved oxygen, turbidity, dioxin, iron, lead, zinc, and mercury in fish tissue (FDEP 2009h); therefore, the review team concludes that the cumulative impact on surface-water quality of the receiving waterbody would be MODERATE. Water-quality information presented above for the impacts of building and operating the new units at the Putnam site would also apply to evaluation of cumulative impacts. As mentioned above, the State of Florida would require PEF to develop a SWPPP (PEF 2009a), which would identify measures to be used to control stormwater runoff (PEF 2009a). The blowdown would be regulated by EPA pursuant to 40 CFR Part 423 and all discharges would be required to comply with limits established by FDEP in a NPDES permit. Such permits are designed to protect water quality. Past and present action in the region has noticeably affected surface water quality adversely. Therefore, the review team concluded that building and operating the proposed units at the Putnam alternative site would not be a significant contributor to impacts on surface-water quality because industrial and wastewater discharges from the proposed units would comply with

NPDES permit limitations and any stormwater runoff from the site during operations would comply with the SWPPP (PEF 2009a).

The review team also concludes that with the implementation of BMPs, the impacts on groundwater quality from building and operating two new nuclear units at the Putnam site would likely be minimal. Therefore, the cumulative impact on groundwater quality would be SMALL. The impacts of other projects listed in Table 9-25 are either considered in the analysis included above or would have little or no impact on surface-water and groundwater quality.

9.3.5.3 Terrestrial and Wetland Resources

Site Description

The following impact analysis includes direct, indirect, and cumulative impacts from construction and preconstruction activities and operations on terrestrial and wetland resources. The analysis also considers past, present, and reasonably foreseeable future actions that affect the terrestrial ecological resources, including the other Federal and non-Federal projects and the projects listed in Table 9-25. For the analysis of terrestrial ecological impacts at the Putnam site, the geographic area of interest is considered to be a 20-mi-wide area centered on the Putnam site and the associated offsite and transmission-line corridors. This 20-mi radius is expected to encompass the locations of possible development projects potentially capable of substantially influencing terrestrial ecological resources on and close to the Putnam project site. This geographical area of influence generally coincides with those defined for hydrology and aquatic ecology, both of which are closely interrelated with the terrestrial ecology of this setting. This area includes watersheds providing direct runoff from the Putnam site to onsite streams and the St. John’s River, as well as the watersheds through which the transmission lines would be routed.

The Putnam site is a greenfield site situated in a rural area in the Eastern Florida Flatwoods ecoregion on the lower St. Johns River, a blackwater river designated as an American Heritage River. The St. Johns River is a wide, meandering, slow-moving river system that drops less than 30 ft as it flows north from its origins in south-central Florida to the Atlantic Ocean near Jacksonville (St. Johns Riverkeeper 2009). Most of the site has been disturbed by previous mining activities, but much has been reclaimed. Land use on and in the vicinity of the Putnam site is mostly forested habitat, with a large proportion of coniferous plantations and forest regeneration areas (CH2M Hill 2009). Habitats found on the Putnam site and in the vicinity are typical of those in the Eastern Florida Flatwoods ecoregion, which include mixed wetland hardwoods, cypress swamps, hydric pine flatwoods, freshwater marshes, and some wet prairies.

The associated transmission-line corridors would begin in the Eastern Florida Flatwoods ecoregion and cross the Central Florida Ridges and Uplands and Southwestern Florida

Flatwoods ecoregions. Vegetation community types in the Central Florida Ridges and Uplands ecoregion include sandhill vegetation such as turkey oak, bluejack oak, and longleaf pine for the dominant canopy species along with common understory species of running oak, gopher apple, and bluestem and panicum grasses (USDA 2006). Vegetation community types in the Southwestern Florida Flatwoods ecoregion include slash pine, longleaf pine, cabbage palm, and live oak with typical understory species of saw palmetto, and gallberry.

Important Species

Common wildlife, including important species, associated with the above-mentioned ecoregions that may occur on the Putnam site and associated transmission-line corridors includes Florida recreationally important species such as white-tailed deer, bobcat, feral hog, squirrel, northern bobwhite, and mourning dove, as well as skunk, raccoon, and several species of woodpecker. Various bird, reptile, and amphibian species also have the potential to reside on the Putnam site and associated transmission-line corridors (USDA 2006; FNAI 2009).

No site-specific surveys have been conducted for threatened and endangered species on the site and in the vicinity, offsite corridors, or the associated transmission-line corridors. Table 9-7 lists all Federally and State-listed species that could occur on the Putnam site and in the vicinity, offsite corridors, and in the counties crossed by the transmission-line corridors. Some of these species may at times be found on or in vicinity of the Putnam site and associated offsite corridors. Counties crossed by the transmission-line corridors for the Putnam site would include Hillsborough, Marion, Pinellas, Polk, Putnam, Seminole, Sumter, and Volusia Counties. PEF has stated that on-the-ground field surveys would be conducted before commencement of ground-disturbing activities on the site and in the offsite corridors and transmission-line corridors as required by the FDEP (PEF 2009a; CH2M Hill 2009; FDEP 2010a).

Building Impacts

Impacts from building two nuclear units and supporting facilities on wildlife habitat would be unavoidable. Activities that would affect wildlife include land clearing and grading (temporary and permanent), filling and or draining of wetlands, increased human presence, heavy equipment operation, traffic, noise, avian collisions, and fugitive dust. These activities would likely displace or destroy wildlife that inhabits the construction areas. Some wildlife, including important species, would perish or be displaced during land clearing for any of the above projects as a consequence of habitat loss, fragmentation, and competition for remaining resources. Less mobile animals, such as reptiles, amphibians, and small mammals, would be at greater risk of incurring mortality than more mobile animals, such as birds, many of which would be displaced to adjacent communities. Undisturbed land adjacent to disturbed areas could provide habitat to support displaced wildlife, but increased competition for available space and resources could affect population levels. Wildlife would also be subjected to impacts from noise and traffic, and birds could be injured if they collide with tall structures. The impact on wildlife from noise is expected to be temporary and minor. The creation of new transmission-line corridors could be beneficial for some important wildlife species, including those that inhabit early successional habitat or use edge environments, such as white-tailed deer, northern bobwhite, eastern meadowlark, and the gopher tortoise. Birds of prey, such as red-tailed hawks would likely exploit newly created hunting grounds. Forested wetlands within the corridors would be converted to and maintained in an herbaceous or scrub-shrub condition that could provide improved foraging habitat for waterfowl and wading birds. However, fragmentation of upland and wetland forests could affect species that are dependent on large tracts of continuous forested habitat.

To accommodate the building of two nuclear units on the Putnam site, PEF would need to clear approximately 441 ac of terrestrial habitats for the nuclear facility, approximately 191 ac for associated offsite structures and corridors (excluding transmission line corridors), and an additional 1282 ac of land would need to be cleared and excavated to accommodate a reservoir (See Table 9-26 and Table 9-27) (CH2M Hill 2009). Based upon FLUCFCS land-use data, approximately 34 ac of wetlands would be affected on the site during building (CH2M Hill 2009). Approximately 15 ac of wetlands would be affected in the offsite corridors (CH2M Hill 2009). Approximately 210 ac of wetlands would be affected to excavate the reservoir (CH2M Hill 2009). PEF states that the nuclear facility would be sited to avoid wetlands whenever possible and potential impacts on wetlands near building zones would be minimized through the use of established BMPs (PEF 2009a). Under Federal and State permitting requirements, PEF would be obligated to mitigate any unavoidable construction impacts on jurisdictional wetlands and listed species (FDEP 2010a).

Table 9-26. Summary of Impacts by Land-Use Class for the Putnam Alternative Site

Land-Use Class (FLUCFCS) (acreage)	Onsite	Reservoir	Offsite Corridors (Except Transmission)	Transmission Corridors[(a)]
Urban and Built Environment (% of area)	159 (36%)	413 (32%)	19 (10%)	1360 (23%)
Agriculture	0 (0%)	1 (<1%)	11 (6%)	828 (14%)
Upland Nonforested	17 (4%)	3 (<1%)	1 (1%)	202 (3%)
Upland Forested	225 (51%)	652 (51%)	138 (72%)	1978 (33%)
Water	0 (0%)	3 (<1%)	1 (1%)	402 (7%)
Wetlands	34 (8%)	210 (16%)	15 (8%)	702 (12%)
Barren Lands	0 (0%)	0 (0%)	5 (3%)	15 (<1%)
Transportation, Communication and Utilities	7 (2%)	9 (1%)	2 (1%)	516 (9%)

Source: CH2M Hill 2009
(a) Acreages listed for transmission-line corridors are total acres available, not total acres affected.

Table 9-27. Total Terrestrial Habitat Impacts for the Putnam Site

Impact Areas	Acres
Onsite Impact Areas	442
Reservoir Impact Areas	1291
Transmission-Line Corridor Areas	6003[(a)]
Offsite Impact Areas	191
Total Impact Areas	1908 (plus portion of 6003-ac transmission corridor)

Source: CH2M Hill 2009
(a) Acreages for transmission lines are total acres available in the corridor, not total acres affected.

New transmission-system infrastructure would be needed to support a nuclear power facility at the Putnam site and would include approximately 215 mi of transmission lines (estimates made by measuring the approximate distance of hypothetical corridors provided in CH2M Hill [2009]; see assumptions in Section 9.3.5.1). There are no existing transmission lines or transmission-line corridors present on the site. PEF has assumed that transmission lines would be collocated within existing transmission-line corridors to the extent possible, thereby minimizing potential terrestrial impacts (CH2M Hill 2009). In addition, transmission-line corridors, towers, and the access road would be situated to avoid critical or sensitive habitats and species to the extent possible. Transmission-line corridor width would vary from 55 ft to 460 ft wide, depending on size, voltage, and whether or not existing corridors could be used. These widths were used in the analysis of the hypothetical routes for each alternative site to determine land-use cover types within the identified corridor (CH2M Hill 2009). The transmission-line corridors for the Putnam site include 6003 ac, of which approximately 702 ac are wetlands and approximately 1978 ac is forested habitat (CH2M Hill 2009). Some portion of the total 1978 ac of forested habitat and 702 ac of wetland habitat present in the corridors would be affected; however, because actual routes have not been determined, impacts on forests and wetlands cannot be quantified. Under Federal and State permitting requirements, PEF would be obligated to mitigate any unavoidable construction impacts on jurisdictional wetlands and listed species. PEF stated that all land clearing associated with the nuclear facility, offsite structures, and transmission-line creation would be conducted according to Federal, State, and local regulations, permit requirements, existing procedures, and established BMPs (PEF 2009a; FDEP 2010a).

Building two new nuclear reactors at the Putnam site, including the reservoir and offsite corridors (except transmission line corridors), would result in the loss of approximately 1924 ac of terrestrial habitat. Clearing land for the transmission-line corridor would also result in a loss of an undetermined amount of terrestrial habitat due to clearing and increase habitat fragmentation along the corridor. Other sources of impacts on terrestrial resources such as noise, increased risk of collision and electrocution, and displacement of wildlife would likely be temporary and result in minimal impacts on the resource. Because of the extent of unavoidable terrestrial habitat losses, building the two new units would noticeably alter the available terrestrial habitat on and in the landscape surrounding the Putnam site.

Operational Impacts

Impacts on terrestrial ecological resources, including important species, from operation of two new nuclear units at the Putnam site include those associated with transmission system structures, maintenance of transmission-line corridors, and operation of the cooling towers. Also, during plant operation, wildlife would be subjected to impacts from collisions with increased traffic.

Impacts on crops, ornamental vegetation, and native plants from cooling-tower drift cannot be evaluated in detail in the absence of information about the specific location of cooling towers at each alternative site. Similarly, bird collisions with cooling towers cannot be evaluated in the absence of information about the specific location of cooling towers at the site. The impacts of cooling-tower drift and bird collisions for existing power plants were evaluated in NUREG-1437 (NRC 1996) and found to be of minor significance for nuclear power plants in general, including those with various numbers and types of cooling towers. On this basis, the review team concludes, for the purpose of comparing the alternative sites, that the impacts of cooling-tower drift and bird collisions with cooling towers resulting from operation of new nuclear units would be minor.

Outdoor noise levels on the Putnam site are predicted to range from 90 dBA near the loudest equipment to 65 dBA in areas more distant from major noise sources (PEF 2009a). Noise modeling predicts not perceptible to slight increases in noise from plant operations at the site boundary (PEF 2009a). Except in areas immediately adjacent to major noise sources, expected noise levels would be below the 60- to 65-dBA threshold at which birds and red foxes (a surrogate for small and medium-sized mammals) are startled or frightened (Golden et al. 1980). Thus, noise from operating cooling towers at the Putnam site would not be likely to disturb wildlife beyond the site boundary. Consequently, the review team concludes that the impacts of cooling-tower noise on wildlife would be minimal.

An evaluation of specific impacts resulting from building of transmission lines and transmission-line corridor maintenance cannot be conducted in any detail due to the lack of information, such as the specific locations of new rights-of-way that could result from transmission system upgrades. However, in general, impacts associated with transmission-line operation consist of bird collisions with transmission lines, EMF effects on flora and fauna, and habitat loss due to corridor maintenance. The impacts associated with transmission-line corridor maintenance activities include alteration of habitat, including wetland and floodplain habitat, due to cutting and herbicide application, and similar related impacts.

Transmission lines and associated structures pose a potential avian collision hazard. Direct mortality resulting from birds colliding with tall structures has been observed (Erickson et al. 2005). Factors that appear to influence the rate of avian impacts with structures are diverse and related to bird behavior, structure attributes, and weather. Migratory flight during darkness by flocking birds has contributed to the largest mortality events. Tower height, location, configuration, and lighting also appear to play a role in avian mortality. Weather, such as low cloud ceilings, advancing fronts, and fog also contribute to this phenomenon. Waterfowl may be particularly vulnerable due to their low, fast flight and flocking behavior (EPRI 1993). Bird collisions with transmission lines are recognized as being of minor significance at operating nuclear power plants, including transmission-line corridors with variable numbers of power lines (NRC 1996). Accordingly, although additional transmission lines would be required for new nuclear units at the Putnam site, increases in bird collisions would be minor and they would likely not be expected to cause a measurable reduction in local bird populations. PEF would also be required to have an Avian Protection Plan in compliance with State certification guidelines (FDEP 2010a). Consequently, the incremental number of bird collisions posed by the addition of new transmission lines for new nuclear units would be negligible.

EMFs are unlike other agents that have an adverse impact (e.g., toxic chemicals and ionizing radiation) in that dramatic acute effects cannot be demonstrated and long-term effects, if they exist, are subtle (NRC 1996). A careful review of biological and physical studies of EMFs did not reveal consistent evidence linking harmful effects with field exposures (NRC 1996). At a distance of 300 ft, the magnetic fields from many lines are similar to typical background levels in most homes. Thus, impacts of EMFs on terrestrial flora and fauna are of small significance at operating nuclear power plants, including transmission systems with variable numbers of power lines (NRC 1996). Since 1997, more than a dozen studies have been published that looked at cancer in animals that were exposed to EMFs for all or most of their lives (Moulder 2003). These studies have found no evidence that EMFs cause any specific types of cancer in rats or mice (Moulder 2003). Therefore, the incremental EMF impact posed by addition of new transmission lines for new nuclear units would be negligible.

Roads providing access to the existing transmission-line corridors at the Putnam site would likely be sufficient for use in any expanded corridors; however, new roads would be required during the construction of new transmission-line corridors. Management activities (cutting and herbicide application) related to transmission-line corridors and related impacts on floodplains and wetlands in transmission-line corridors are recognized as being of minor significance at operating nuclear power plants, including those with transmission-line corridors of variable widths (NRC 1996). The review team assumes that the same vegetation and construction management of corridors currently used by PEF would be used in the establishment and maintenance of the new corridors. Under the Conditions of Certification for the State, PEF would also be required to retain existing vegetation whenever practicable and use BMPs that comply with the Florida State regulations (FDEP 2010a). Consequently, the incremental effects of the maintenance of transmission-line corridors and associated impacts on floodplains and wetlands posed by expanding existing corridors or the addition of a new transmission-line corridor for new nuclear units would be negligible.

To summarize, the potential effects of operating two new nuclear reactors at the Putnam site would be primarily associated with the maintenance of transmission-line corridors and increased traffic. Operational impacts on terrestrial resources would generally be expected to be minimal.

Cumulative Impacts

Past and present actions in the geographic area of interest that have influenced terrestrial resources in a way similar to the building and operation of the proposed two new nuclear units at the Putnam site include the approximately 2000-ac Seminole Power Plant and the Putnam Steam Power Plant. Construction of the nuclear facility at the Putnam site would have impacts on terrestrial resources similar to those of the proposed project at the LNP site, and operation of the transmission system would have similar impacts on terrestrial resources as mentioned above. The Iluka Resources Inc. mine, located north of the Putnam site, would have also affected terrestrial resources in a similar way. Furthermore, terrestrial habitats throughout the geographic area of interest have been extensively altered by a history of forestry and agricultural practices as well as low density residential development.

Proposed reasonably foreseeable future actions that would affect terrestrial resources in a way similar to development at the Putnam site would include transmission-line creation and/or upgrading throughout the designated geographical ROI, and future urbanization would also be expected to occur. There are no areas within the geographical ROI that are managed for the benefit of wildlife.

The other impact on terrestrial resources at the Putnam site would be the effect of global climate change on plants and wildlife. The impact of global climate change on terrestrial wildlife and habitat in the geographic area of interest is not precisely known. Global climate change would result in a rise in sea level and may cause regional increases in the frequency of severe weather, decreases in annual precipitation, and increases in average temperature (GCRP 2009). Such changes in climate could alter terrestrial community composition on or near the Putnam site through changes in species diversity, abundance and distribution. Elevated water temperatures, droughts, and severe weather phenomena may adversely affect or severely reduce terrestrial habitat. Specific predictions of habitat changes in this region due to global climate change are inconclusive at this time. However, because of the regional nature of climate change, the impacts related to global climate change would be similar for all of the alternative sites.

Summary Statement

Impacts on terrestrial ecology resources are estimated based in the information provided by PEF and the review team's independent review. There are past, present, and future activities in the geographic area of interest that could affect terrestrial ecology in ways similar to the building of two units at the Putnam site. The Putnam site and some of the associated transmission lines are natural habitats that would be substantially altered by development and maintenance activities, noticeably affecting the level and movement of terrestrial wildlife populations in the surrounding landscape. Other anticipated development projects would further alter wildlife habitats and migration patterns in the surrounding landscape. The review team therefore concludes that the cumulative impacts on baseline conditions for terrestrial ecological resources would be MODERATE. This determination is based upon the extent of expected wetland loss and habitat fragmentation from ongoing and planned development projects, continued widespread manipulation of habitats for commercial forest management, and anticipated losses of habitat for important species. The incremental impacts from building and operating the Putnam project would be a significant contributor to the moderate cumulative impact, primarily because of a loss or modification of habitats that support wildlife, wetlands, and important species. Although incremental impacts on terrestrial resources could be noticeable near the Putnam project site, these impacts would not be expected to destabilize the overall ecology of the regional landscape.

9.3.5.4 Aquatic Resources

The following impact analysis includes impacts from building activities and operations on aquatic ecology resources. The proposed Putnam site has no existing infrastructure associated with development of a nuclear power plant. This greenfield site is adjacent to the St. Johns River, which is proposed as the water source for cooling and discharge. Water flow in the St. Johns River is managed by the St. Johns River Water Management District (SJRWMD), with an established minimum average flow of 240 cfs for the St. Johns River below the Lake Washington weir. PEF maintains that there would be adequate flow to supply water through a closed-cycle cooling design for a two-unit plant. However, under drought conditions, the St. Johns River may not be able to provide sufficient water, and PEF acknowledges that the building of a reservoir would be required to ensure consistent water supply (PEF 2009a). The geographic area of interest includes the site and vicinity streams as well as the St. Johns River upstream and downstream of the intake and discharge as the area most likely to be affected by new nuclear units, as well as associated transmission-line corridors.

The St. Johns River flows from swampy headwaters in Melbourne, Florida, northward to the mouth near Mayport on the Atlantic Ocean. Classified as an American Heritage River, the St. Johns River has experienced a severe decline in water quality and increased use as a freshwater resource, which have prompted the water management district to improve water quality and restore habitat, particularly in the lower river basin, which includes Putnam County

(SJRWMD 2008a). Several initiatives are planned to target water quality, biological health, and sediment management in the lower St. Johns River basin and the connecting Lake George basin, which is also located in Putnam County (SJRWMD 2008b).

There are no sanctuaries or preserves that could be affected by the proposed action. The nearest State-managed areas are the Oklawaha River Aquatic Preserve in Marion County and the Wekiva River Aquatic Preserve to the south of Putnam County. The Oklawaha River Aquatic Preserve covers 4600 ac of submerged lands and flows into the St. Johns River at Palatka (FDEP 2009d). The Wekiva River Aquatic Preserve encompasses 19,000 ac of submerged land and flows into the middle St. Johns River basin (FDEP 2009e).

Commercially Important Species

Commercial fisheries allowed in the St. Johns River include menhaden (*Brevoortia tyrannus*), black mullet, and blue crab. For life history information on the black mullet and blue crab refer to Section 2.4.2.

The Atlantic menhaden inhabit inland tidal waters and spawn offshore during October through March. Juvenile development typically occurs in estuarine or tidal habitat with salinities less than 10 ppt (ASMFC 2009). Fished as both a bait and food fish, landings for Putnam County in 2008 recorded over 12,000 lb (FFWCC 2009a).

Recreationally Important Species

Largemouth bass, speckled perch (*Pomoxis nigromaculatus*), striped bass (*Morone saxatilis*), catfish (*Ameiurus* spp.), blue crab, and sunfish (*Lepomis* spp.) are the primary recreational species caught in the Lake George basin and Putnam County area of the St. Johns River (BASS Online Inc. 2008).

Non-Native and Nuisance Species

Water hyacinth, water lettuce, and hydrilla are common invasive aquatic plant species that have been noted in the St. Johns River and are controlled by the SJRWMD through the FDEP/Florida Fish and Wildlife Conservation Commission's Invasive Plant Management Program (FDEP 2008). Power plant operations are not expected to affect these aquatic nuisance species.

Critical Habitats

No critical habitat has been designated by the FWS or NMFS in the vicinity of the Putnam County alternative site.

Federally and State-Listed Species

Federally and State-listed aquatic species that may occur near the Putnam County alternative site include the endangered Florida manatee and the endangered shortnose sturgeon (*Acipenser brevirostrum*). Federally and State-listed species may also occur along transmission-line corridors in Hillsborough County, such as the endangered green sea turtle, leatherback sea turtle, Kemp's ridley sea turtle, loggerhead sea turtle, and the threatened gulf sturgeon. Detailed species information is provided in Section 2.4.2.3.

<u>Florida Manatee</u> (*Trichechus manatus latirostris*)

The Florida manatee upper St. Johns River management unit, which includes Putnam County, constitutes approximately 5 percent of the total manatee population, but is the fastest growing of the four management units. Over 450 ac are regulated in Putnam County by FWS as Manatee Protection Zones (FFWCC 2007d). PEF would comply with the Standard Manatee Conditions for In-Water Work (FDEP 2010a) for construction activities in the St. Johns River to prevent impacts on manatees in the vicinity of construction activities. Thermal discharges from operations may result in increased use of habitat near the point of discharge if discharge is to the St. Johns River. Plant outages that result in cold shock could affect manatees that become habituated to power plant thermal discharges.

<u>Shortnose Sturgeon</u> (*Acipenser brevirostrum*)

Shortnose sturgeon range along the eastern Canadian and U.S. coast from the St. John River in Canada to the St. Johns River in Florida. All spawning occurs in freshwater during a narrow 1- to 2-week period in the spring. Females only spawn every 3 to 5 years after reaching sexual maturity at age 8 to 12. Males may spawn every year after reaching age 6 to 10 (NMFS 1998). Shortnose sturgeon are sensitive to water-quality conditions and require rocky or gravel substrate for spawning. If habitat is not favorable, spawning will not occur, and the lower St. Johns River has little of this preferred habitat type. In the St. Johns River, most catch records for the shortnose sturgeon have occurred in the lower basin near Palatka. A sampling survey from 2002 to 2003 recorded a single shortnose sturgeon to the south of Palatka, despite more than 820 hours of sampling effort (FFWCC 2009c). To date, no evidence of spawning or adult migration in the St. Johns River has been collected to indicate that there is a viable reproducing population in this river.

Building Impacts

New cooling-water intake and discharge structures in addition to a cooling-water reservoir would be required at the Putnam County site. Installation of a new intake and discharge would result in the temporary displacement of aquatic biota within the vicinity of both structures. It is expected that these biota would return to the area after installation is complete. Sedimentation due to disturbances of the river bank and bottom during installation activities could affect local benthic populations. However, the impacts on aquatic organisms would be temporary and largely mitigable through the use of BMPs. The impacts of building a cooling-water reservoir may be significant depending on the siting of the reservoir. During the review team's visit to the Putnam site, observations of the site from public roads indicated the presence of streams that are either perennial or seasonal. These aquatic resources have not been examined for diversity of aquatic biota, but nonetheless, they represent aquatic habitat that would likely be affected by the building of facilities for the site. Offsite corridor preparations would not cross any streams, but would cross two open waterbodies (CH2M Hill 2009). The use of BMPs during building activities would result in minimal impacts on aquatic biota located in water resources within the site building areas.

New transmission-line infrastructure would be required for a new two-unit facility. There currently are no existing transmission-line corridors in the immediate vicinity of the greenfield site, and new corridors would need to be established. Transmission corridors appear to follow the Polk-Hillsborough-Pinellas corridor identified for the LNP site in addition to other corridors in Marion, Putnam, Seminole, Sumpter, and Volusia Counties (CH2M Hill 2009). PEF anticipates transmission-line corridors would cross 7 streams and 94 open waterbodies and should have minimal impact on aquatic resources, including minimal impacts on threatened and endangered sea turtles and the threatened gulf sturgeon (CH2M Hill 2009).

Operational Impacts

Impingement and entrainment of organisms from the St. Johns River and from a constructed reservoir would be the most likely impacts on aquatic populations that could occur from operation of two new nuclear units at the Putnam County site. Assuming a closed-cycle cooling system, a maximum through-screen intake velocity of 0.5 ft/sec or less and an intake flow of less than or equal to 5 percent of the mean annual flow which meets the EPA's Phase I regulations for new facilities (66 FR 65256), the anticipated impacts on aquatic populations from entrainment and impingement are expected to be minimal. Operational impacts associated with water quality and discharge cannot be determined without additional detailed analysis. However, based on the staff's experience with other facilities, the review team concludes that with proper design the impacts on aquatic resources due to the blowdown discharge from operation of two new nuclear units at the Putnam County site would likely be minimal with FDEP NPDES compliance.

The staff also concludes that operational impacts on aquatic biota from maintenance of the transmission-line corridors would be minimal assuming that appropriate BMPs are used.

Cumulative Impacts

Cumulative impacts on aquatic resources within the St. Johns River include the operation of Seminole Power Plant and Putnam Steam Power Plant, both of which use water from and discharge to the St. Johns River. Other impacts include small business and wastewater-treatment plants that discharge wastewater to the St. Johns River within the geographic area of interest for the Putnam site. These discharge operators and businesses have active NPDES permits for discharge.

Anthropogenic activities such as residential or industrial development near the vicinity of the nuclear facility can present additional constraints on aquatic resources. Future activities may include shoreline development (i.e., removal of habitat), increased water needs, and increased discharge of effluents into the St. Johns River. The effects of continued industrial discharge practices could result in additional habitat loss and/or degradation due to water use using surface waters and groundwater withdrawal, point and non-point source pollution, siltation, and bank erosion.

The review team is also aware of the potential for global climate change to affect aquatic resources. The impact of global climate change on aquatic organisms and habitat in the geographic area of interest is not precisely known. Global climate change would result in a rise in sea level and may cause regional increases in the frequency of severe weather, decreases in annual precipitation, and increases in average temperature (GCRP 2009). Such changes in climate could alter aquatic community composition on or near the Putnam site through changes in species diversity, abundance, and distribution. Elevated water temperatures, droughts, and severe weather phenomena may adversely affect or severely reduce aquatic habitat, but, specific predictions of aquatic habitat changes in this region due to global climate change are inconclusive at this time. The level of impact resulting from these events would depend on the intensity of the perturbation and the resiliency of the aquatic communities.

Summary Statement

Impacts on aquatic ecology resources are estimated based on the information provided by PEF, the State of Florida, and the review team's independent review. Properly siting associated transmission lines, avoiding habitat for protected species and minimizing interactions with waterbodies and watercourses along the corridors, and the using BMPs during intake and discharge installation, transmission-line corridor preparation, and tower placement would minimize building and operation impacts. There would be impacts associated with the loss of aquatic habitat, particularly during low flow conditions in the river, due to the consumptive loss of water from closed-cycle cooling. There also would be unspecified impacts related to the construction and operation of a cooling reservoir however these could be minimized through proper siting and the use of BMPs during construction. The use of a cooling reservoir would partially mitigate the effects of consumptive water loss on aquatic habitat during low river flow.

The review team concludes that the cumulative impacts of building and operating two new reactors on the Putnam site combined with other past, present, and future activities on aquatic resources in the St. Johns River would be SMALL.

9.3.5.5 Socioeconomics

The following impact analysis includes direct, indirect, and cumulative impacts from the building activities and operations of two new nuclear units at the Putnam site, which is located in rural Putnam County in northeastern Florida. The analysis considers other past, present, and reasonably foreseeable future actions that affect socioeconomics, including other Federal and non-Federal projects listed in Table 9-25. For the analysis of socioeconomic impacts at the Putnam site, the geographic area of interest is the region within a 50-mi radius centered on the Putnam site (the region) with special consideration of the five counties of Putnam, Clay, Flagler, Marion, and St. Johns Counties, because that is where the review team expects socioeconomic impacts to be the greatest. In evaluating the socioeconomic impacts of site development and operation at the Putnam site, the review team undertook a reconnaissance survey of the site using readily obtainable data from the Internet or published sources.

The Putnam site is a greenfield site located in an area in which there is an operating coal-fired power plant and a combined-cycle gas/oil-fired power plant, sand mines, and a concrete batch plant. The review team drew upon UCSB 2000 data to find the available total construction workforce within the host county, adjacent counties, and any nearby counties with a major population center within a reasonable commuting distance from the site. For the Putnam site, this included Putnam, Clay, Alachua, Marion, Volusia, Flagler, St. Johns, and Duval Counties. The total workforce employed in these counties in 2000 was 71,994 workers. Based on this workforce availability, the review team assumed that up to 80 percent of the 3300-person workforce involved in building the two-unit plant, or 2640 workers, would be drawn from existing residents of this region, and that 20 percent, or 660 workers, would migrant into the area. This 20 percent would include special trades needed for nuclear power plant production that may not be available in the region.

The review team identified the Economic Impact Area (EIA) for a two-unit nuclear plant at the Putnam site to include Putnam County and the immediately adjacent counties of Clay, Flagler, Marion, and St. Johns, based on the review team's expected effects of in-migrating workers and families. The review team expects that some of the in-migrating workers would choose to reside in Alachua, Duval, and Volusia Counties because of the amenities available in the larger cities there, but these counties' economies and community infrastructures are sufficiently large that the review team expects that project-related effects would not be noticeable. The review team focused on the effects of the workforce involved in building the two-unit plant because the operations workforce would be smaller than the construction and preconstruction workforce, with smaller socioeconomic impacts.

Table 9-28 provides some socioeconomic data for the EIA. For the purposes of this analysis the review team projected that about one-quarter, or 165 of the in-migrating workers, would be distributed among Alachua, Duval, and Volusia Counties because they offer more urban amenities than the counties in the EIA. The review team assumed that the other 495 in-migrating workers would be distributed among the EIA. The review team further assumed that all in-migrating workers would bring families; this is unlikely but provides an upper bound on population impacts associated with the project. The review team used the 2.49 average Florida family size to project the distribution of population due to in-migrating workers shown in Table 9-29.

Physical and Aesthetics Impacts

The physical impacts on workers and the public from building and operating a two-unit plant at the Putnam site would be very similar to those described for the LNP site. People who work or live around the site could be exposed to noise, fugitive dust, and gaseous emissions from building activities. Building workers and personnel working onsite could be the most affected. Air-pollution emissions are expected to be controlled by applicable BMPs and Federal, State, and local regulations. During plant operations, standby diesel generators used for auxiliary power would have air-pollution emissions. These generators would see limited use and, if used, would be used for only short periods of time. Applicable Federal, State, and local air-pollution requirements would apply to all fuel-burning engines. During normal operations, the annual average exposure from gaseous emission sources is anticipated to not exceed applicable regulations at the site boundary. The review team expects the impacts of plant operations on air quality to be minimal. As with building impacts, potential offsite receptors of operations noise and emissions are generally located well away from the site boundaries.

Building activities and unit operations are not expected to affect any offsite buildings. Most buildings are well removed from the site boundaries. Because this is a greenfield site, there are no onsite buildings to be affected by shock and vibration from pile-driving and other related activities. No long-term physical impacts on structures, including any residences near the site boundaries, would be expected. Therefore, based on consideration of reconnaissance-level information, the review team concludes that the physical impacts of station building and operation on offsite buildings would be minor.

PEF reports that a reservoir may need to be created for water supply. There would likely be vegetative screening around the reservoir that would potentially mitigate the aesthetic impacts. Therefore, the review team expects the aesthetic impacts of a reservoir would be minimal.

Table 9-28. Socioeconomic Data for the Putnam Site EIA

Data Category	Putnam	Clay	Flagler	Marion	St. Johns	Data Source
Population						
1980	50,549	67,052	10,913	122,488	51,303	(1a)
1990	65,070	105,986	28,701	194,833	83,829	(1)
2000	70,423	140,814	49,832	259,914	123,148	(1)
Projected 2010	74,208	195,731	101,595	348,610	196,113	(2)
Median Household Income (1999)	$28,180	$48,854	$40,214	$31,944	$50,099	(3)
Vacant Housing Units						
2000	6031	3505	3158	15,908	8394	(1), (7)
2005	7582	5089	8396	24,860	13,619	(1), (7)
Total Housing Units						
2000	33,870	53,748	24,452	122,663	58,008	(7)
2005	35,870	71,735	48,454	159,283	83,147	(7)
Workforce						
2000	26,326	66,268	18,815	98,248	59,394	(3)
Peak Project	2669	5987	1873	8803	4491	(3)
Total schools[(a)]	1 A, 5 B, 9 A-B, 2 C, 1 B-C, 1 A-B-C	1A, 7 B, 22 A-B, 6 C, 1 B-C, 1 A-B-C	0 A, 2 B, 5 A-B, 3 C, 1 B-C	2 A, 9 B, 29 A-B, 8 C, 1 B-C, 1 A-B-C	0 A, 7 B, 17 A-B, 5 C, 2 B-C	(4)

Table 9-28. (contd)

Data Category	Putnam	Clay	Flagler	Marion	St. Johns	Data Source
Number of Schools Failing Student-Teacher Ratio	1	1	1	4	0	(4)
Police	Sheriff Dept	Sheriff Dept – 40-60 deputies	Sheriff Dept –4 patrol squads, traffic unit.	Sheriff Dept plus police depts. in Dunnellon, Belleview, and Ocala	Sheriff Dept – almost 200 employees and 300 in support	(5)
Emergency Services	Dept of emergency services; 70+ EMS staff at 7 stations; 2 staffed and 18 volunteer fire departments	Emergency management dept. 14 fire stations, emergency dispatchers	Emergency services includes fire and EMS – 80 budgeted positions, including fire and paramedics	Emergency operations department – joint county, Ocala, Dunnellon; 22 staffed and 7 volunteer fire stations	Emergency management department details not available	(6)
Population(8)						
White	78.9	89.1	88.5	85.3	91.8	
Afr-American	17.3	7.3	9.4	12	6.5	
Hispanic	12.1	4.3	5.1	35.7	2.6	
Low Income	20.9	6.8	8.7	13.1	8.0	(3)

(a) A-elementary school; B-middle school ;C-high school
Sources:
(1a) USCB 1990
(1) USCB 2000b
(2) 2010 projection assuming 2000-2008 growth rate (from USCB 2009) extends to 2010
(3) USCB 2000c
(4) FDOE 2009a
(5) Putnam: Putnam Sheriff 2009, Clay Sheriff 2009, Flagler Sheriff 2009, Marion: Section 2.5.2.6, St. Johns Sheriff 2009
(6) Putnam: Putnam EM 2009, Clay Public Safety 2009, Flagler EM 2009, Marion EM 2009, Marion Fire 2009, St. Johns EM 2009
(7) USCB 2007
(8) BEA 2010
EMS = emergency management services

Table 9-29. Projected Distribution of Workers and Associated Population Increase in the EIA

County	Percent Population Increase 1990-2000[(a)]	Projected Percent Increase 2000–2010 [(b)]	Workers in-migrating to build Putnam Plant	Civilian Workforce in 2007[(c)]	Population of In-Migrating Workers and Families	Population of Workers and Families (as a percent of projected 2010)	Population of Workers and Families (as a percent of projected 2010 population + in-migrants)
Putnam	8.2	5.4	81	31,768	201	0.27	0.27
Clay	32.9	39.0	47	92,879	117	0.06	0.06
Flagler	73.6	103.9	42	30,599	105	0.10	0.10
Marion	32.9	34.1	213	135,333	530	0.15	0.15
St. Johns	46.9	59.3	112	89,843	280	0.14	0.14

(a) Based on USCB data, as reported in PEF 2007b.
(b) Calculated as 1.25 times percent change 2000-2008 shown in USCB 2009, i.e., assumes rate of change for first eight years would continue through last two years of the decade.
(c) BEA 2010

The Putnam site is in a rural area within an area that has experienced sustained, substantial population growth over the past several decades, as indicated in Table 9-28. Residential and commercial areas are located away from the alternative site boundaries, applicable air-pollution regulations would have to be met by PEF, and applicable BMPs would be put in place, including during the construction and use of the site access road. Therefore, based on information provided by PEF and the review team's independent review of reconnaissance-level information, the review team concludes that the physical impacts of building and operating the station would have minimal impact on workers and the local public around the Putnam site.

As the transmission lines to connect the site to the distribution grid are put in place and the buildings and cooling towers associated with the new reactors reach their final heights and begin operating, they would introduce a noticeable aesthetic impact that could be similar to those created by the existing fossil-fuel plants already operating within the county. In places requiring the clearing of new transmission-line corridors, aesthetic impacts would be noticeable but not destabilizing, depending on the proximity of viewers and the nature of vegetation remaining between them and the corridors. Given the general characteristics of the area, there would likely be vegetative screening around the site that would potentially mitigate the aesthetic impacts at the reactor site.

Demographic Impacts

Table 9-29 indicates the estimated project-related population migrating into the EIA at peak workforce levels and the population increase in each county between 1990 and 2000 and between 2000 and 2010. As seen in the table, each county except Putnam saw a large rate of population increase between 1980 and 2000, with continued high rates forecast for between 2000 and 2010. For Putnam County the rates are similar for both the 1990–2000 and the 2000–2010 periods, with a somewhat lower rate of increase forecast for 2000–2010 than for the prior decade, although this increase is upon a larger base. Given the estimated increase of 0.27 percent or less over projected populations for 2010, the review team found that the demographic impact of the in-migrating population associated with constructing two new nuclear generating units would be minor.

Economic Impacts

The review team determined that the combined impact of the direct and indirect jobs and income associated with building the two units would have a minor effect on total employment and income in the EIA, with in-migrating workers projected at less than 2.2 percent of the 2000 employee base in any county. The impact of approximately 541 operations jobs (70 percent of the total operations jobs) filled by in-migrating operations workers within a 1-hour commute of the site, and the indirect jobs they would create would be minor, given the size of the economy of the area.

State and local taxes would be governed by Florida law. The review team assumed that tax revenues generated from sales and use taxes associated with the building and operation of the proposed project at the Putnam site would be very similar to those evaluated for the LNP site in Sections 4.4.3.2 and 5.4.3.2, with a similar minor impact on revenues in the EIA and region. The review team concluded that increased property taxes from the proposed project at the Putnam site during operation would have a substantial beneficial impact on Putnam County. The review team found that additional property taxes on new houses built by in-migrating workers would constitute a small percentage increase in the local tax base in the EIA; thus the impact of operations on residential property tax revenues would be minor and beneficial for all of the region except Putnam County, where the review team determined property tax impacts would be substantial and beneficial.

Housing

The review team compared the 2000 figures for vacant housing in the EIA listed in Table 9-28 with the number of in-migrating workers projected for peak workforce years listed in Table 9-29. Table 9-28 housing figures do not include RV parks, campgrounds, or hotels, and thus provide a lower bound of what would be available to house workers. In the EIA, less than 2 percent of the 2000 vacant housing present in 2000 would be needed to house in-migrating workers, assuming that each worker occupied a separate housing unit. The review team divided the projected increase in population without the project by 2.49 (Florida average family size) to estimate the number of housing units required to accommodate the increase.

The U.S. Census Housing Profile (USCB 2000b) in the EIA estimated the following:

- Putnam County – a total housing stock of 33,870 units with a rental vacancy rate of 18 percent (approximately 6031 housing units were unoccupied at the time of the survey).
- Clay County – a total housing stock of 53,748 units with a rental vacancy rate of 7 percent (approximately 3505 housing units were unoccupied at the time of the survey).
- Flagler County – a total housing stock of 24,452 units with a rental vacancy rate of 13 percent (approximately 3158 housing units were unoccupied at the time of the survey).
- Marion County – a total housing stock of 122,663 units with a rental vacancy rate of 13 percent (approximately 15,908 housing units were unoccupied at the time of the survey).
- St. Johns County – a total housing stock of 58,008 units with a rental vacancy rate of 14 percent (approximately 8394 housing units were unoccupied at the time of the survey).

The review team expects that the in-migrating workforce could be absorbed into the existing housing stock in the EIA and the region without a measureable impact. Based on the information provided by PEF and the review team's independent evaluation, the review team concludes that housing impacts of building and operating two nuclear units at the Putnam site would not be noticeable.

Public Services

The review team assumed that the Putnam EIA, like the three-county local area for the LNP EIA, have planned to meet needs for public services based on forecast population increases that did not include the presence of a workforce associated with building and operating a nuclear plant. The review team based its analysis of potential impacts on public services on the level of population increase represented by in-migrant workers during peak workforce years, an estimated increase of 0.27 percent or less over projected populations for 2010, as shown in Table 9-29. Using this approach, the review team expects that the impacts of building two units on county public services during peak workforce years would be minor in the EIA.

Transportation

Main roads in Putnam County include US-17, a two-lane north-south road on the eastern side of the county; SR-20, a two-lane east-west road across the center of the county; and SR-9, a two-lane north-south road that extends from the center of the county and trends northeast to join US-17 in the county capital, Palatka. All three roads have a LOS standard of "C." SR-20 forms part of the Strategic Intermodal System, for which the FDOT sets the standards (FDOT 2009a). The other roads are not part of the Strategic Intermodal System and are assigned LOS standards according to the Putnam County Comprehensive Plan (Putnam County 2009a).

One-way annual (2008) AADT counts for US-17 ranged from 17,000 to 16,500 near the bridge east of Palatka and east of the junction with SR-20; 5000 to 4900 north of Palatka; and 2600 to 4600 in the south of the county. Two-way AADT estimates for SR-20 ranged from 7600 in the west of the county to 15,900 near the intersection with SR-19 and 7700 just south of the intersection with US-17. Two-way AADT estimates for SR-19 range from 2900 in the south of the county to 8600 south of the junction with SR-20 (FDOT 2008).

The review team considered these roads to be the main routes that would be used by workers commuting to the plant site, with US-17 linking to the site access road. The review team considered the impact of project-related traffic in terms of likelihood that it would change the LOS along US-17 to be lower than the assigned standard "C." The review team assumed 2281 trips daily (following LNP site analysis in Section 4.4.4.1), with 50 percent to/from the north and 50 percent to/from the south, based on the distribution of in-migrating worker residence discussed previously as well as commuters from Duval, Alachua, and Volusia Counties. At morning shift change, this would add 1977 cars to the total flow on SR-70, 711 incoming from the north, 711 from the south; and 275 outgoing to the north, 275 to the west. The incoming traffic from both north and south would increase the flow by about 15 percent over the 2008 AADT for US-17 north of Palatka, in the general site vicinity, which, according to FDOT's generalized planning standards (FDOT 2009b), would not reduce the LOS below "C." Effects south of Palatka would be less. An increase of 711 cars entering the Palatka area from US-17 south, SR-19 south, and SR-20 west would not significantly add to the 2008 counts. The review team found no evidence that the LOS for US-17 would change as a result of project-related traffic. While more analysis would be required once specific proposals for turn lanes, signals, and other modifications were made, the review team identified the potential for a noticeable, intermittent impact at the intersection of US-17 with the site access road, analogous to that predicted for the LNP site. Given the lower number of commuters during operations, the review team believes the traffic-related impacts during operations would be minor.

Education

Table 9-28 provides data about schools in the EIA. Schools in the socioeconomic impact area met the State teacher-student ratio classroom requirements in 2007–2008 with the exception of four schools in Marion County and one school each in each Putnam, Clay, and Flagler Counties. The review team assumed that school districts in the EIA, like those in the EIA for the LNP site, would address short-term gains in student population with mobile classrooms and that the PK-12 public schools would be funded according to the Florida equalized funding formula (FDOE 2009b). The review team assumed that students would accompany each in-migrating worker family in the average of the ratios of students per household from the LNP site counties listed in Table 2-35, resulting in the number of new students listed in Table 9-30.

Table 9-30. Students from In-Migrating Families at Peak Workforce Years

County	In-Migrating Worker Households	Grades PK–3 Students[a]	New Rooms	Grades 4–8 Students[b]	New Rooms	Grades 9–12 Students[c]	New Rooms
Putnam	81	13	1	7	0	7	0
Clay	47	7	0	4	0	4	0
Flagler	42	7	0	3	0	4	0
Marion	213	34	2	17	1	19	1
St. Johns	112	18	1	9	0	10	0

Source: Table 4-14; State of Florida 2002
(a) 0.158 per household; 18 students per teacher required by State law
(b) 0.081 per household; 22 students per teacher required by State law
(c) 0.091 per household; 25 students per teacher required by State law
PK = preschool

The review team found that the addition of up to four classrooms in Marion County, one classroom each in Putnam and St. Johns Counties, and none in Clay or Flagler County would amount to less than one additional classroom per school, which would constitute a minor impact.

Recreation and Aesthetics

The review team learned that fishing for a number of species is important along the St. John's River in Putnam County (Florida Bass Online.com 2010). The review team anticipates that building activities would have short-term minor effects on the recreation industry.

The economy in the Putnam site EIA draws on its natural resources, including many lakes and parks. Because the exact footprint of the site is not determined, specific impacts on specific recreational facilities from site structures and the intake and discharge structures are not known, but, based on the considerations discussed for the LNP site, the review team anticipates that adverse impacts of building units at the Putnam site would have minor impacts on use of the recreational facilities from which activities would be visible or audible. The increased population in the EIA may increase use of local recreational areas, which is expected to have negligible impact on either the sites or the recreational experience, given the number, geographic distribution, and variety of recreational locations available.

Aesthetic viewsheds would be negatively affected by the height of structures during construction and operation. Given the general characteristics of the area, there would likely be vegetative screening around the site that would potentially reduce the aesthetic impacts to minor. In places requiring the clearing of new transmission-line corridors, aesthetic impacts would vary depending on the location of viewers and the nature of vegetation remaining between them and the corridors, ranging from minor to noticeable.

PEF reports that a reservoir may need to be created for water supply. There would likely be vegetative screening around the reservoir that would potentially mitigate the aesthetic impacts and therefore the impact would be minor. Also, there are many opportunities in the region for various sorts of recreation and the review expects the impact to recreation to be minimal.

Summary of Socioeconomics

Physical impacts on workers and the general public include impacts on existing buildings, transportation, aesthetics, noise levels, and air quality. Social and economic impacts span issues of demographics, economy, taxes, infrastructure, and community services. Based on information provided by PEF and its own independent evaluation, the review team finds that the socioeconomic effects of building two units at the Putnam site would be minor with few exceptions. There would be noticeable, intermittent and temporary adverse effects on transportation in Putnam County in the immediate vicinity of the site. Once plant operations begin, the review team believes transportation impacts would be minor and tax impacts on Putnam County would be substantial and positive. The aesthetic impacts of the transmission lines and corridors would be noticeable in the areas along the corridors.

Cumulative Impacts

In addition to assessing the incremental socioeconomic impacts from the building and operation of two nuclear units on the Putnam site, the cumulative impact assessment considers other past, present, and reasonably foreseeable future actions including other Federal and non-Federal projects that could contribute to the cumulative socioeconomic impacts on a 50-mi radius centered on the Putnam site (the region) with special consideration of Putnam, Clay, Flagler, Marion, and St. Johns Counties, because that is where the review team expects socioeconomic impacts to be the greatest (Economic Impact Area or EIA). Table 9-25 identifies the projects that have contributed and will continue to contribute to the demographics, economic climate, and community infrastructure of the region.

The Putnam site is a greenfield site in a semi-rural area. The region and the EIA are located within commuting distance of several large cities and the coast, and have been growing rapidly over the past several decades. Within the region, active residential/retirement /recreational and commercial developments, along with planned improvements to the areas transportation infrastructure are expected to result in continued urbanization that would have noticeable socioeconomic effects on the economy and residents of the EIA. The review team determined that cumulative socioeconomic effects of building new units at the Putnam site and the actions identified in Table 9-25 would not differ noticeably from the project effects analyzed above. Thus, the review team determined that the cumulative socioeconomic effects of the proposed project and other past, present, and reasonably foreseeable projects would be SMALL, with the following exceptions: Putnam County would experience MODERATE, but short-term and spatially limited impacts on roads and traffic during construction and SMALL impacts during operation. Cumulative impacts would be LARGE and beneficial from property tax receipts in Putnam County after the plant begins operations, and small and beneficial elsewhere in the region. Building new units at the Putnam site would be a significant contributor to the MODERATE impacts on roads and traffic. Building and operating the Putnam site would be a significant contributor to MODERATE impacts on aesthetics along the transmission lines and corridors.

9.3.5.6 Environmental Justice

The review team used the approach in Section 2.6 in identifying significant minority and low-income populations. Figure 9-6 shows the distribution of minority populations of interest by census block group within the region. There are block groups with a concentration of minority populations distributed throughout the region, but as seen in these figures, no minority or low-income populations of interest are within 6 mi of the Putnam site. Most of these populations are at some distance from the Putnam site. The largest geographic area with a concentration of minority populations is to the south-southeast of the Putnam site extending to the border of the region. Figure 9-7 shows the distribution of block groups with concentrations of low-income populations of interest in the region. There are seven geographic clusters of block groups with concentrations of low-income residents distributed widely within the area defined by the region. The closest identified block groups with low-income populations of interest are farther than 6 mi from the Putnam site.

The physical effects of building activities (noise, fugitive dust, air emissions, traffic) would not impose a disproportionately high and adverse affect on minority or low-income populations of interest because the effects would be small and spatially limited, with none extending to the geographic area of the minority or low-income populations of interest. The review team investigated the presence of unique characteristics or practices in minority or low-income communities that could result in different socioeconomic impacts from the Putnam site compared to the general population and found one unique characteristics that could lead to disproportionate impacts: reliance on subsistence. Personnel from the Putnam County Health Department, Florida Department of Environmental Protection, and Florida Fish and Wildlife

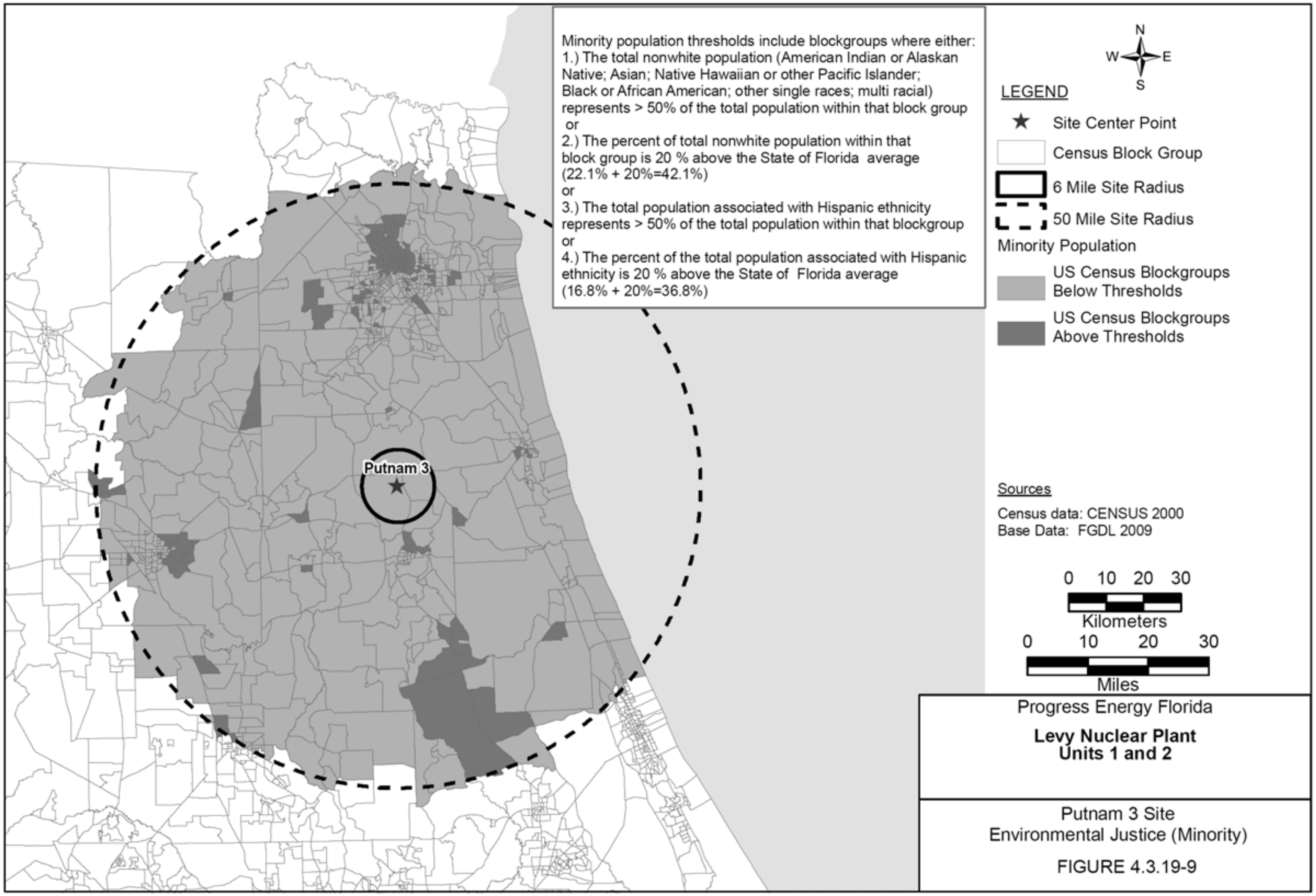

Figure 9-6. Putnam Site Minority Populations (PEF 2009d; CH2M Hill 2009)

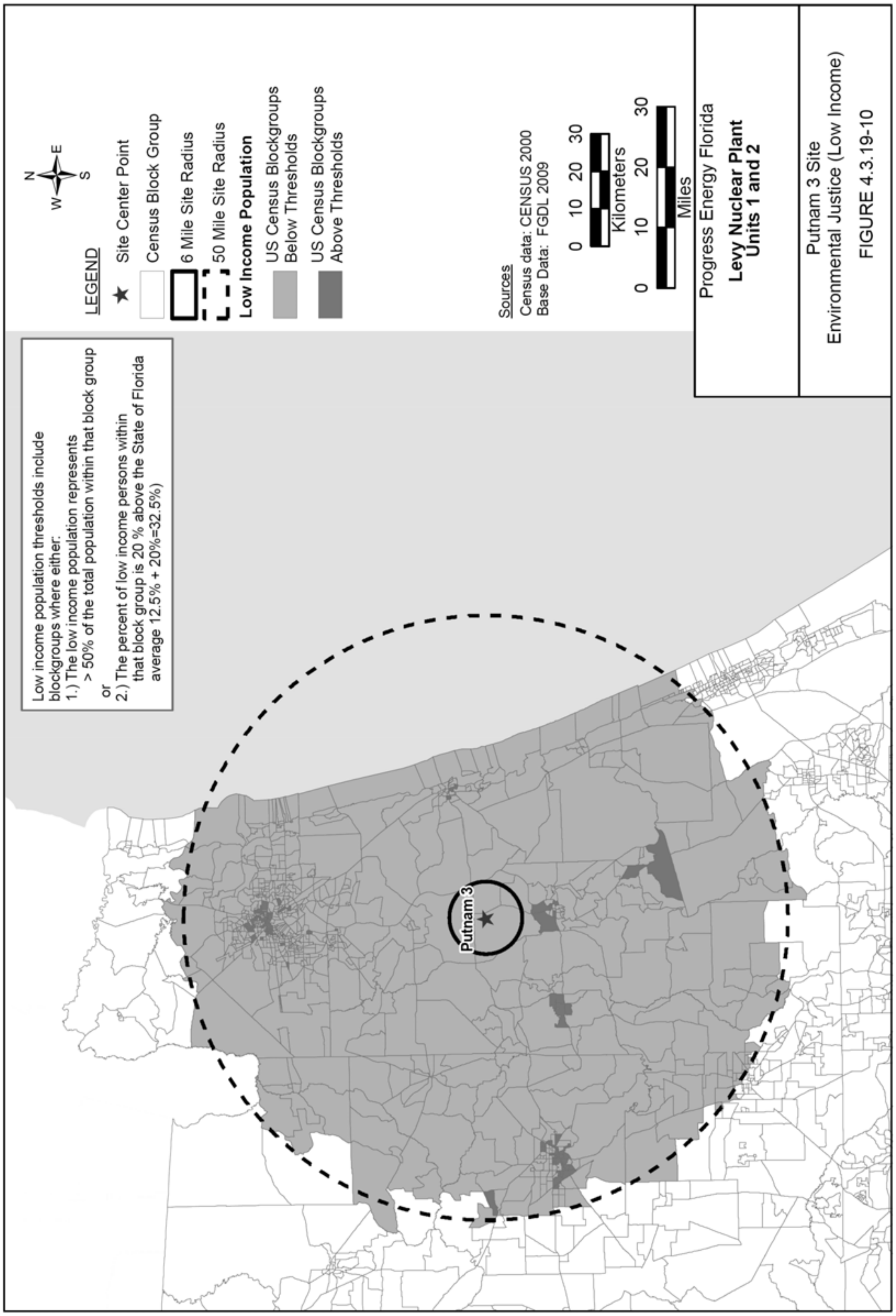

Figure 9-7. Putnam Site Low-Income Populations (PEF 2009d; CH2M Hill 2009)

Commission were unable to provide data on subsistence behavior in the region (Putnam County 2009b). The review team assumes that some subsistence fishing may take place along the St. John's River, in addition to the recreational fishing mentioned in Section 9.3.5.5, and in the lakes in the west and southwest of the county. The review team assumes that subsistence fishing activities may be affected by construction runoff or spills, perhaps requiring fishermen to use different locations. In the absence of specific information about effects on local lakes and streams that are used for subsistence fishing, the review team concludes provisionally that there may be disproportionately high and adverse effects on low-income populations that engage in subsistence fishing.

Minority and low-income populations would experience the minor adverse effects on housing availability, public services; and education, and the noticeable, intermittent, and geographically concentrated adverse effects on transportation discussed in Section 9.3.5.5 during the peak workforce years. The review team has no evidence that impacts would be disproportionately high and adverse toward minority populations, nor toward low-income populations.

Cumulative Impacts

The building and operation of the proposed nuclear power plant at the Putnam site would be unlikely to have a disproportionately and adverse impact on minority or low-income populations due to physical impacts, economic impacts, or impacts on community infrastructure. With the exception of a potentially disproportionate MODERATE adverse impact on subsistence fishing, the review team expects that the impacts associated with the building and operation of two new units at Putnam on minority and low-income populations would be SMALL as discussed above. The review team concluded that, in addition to other past, present, and reasonably foreseeable future projects, building and operating two new nuclear units at Putnam would impose only a minor impact on minorities or low-income populations. Therefore, the environmental justice impacts would be SMALL, expect for subsistence fishing which may be MODERATE. Building and operating two units at the Putnam site would be a significant contributor to the MODERATE impact to subsistence fishing.

9.3.5.7 Historic and Cultural Resources

The following cumulative impact analysis includes building and operating two new nuclear generating units at the Putnam site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect historic and cultural resources, including the other Federal and non-Federal projects listed in Table 9-25. For the analysis of cultural impacts at the Putnam site, the geographic area of interest is considered to be the APE for this site. This includes the direct effects APE, defined as the area physically affected by the site-development and operation activities at the site and within the transmission–line corridors. The indirect effects APE is defined as the area visually affected and includes an additional 0.5-mi–radius APE around the transmission-line corridors and a 1-mi-radius APE around the cooling towers.

Reconnaissance activities in a cultural resource review have particular meaning. Typically, the activities include preliminary field investigations to confirm the presence or absence of cultural resources. However, in developing this EIS, the review team relied upon reconnaissance-level information to perform its alternative site evaluation in accordance with ESRP 9.3 (NRC 2000). Reconnaissance-level information is data that are readily available from agencies and other public sources. It can also include information obtained through visits to the site area. To identify the historic and cultural resources at the Putnam site, the following information was used:

- PEF ER (2009a)
- National Register of Historic Places database (NPS 2010)
- Florida Historical Markers Program (FDOS 2010)
- NRC Alternative Sites Visit October 14–17, 2008 (NRC 2009).

Historically, the Putnam site and vicinity were largely undisturbed and likely contained intact archaeological sites associated with the past 10,000 years of human settlement. Over time, the area has been disturbed by mostly agricultural development (PEF 2009a). In its ER, PEF states that an initial database search for potentially significant cultural resources in Putnam County identified NRHP-listed sites, and that further investigation would be required before siting new reactors at this location. PEF also states that consultation with the SHPO would occur if any significant historic, cultural, or archaeological resources are identified and that appropriate mitigation measures would be put in place before construction and operation.

A search of the National Register revealed 15 sites listed in Putnam County, including several historic districts – Palatka Ravine Gardens Historic District, Crescent City Historic District and Palatka South Historic District (NPS 2010). A search of the Florida Historical Markers Program revealed nine sites in Putnam County, including the CFBC and the Mount Royal Site, a Native American mound and earthworks site (FDOS 2010).

Building Impacts

To accommodate building two new nuclear generating units on the Putnam site, PEF would need to clear approximately 300 ac for the main power plant site (the same acreage needed for the LNP site) and 1282 ac for the reservoir (PEF 2009a). If the Putnam site were chosen for the proposed project, identification of cultural resources would be accomplished through cultural resource surveys and consultation with the SHPO, Tribes, and interested parties. The results would be used in the site-planning process to avoid cultural resources impacts. If significant cultural resources were identified by these surveys, the review team assumes that PEF would develop protective measures in a manner similar to that for the LNP site, and therefore the impacts would be minimal. If direct effects on significant cultural resources could not be avoided, land clearing, excavation, and grading activities could destabilize important attributes of historic and cultural resources.

There are no existing transmission-line corridors connecting to the Putnam site. Section 9.3.5.1 describes the proposed transmission-line corridors associated with this site. Visual impacts from transmission lines may result in significant alterations to the visual landscape within the geographic area of interest. If the Putnam site were chosen for the proposed project, the review team assumes that PEF would conduct its transmission line-related cultural resource surveys and procedures in a manner similar to that for the LNP site, as described in Section 4.6. In addition, the review team assumes the State of Florida's Conditions of Certification regarding transmission-line siting and building activities would also apply, and therefore the impacts would be minimal. If direct effects on significant cultural resources could not be avoided, land clearing, excavation, and grading activities could destabilize important attributes of historic and cultural resources.

Operations Impacts

Impacts on historic and cultural resources from operation of two new nuclear generating units at the Putnam site would include those associated with the operation of new units and maintenance of transmission lines. The review team assumes that the same procedures currently used by PEF, including the State of Florida's Conditions of Certification, would be used for onsite and offsite maintenance activities. Consequently, the incremental effects of the maintenance of transmission-line corridors and operation of the two new units and associated impacts on the cultural resources would be negligible for the physical and visual APEs.

Cumulative Impacts

Past actions in the geographic area of interest that have similarly affected historic and cultural resources include rural development and agricultural development and activities associated with these land-disturbing activities such as road development. Table 9-25 lists past, present, and reasonably foreseeable projects and other actions that may contribute to cumulative impacts on historic and cultural resources in the geographic area of interest. Projects from Table 9-25 that may fall within the geographic area of interest for cultural resources include future urbanization.

Long linear projects such as new or expanded roads may intersect the proposed transmission-line corridors. Because cultural resources can likely be avoided by long linear projects, impacts on cultural resources would be minimal. If building associated with such activities results in significant alterations (both physical alteration and visual intrusion) of cultural resources in the transmission-line corridors, then cumulative impacts on cultural resources would be greater.

Cultural resources are nonrenewable; therefore, the impact of destruction of cultural resources is cumulative. Based on the information provided by PEF and the review team's independent evaluation, the review team concludes that the cumulative impacts from building and operating two new nuclear generating units on the Putnam site and other projects would be SMALL. This impact-level determination reflects no known cultural resources that could be affected; however, if the Putnam site were to be developed then cultural resource surveys and evaluations would need to be conducted and PEF would assess and resolve adverse effects of the undertaking. Adverse effects could result in greater cumulative impacts.

9.3.5.8 Air Quality

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affected or could affect air quality, including the shutdown of two coal-fired units at CREC, and other Federal and non-Federal projects listed in Table 9-25. The geographic area of interest for the Putnam site is Putnam County, which is in the Jacksonville (Florida)-Brunswick (Georgia) Interstate Air Quality Control Region (40 CFR 81.91).

The emissions related to building and operating a nuclear plant at the Putnam site would be similar to those at the LNP site. The air quality status for Putnam County as set forth in 40 CFR 81.310 reflects the effects of past and present emissions from all pollutant sources in the region. Putnam County is classified as being in attainment for all NAAQSs.

The atmospheric emissions related to building and operating a nuclear plant at the LNP site in Levy County, Florida are described in Chapters 4 and 5. The criteria pollutants were found to have a SMALL impact. In Chapter 7, the cumulative impacts of criteria pollutants at the LNP site were evaluated and also determined to have a SMALL impact.

Cumulative impacts

Reflecting on the projects listed in Table 9-25, the most significant in regard to air quality are the Seminole Generating Station, which consists of two coal-fired boilers, and the Putnam Steam Plant, which consists of four combustion turbines fueled with either natural gas or fuel oil. Other industrial projects listed in Table 9-25 would have *de minimis* impacts. The impact of closing two coal-fired units at CREC on criteria pollutants at the Putnam site are not considered because the CREC is located outside of the geographic area of interest for this site. Given that these projects would be subject to institutional controls, it is unlikely that the air quality in the region would degrade to the extent that the region would be declared to be in non-attainment for any of the NAAQSs.

The air quality impact of Putnam site development would be local and temporary. The distance from building activities to the site boundary would be sufficient to generally avoid significant air quality impacts. There are no land uses or projects, including the aforementioned sources at the Seminole Generating Station and Putnam Steam Plant, that would have emissions during site development that would, in combination with emissions from the Putnam site, result in a degradation of air quality in the region.

Releases from the operation of two new units at the Putnam site would be intermittent and made at low altitudes with little or no vertical velocity. The air quality impacts of current emissions near the Putnam site are included in the baseline air quality status. The cumulative impacts from emissions of effluents from the Putnam site and other sources would be noticeable, primarily due to emissions from the Seminole Generating Station and the Putnam Steam Power Plant.

The cumulative impacts of greenhouse gas emissions related to nuclear power are discussed in Section 7.6. The impacts of the emissions are not sensitive to the location of the source. Consequently, the discussion in Section 7.6 is applicable to a nuclear power plant located at the Putnam site. The review team concludes that the national and worldwide cumulative impacts of greenhouse gas emissions are noticeable. The review team further concludes that the cumulative impacts would be noticeable, with or without the greenhouse gas emissions of the project at the Putnam site.

Cumulative impacts on air quality resources are estimated based on the information provided by PEF and the review team’s independent evaluation. Other past, present, and reasonably foreseeable future activities exist in the geographic areas of interest (local for criteria pollutants and global for greenhouse gas emissions) that could affect air quality resources. The cumulative impacts on criteria pollutants from emissions from the Putnam site and other projects could be noticeable, principally as a result of the contribution of the coal-fired units at the Seminole Generating Station and the Putnam Steam Power Plant. The national and worldwide cumulative impacts of greenhouse gas emissions are noticeable, and the review team concludes that cumulative impacts from construction, preconstruction, and operation and other past, present, and reasonably foreseeable future actions on air quality resources in geographic areas of interest would be SMALL to MODERATE for criteria pollutants (due primarily to the operation of the Seminole Generating Station) and MODERATE for greenhouse gas emissions. The incremental contribution of impacts on air quality resources from building and operating two new units at the Putnam site would be insignificant for both criteria pollutants and greenhouse gas emissions.

9.3.5.9 Nonradiological Health

The following analysis assesses impacts from building activities and operations for the Putnam site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect nonradiological health, including the other Federal and non-Federal projects listed in Table 9-25. Impacts from building activities that have the potential to affect the health of members of the public and workers include exposure to dust and vehicle exhaust, occupational injuries, noise, and the transport of construction materials and personnel to and from the site. The operation-related activities that have the potential to affect the health of members of the public and workers includes exposure to etiological agents, noise, EMFs, and increased traffic associated with the transport of workers to and from the site.

Most of the nonradiological health impacts associated with building and operation (e.g., air emissions, noise, occupational injuries) would be limited to areas within approximately 2 mi from the site. Occupational injuries would occur only within the boundaries of the site, and noise from construction and operation has likewise been assessed as minimal for offsite receptors beyond a 2-mi radius. For nonradiological health impacts associated with transmission lines, the geographic area of interest would be the transmission-line corridor. If the facility were built and operated at the Putnam site, the St. Johns River would serve as the source of cooling water. In addition, a reservoir would need to be built to assure an adequate cooling-water supply.

Building Impacts

Nonradiological health impacts on construction workers and members of the public from building two new nuclear units at the Putnam site would be similar to those evaluated in Section 4.8 for building at the LNP site. The impacts include noise, vehicle exhaust, dust, occupational injuries, and transportation accidents, injuries, and fatalities. A detailed noise study has not been performed for the Putnam site, but it is likely that noise impacts from building, except for rare, high-noise activities such as pile-driving, would comply with Federal, State and local noise ordinances, and that the overall noise impact associated with building would be minimal. Fugitive dust and vehicle emissions during building would be controlled by good management practices and compliance with Federal, State, and local air quality regulations. The incidence of construction worker accidents would be the same as that for the LNP site, the only difference being potential injuries associated with building of the cooling-water reservoir.

Analyses in Section 9.3.5.5 indicated that noticeable but intermittent traffic impacts would be observed during peak building activities at the Putnam site at the intersection of US-17 and the site access road. These impacts would be of the same magnitude as those predicted for building at the LNP site. Given the existing traffic patterns in the area near the Putnam site, there is little potential for cumulative traffic impacts with other projects, and additional injuries and fatalities from traffic accidents involving transportation of materials and personnel for building of a new nuclear power plant at the Putnam site would be similar to those estimated in Section 4.8.3 for building at the LNP site.

Because all of the past, present, or potential future construction projects identified in Table 9-25 are relatively distant (greater than 10 mi) from the Putnam site, combined nonradiological impacts from building at the Putnam site and other projects would not occur. Cumulative impacts of building at the Putnam alternative site would therefore be minimal.

Operational Impacts

Noise, air emissions, and occupational injuries from the operation of two new nuclear units at the Putnam site would be similar to those evaluated in Section 5.8 for the LNP site. Occupational health impacts on workers (e.g., falls, electric shock or exposure to other hazards) at the Putnam site would likely be the same as those evaluated for workers at two new units operating at the LNP site. The cooling-system discharge from the facility might encourage the growth of etiologic organisms in the St. Johns River. Etiological agent growth could be reduced by the use of biocides in the cooling systems, thermal discharge would be restricted by NPDES permit limitations, and exposure to impaired water would be limited by controls on access to the discharge zone (fencing, signage, and other security measures). However, because the cooling-system discharge may amount to a significant proportion of the recommended minimum flow in the St. Johns River, and water quality in the river has been identified as impaired due to the presence of nutrients, fecal coliform, depressed dissolved oxygen, turbidity, and other pollutants (FDEP 2009g), the review team has concluded that the discharge of blowdown to the river could have a noticeable effect on the growth of etiological agents. Exposure to etiological agents in the cooling-water reservoir would not pose an additional health risk as long as access to the reservoir is limited by virtue of its being within the controlled and fenced site boundaries.

Noise and EMF exposure from operations would be monitored and controlled in accordance with applicable OSHA regulations. Although no detailed noise modeling has been performed for the Putnam site, it is likely that noise impacts would be similar to those predicted for operations at the LNP site. The effects of EMF on human health in the transmission-line corridors would be controlled and minimized by conformance with NESC criteria and adherence to the standards for transmission systems regulated by the FDEP. Nonradiological impacts of traffic associated with the operations workforce would therefore be less than the impacts during building.

A number of the projects and activities identified in Table 9-25 (surface mining, minor permitted municipal discharges) may also affect water quality in the St. Johns River near the Putnam site. However, these releases are unlikely to have significant cumulative impacts on water quality with a nuclear facility built at the Putnam site because all of the current and future projects are distant from the site. In addition, the amounts of chemicals released from the nuclear facility would be limited by NPDES permits to levels that would not adversely affect water quality, even in combination with the existing pollutant load in the St. Johns River. As noted above, however, blowdown discharge may result in increased water temperature that could facilitate the growth of etiological agents.

The review team is also aware of the potential climate changes that could affect human health; recent analyses of these issues (GCRP 2009) have been considered in the preparation of this EIS. Projected changes in the climate for the region include an increase in average temperature and a decrease in precipitation, which may alter the presence of microorganisms and parasites in surface water. While the overall impacts of climate change may not be insignificant (see Section 7.7), the effect of, or contribution to, climate change impacts by the operation of two new units at the Putnam site is likely to be minor. In its analysis of climate change impacts, the review team did not identify any additional data that would alter its conclusion regarding the presence of etiological agents or change in the incidence of waterborne diseases associated with operation of a nuclear facility at the Putnam site.

Summary

The assessment of impacts on nonradiological health from building and operation of the two new units at the Putnam alternative site is based on the information provided by PEF and the review team's independent evaluation. The review team concludes that nonradiological health impacts on workers and the public resulting from building two new units and associated transmission lines at the Putnam alternative site would be minimal. Similarly, the review team also expects occupational injuries and other nonradiological health impacts on workers and the public of two new nuclear units operating at the Putnam site would be minimal except for potential growth of etiological agents in the St. Johns River from the influence of the cooling-system blowdown discharges during droughts or low-flow periods. These effects could be reduced if the blowdown were discharged to the cooling reservoir, rather than directly to the river. Exposure to etiological agents could be increased if access to the cooling reservoir is not limited by physical and administrative controls. Based on these findings, the review team concludes that cumulative impacts on nonradiological health from related past, present, and future actions in the geographic area of interest and building and operations of two nuclear units at the Putnam site would be SMALL to MODERATE. The severity of impacts would depend on the design characteristics of the facility, which have not been fully defined. If exposure to water heated by thermal discharge is not limited by administrative of physical controls, the contribution from building and operations at the Putnam site could be a significant contributor to the cumulative nonradiological health impacts.

9.3.5.10 Radiological Impacts of Normal Operations

The following impact analysis includes radiological impacts from building activities and operation for two additional nuclear units at the Putnam site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health, including other Federal and non-Federal projects listed in Table 9-25. As described in Section 9.3.5, the Putnam site is a greenfield site. The geographic area of interest is the area within a 50-mi radius of the Putnam site. There are no major facilities that result in regulated exposures to the public or biota within 50 mi of the Putnam site. However, there are likely to be hospitals and industrial facilities with 50 mi of the Putnam site that use radioactive materials.

The radiological impacts of building and operating the proposed two AP1000 units at the Putnam site include direct radiation and liquid and gaseous radioactive effluents. Releases of radioactive materials and all pathways of exposure would produce low doses to people and biota offsite, well below regulatory limits. The impacts are expected to be similar to those estimated for the LNP site. The NRC staff concludes that the dose from direct radiation and effluents from hospitals and industrial facilities that use radioactive material would be an insignificant contribution to the cumulative impact around the Putnam site. This conclusion is based on the radiological monitoring programs conducted around currently operating nuclear power plants.

Based on the information provided by PEF and the NRC staff's independent analysis, the NRC staff concludes that the cumulative radiological impacts from building and operating the two proposed AP1000 units and other past, present, and reasonably foreseeable projects and actions in the geographic area of interest around the Putnam site would be SMALL.

9.3.5.11 Postulated Accidents

The following impact analysis includes radiological impacts from postulated accidents from operations for two nuclear units at the Putnam site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health from postulated accidents, including other Federal and non-Federal projects and the projects listed in Table 9-24. The geographic area of interest considers all existing and proposed nuclear power plants that have the potential to increase the probability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the Putnam site. As described in Section 9.3.5, the Putnam site is less 100 mi from the existing CREC power plant site; there is one nuclear facility at the CREC site. There are no proposed reactors that have the potential to increase the probability-weighted consequences from a severe accident at any location within 50 mi of the Putnam site.

As described in Section 5.11.1, the NRC staff concludes that the environmental consequences of DBAs at the LNP site would be minimal for AP1000s. DBAs are addressed specifically to demonstrate that a reactor design is robust enough to meet the NRC safety criteria. The AP1000 design is independent of site conditions and the meteorological conditions of the Putnam and LNP sites are similar; therefore, the NRC staff concludes that the environmental consequences of DBAs at the Putnam site would be minimal.

Assuming the meteorology, population distribution, and land use for the Putnam site are similar to those at the LNP site, risks from a severe accident for an AP1000 reactor located at the Putnam site are expected to be similar to those analyzed for the LNP site. These risks for the

LNP site are presented in Tables 5-17 and 5-18 and are well below the median value for current-generation reactors. In addition, estimates of average individual early fatality and latent cancer fatality risks are well below the Commission's safety goals (51 FR 30028). For the existing plant within the geographic area of interest, namely CREC Unit 3, the Commission has determined that the probability-weighted consequences of severe accidents are SMALL (10 CFR Part 51, Appendix B, Table B-1). The planned 20-percent power uprate at CREC Unit 3 will only be approved by the NRC if the probability-weighted consequences of severe accidents would continue to meet NRC's regulatory requirements. Therefore, the impact would continue to be SMALL. On this basis, the NRC staff concludes that the cumulative risks of severe accidents at any location within 50 mi of the Putnam site would be SMALL.

9.3.6 Comparison of the Impacts of the Proposed Action and Alternative Sites

This section summarizes the review team's characterization of the cumulative impacts related to locating a two-unit AP1000 nuclear power facility at the proposed LNP site and at each alternative site. The four sites selected for detailed review as part of the alternative sites environmental analysis are the Crystal River, Dixie, Highlands, and Putnam sites in Florida. Comparisons are made between the proposed and alternative sites to evaluate if one of the alternative sites would be environmentally preferable to the proposed site. The NRC's determination is independent of the USACE's determination of a LEDPA pursuant to the Clean Water Act Section 404(b)(1) Guidelines at 40 CFR Part 230. While the USACE concurs as part of the review team with the designation of impact levels for terrestrial or aquatic resource areas in this EIS; in so far as waters of the United States are concerned, the USACE must conduct a quantitative comparison of impacts on waters of the United States as part of the LEDPA analysis. The USACE will conclude its analysis of both offsite and onsite alternatives in its Record of Decision. The need to compare the proposed site with alternative sites arises from the requirement in Section 102(2)(c)(iii) of NEPA (42 USC 4332) that EISs include an analysis of alternatives to the proposed action. The NRC criteria to be used in assessing whether a proposed site is to be rejected in favor of an alternative site is based on whether the alternative site is "environmentally preferable" and if so whether it is "obviously superior" to the site proposed by the applicant (Public Service Company of New Hampshire 1977). An alternative site is "obviously superior" to the proposed site if it is "clearly and substantially" superior to the proposed site (Rochester Gas & Electric Corp. 1978). The standard of obviously superior "...is designed to guarantee that a proposed site will not be rejected in favor of an alternate unless, on the basis of appropriate study, the Commission can be confident that such action is called for" (New England Coalition on Nuclear Pollution 1978).

The "obviously superior" test is appropriate for two reasons. First, the analysis performed by the NRC in evaluating alternative sites is necessarily imprecise. Key factors considered in the alternative site analysis, such as population distribution and density, hydrology, air quality, aquatic and terrestrial ecological resources, aesthetics, land use, and socioeconomics are difficult to quantify in common metrics. Given this difficulty, any evaluation of a particular site must have a wide range of uncertainty. Second, the applicant's proposed site has been analyzed in detail, with the expectation that most adverse environmental impacts associated with the site have been identified. The alternative sites have not undergone a comparable level of detailed study. For these reasons, a proposed site may not be rejected in favor of an alternative site when the alternative site is marginally better than the proposed site, but only when it is obviously superior (Rochester Gas & Electric Corp. 1978). NEPA does not require that a nuclear plant be constructed on the single best site for environmental purposes. Rather, "...all that NEPA requires is that alternative sites be considered and that the effects on the environment of building the plant at the alternative sites be carefully studied and factored into the ultimate decision (New England Coalition on Nuclear Pollution 1978)."

Section 9.3.6.1 reviews the cumulative environmental impacts of building and operating a two-unit nuclear power plant at the proposed LNP site. Cumulative impact levels from Chapter 7 (for the proposed LNP site), and the four alternative sites (from Sections 9.3.2 through 9.3.5) are listed in Table 9-31. Section 9.3.6.2 and Section 9.3.6.3 discuss the cumulative impacts of the proposed project located at the LNP site and at the alternative sites as they relate to a determination of environmental preference or obvious superiority.

Table 9-31. Comparison of Cumulative Impacts at the Proposed and Alternative Sites

Resource Area	Levy	Crystal River	Dixie	Highlands	Putnam
Land Use	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE
Water Related					
Surface-Water Use	SMALL	SMALL	MODERATE	MODERATE	MODERATE
Surface-Water Quality	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE
Groundwater Use	SMALL	SMALL	SMALL	SMALL	SMALL
Groundwater Quality	SMALL	SMALL	SMALL	SMALL	SMALL
Ecology					
Terrestrial Ecosystems	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE
Aquatic Ecosystems	SMALL	SMALL	MODERATE	SMALL	SMALL
Socioeconomic[(a)]					
Physical	SMALL	SMALL	SMALL	SMALL	SMALL
Demography	SMALL	SMALL	SMALL	SMALL	SMALL
Taxes and Economy	SMALL to LARGE (beneficial)	SMALL to LARGE (beneficial)	SMALL to LARGE (beneficial)	SMALL to LARGE (beneficial)	SMALL to LARGE (beneficial)
Housing	SMALL	SMALL	SMALL	SMALL	SMALL
Transportation	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE

Table 9-31. (contd)

Resource Area	Levy	Crystal River	Dixie	Highlands	Putnam
Public Services and Education	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL	SMALL
Aesthetics	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE
Recreation	SMALL	SMALL	SMALL	SMALL	SMALL
Environmental Justice	SMALL	SMALL	SMALL	MODERATE	SMALL to MODERATE
Historic and Cultural Resources	SMALL	SMALL	SMALL	SMALL	SMALL
Air Quality	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Nonradiological Health	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Radiological Health	SMALL	SMALL	SMALL	SMALL	SMALL
Postulated Accidents	SMALL	SMALL	SMALL	SMALL	SMALL

(a) Ranges indicate differences in counties

9.3.6.1 Comparison of Cumulative Impacts at the Proposed and Alternative Sites

The following section summarizes the review team's independent assessment of the proposed and alternative sites. The team characterized the expected cumulative environmental impacts of building and operating new units at the LNP site and alternative sites; these impacts are summarized by resource area in Table 9-31.

The environmental resource areas listed in the following table have been evaluated using the NRC's three-level standard of impact significance: SMALL, MODERATE, or LARGE. These levels were developed using the CEQ guidelines and set forth in the footnotes to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B:

> SMALL – Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
>
> MODERATE – Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
>
> LARGE – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

Full explanations of the specific cumulative impact characterizations are provided in Chapter 7 for the proposed site and in Sections 9.3.2, 9.3.3, 9.3.4, and 9.3.5 for the alternative sites. The staff's impact category levels are based on professional judgment, experience, and consideration of controls likely to be imposed under required Federal, State, or local permits that would not be acquired until an application for a COL is underway. The considerations and assumptions were similarly applied at each of the alternative sites to provide a common basis for comparison. In the following discussion, the review team compares the impact levels between the proposed site, and each alternative site.

9.3.6.2 Environmentally Preferable Sites

As shown in Table 9-31, the cumulative impacts of building and operating two new units at the proposed site and the alternative sites are characterized as SMALL for many resource areas. The resource areas for which the impact level at an alternative site is the same as that for the proposed site does not contribute to the alternative site being judged to be environmentally preferable to the proposed site. Therefore, these resource areas are not discussed further in determining whether an alternate site is environmentally preferable to the proposed site. The resource areas for which an alternative site has a different impact level than the proposed site are discussed further to determine if an alternative site is environmentally preferable to the proposed site. Where there is a range of impacts for a resource, the upper value of the impacts is used for the comparison. In addition, for the cases in which the cumulative impacts for a resource are greater than SMALL, consideration is given to those cases in which the impacts of the project at the specific site do not make any significant contribution to the cumulative impact level. As shown in Table 9-31, there are some differences in impacts among the sites.

Crystal River Site

The LNP site may be marginally preferable to the Crystal River site with regard to tax revenues. Revenues from property taxes and sales taxes from operating the two new nuclear units at the site result in a LARGE beneficial impact level. This LARGE and beneficial tax benefit would fully offset the loss of tax revenues to Citrus County that would occur if the coal-fired CREC units 1 and 2 are decommissioned; but the net beneficial impact to tax revenues from the two new units at the Crystal River site would still be LARGE. The Crystal River site is characterized more favorably than the LNP site for transportation.

For land use, terrestrial ecosystems, public services and education, and aesthetics at both sites, the project would be a significant contributor to the incremental MODERATE impact level. Ongoing and planned development projects at these sites also contribute to the impact level. For transportation, the MODERATE cumulative impact at the LNP site relates to the combined impact of the large construction and preconstruction work forces and traffic from mining activities.

Based on the results and comparison of the resource areas and associated impact characterizations, the review team concludes that the Crystal River site would not be environmentally preferable to the LNP site for two new nuclear generating units.

Dixie Site

The LNP site is characterized more favorably than the Dixie site in Table 9-31 for the resource areas of surface-water use, aquatic ecosystems, and non-radiological health effects. Conversely, the Dixie site is not characterized by the review team as more favorable than the LNP site in Table 9-31 for any resource area. For all of the resource areas for which the LNP site is characterized more favorably, the differences relate directly to the impacts of the proposed project at the two sites. For land use, terrestrial ecosystems, and aesthetics, building and operating two new nuclear units would be a significant contributor to the MODERATE impact levels at both sites.

For surface-water use, building and operating the proposed plant at the Dixie site would be a significant contributor to the MODERATE water use assessment because of the amount of water needed and consumed to operate two units. The impact on surface water use at the LNP site was determined by the review team to be SMALL. The water use at the Dixie site would require a significant portion of river flow, particularly during low flow conditions. For aquatic ecosystems, the concern at the Dixie site is the potential for the water use impact to adversely affect the Gulf sturgeon, a Federally protected species. The review team found that the impact to aquatic resources would be SMALL at the LNP site and MODERATE at the Dixie site. For non-radiological health, the operation of a proposed facility at the Dixie site could result in a SMALL to MODERATE impact due to an increased risk of human exposure to etiological agents. The LNP site was determined to have a potential for only a SMALL impact with respect to non-radiological health effects.

For land use at Dixie, building two new reactor units at the site is a significant contributor to the MODERATE impact assessment because of the disturbance of a substantial amount of land for the power plant, reservoir, and transmission lines. The review team concluded that cumulative land-use impacts also are MODERATE at the LNP site, but would not contribute significantly to the impact level because the higher impact level is based on the effects of projects other than the nuclear units. For terrestrial ecosystems at both sites, the MODERATE impacts are based on alternation of natural environments.

Based on the results and comparison of the resource areas and associated impact characterizations, the review team concludes that the Dixie site would not be environmentally preferable to the LNP site for two new nuclear generating units.

Highlands Site

The LNP site is characterized more favorably than the Highlands site in Table 9-31 for the following resource areas: surface-water use, environmental justice, and nonradiological health effects. Conversely, the Highlands site is characterized by the review team as more favorable than the LNP site in Table 9-31 for the resource areas of public services and education.

For surface-water use, building and operating the proposed plant at the Highlands site would be a significant contributor to water use because the amount of water needed to operate two units would represent a significant portion of the river flow. The higher impact level for environmental justice at the Highlands site relates to potential effects on subsistence fishing, especially on local Native American populations. For non-radiological health, the operation of a proposed plant at the Highlands site could result in a SMALL to MODERATE impact due to an increased risk of human exposure to etiological agents. The LNP site was determined to have a potential for only a SMALL impact with respect to non-radiological health effects For public services and education at the LNP site, the MODERATE impact level is a result of short-term adverse effects on police, emergency service, fire-protection services, and schools in specific local communities during peak construction and preconstruction. The review team's finding of a MODERATE impact for the two resource areas at the LNP site is based on the fact that specific community public services were either at capacity or otherwise limited. The higher impact level for public services and education at LNP is directly related to peak construction and preconstruction of two new nuclear units at the site.

For land use at Highlands, building two new reactor units at the site is a significant contributor to the MODERATE impact assessment because of the disturbance of a substantial amount of land for the power plant, reservoir, and transmission lines. The review team concluded that cumulative land-use impacts also are MODERATE at the LNP site, but would not contribute significantly to the impact level because the higher impact level is based on the effects of projects other than the nuclear units. For terrestrial ecosystems at both sites, the MODERATE impacts are based on the alteration of natural habitats.

Based on the results and comparison of the resource areas and associated impact characterizations, the review team concludes that the Highlands site would not be environmentally preferable to the LNP site for two new nuclear generating units.

Putnam Site

The LNP site is characterized more favorably than the Putnam site in Table 9-31 for the following resource areas: environmental justice and non-radiological health. Conversely, the Putnam site is characterized more favorably than the LNP site in Table 9-31 for public services and education.

For environmental justice at Putnam, the MODERATE level is based on a potentially disproportionate impact on subsistence fishing. For non-radiological health, the operation of a proposed plant at the Putnam site could result in a SMALL to MODERATE increased risk of human exposure to etiological agents. The LNP site was determined to have a potential for only a SMALL effect with respect to non-radiological health. At the LNP site, the review team's finding of a MODERATE impact assessment for public services and education is based on the fact that, during construction, existing community public services would be stressed because they are at capacity or otherwise limited. Operating two new units at the LNP site would not contribute significantly to long-term public service and education impacts.

For land use, terrestrial ecosystems, and aesthetics, although the two sites have essentially the same cumulative impact levels, building and operating two new nuclear units would be a significant contributor to the impact level at the Putnam site. This is because of the substantial amount of land needed for the proposed power plant, supplemental cooling reservoir, and transmission infrastructure and the long-term impacts along transmission lines and corridors.

Based on the results and comparison of the resource areas and associated impact characterizations, the review team concludes that the Putnam site would not be environmentally preferable to the LNP site for two new nuclear generating units.

Summary

Although there are differences and distinctions between the cumulative environmental impacts of building and operating two new nuclear generating units at the proposed LNP site and the alternative sites, the review team concludes that none of these differences is sufficient to determine that any of the alternative sites would be environmentally preferable to the proposed site for building of two new nuclear generating units.

9.3.6.3 Obviously Superior Sites

None of the alternative sites was determined to be environmentally preferable to the proposed LNP site. Therefore, the NRC staff concludes that none of the alternative sites would be obviously superior to the LNP site. As discussed in Section 9.0, the USACE will conclude its analysis of both offsite and onsite alternatives in its Record of Decision.

9.4 System Design Alternatives

The review team considered a variety of alternatives for heat-dissipation systems and circulating-water systems. While other heat-dissipation systems and water systems exist, by far the largest and the most likely to dominate the environmental consequences of operation is the cooling-water system that cools and condenses the steam for the turbine generator. Other water systems, such as service-water systems, are much smaller and reject much less heat than the circulating-water system. As a result, the review team only considers alternative heat-dissipation and water-treatment systems for the circulating-water system. The review team also considers alternative water sources for both the circulating-water system and the service-water system because withdrawal of water for both of these systems has a potential to affect the environment. The proposed circulating-water system is a closed-loop system that relies on evaporative cooling from mechanical draft cooling towers and draws makeup water from the

CFBC. The proposed service-water system relies on groundwater wells to provide makeup water. Both of these proposed systems are discussed in detail in Chapter 3.

9.4.1 Heat-Dissipation Systems

About two-thirds of the heat from a commercial nuclear reactor is rejected as heat to the environment. The remaining one-third of the reactor's generated heat is converted into electricity. Normal heat-sink cooling systems transfer this rejected heat load into the atmosphere and/or nearby waterbodies, primarily as latent heat exchange (evaporating water) or sensible heat exchange (warmer air or water). Different heat-dissipation systems rely on different exchange processes. The following sections describe alternative heat-dissipation systems considered by the review team for proposed LNP Units 1 and 2

The impacts associated with the proposed heat-dissipation system, mechanical draft wet-tower cooling system, are discussed in Sections 4.2, 4.3, 5.2, and 5.3. The review team determined in Chapter 4 that the impacts of building the proposed heat-dissipation system would be SMALL for both hydrologic and ecological resources. The review team determined in Chapter 5 that the impacts of operating the proposed heat-dissipation system would be SMALL for both hydrologic and ecological resources.

PEF considered a range of heat-dissipation systems in its ER, including once-through cooling and several closed-cycle cooling systems. In addition to the closed-cycle alternative using mechanical draft cooling that they have selected, PEF also considered cooling ponds and spray ponds, dry cooling towers, hybrid wet/dry cooling towers, and wet natural draft cooling towers (PEF 2009a).

9.4.1.1 Plant Cooling System – Once-Through Operation

Once-through cooling systems withdraw water from the source waterbody and return the virtually the same volume of water to the receiving waterbody at an elevated temperature. Typically, the source waterbody and the receiving waterbody are the same body and the intake and discharge structures are separated to limit recirculation. While there is no consumptive use of water in a once-through heat-dissipation system, the elevated temperature of the receiving waterbody will result in induced evaporative loss that decreases the net water supply. The large intake and discharge flows associated with once-through cooling systems require large intake and discharge structures; the high flow rates may result in hydrologic alterations in the source/receiving waterbodies. In addition, the high flow rates result in higher levels of impingement and entrainment of aquatic organisms. Based on EPA 316(b) Phase I regulations (66 FR 65256), the review team has determined that once-through cooling systems for new nuclear reactors are unlikely to be permitted in the future, except in rare and unique situations.

The proposed LNP site is approximately 7 mi from the Gulf of Mexico, and construction of intake and outfall structures that would support once-through cooling at this location are not considered practical (PEF 2009a). The review team determined that once-through cooling would not be environmentally preferable because of the magnitude of the impacts of building large intake and outfall structures, the significant volume of makeup water needed, the characteristics of the Gulf of Mexico near the LNP site, and the potential for significant impacts on sensitive aquatic biota.

9.4.1.2 Cooling Pond and Spray Ponds

Cooling-pond cooling systems circulate water in manmade ponds. Heat transfer from the cooling-pond surface to the atmosphere occurs primarily through evaporation, black-body radiation, and conduction. Spray ponds enhance evaporative cooling by spraying water into the air over the pond. While spray ponds require substantiality less area than cooling ponds, both require a significant parcel of contiguous level property. Based on the additional land required for cooling-pond or spray-pond construction, the review team concludes that neither cooling ponds nor spray ponds would be environmentally preferable alternatives for the proposed LNP site.

9.4.1.3 Dry-Cooling Towers

Dry-cooling towers would eliminate all water-related impacts from the cooling system operation. No makeup water would be needed and no blowdown water would be generated. However, dry-cooling systems require much larger cooling systems, result in some loss in electrical generation efficiency because the theoretical approach temperature is limited to the dry-bulb temperature and not the lower wet-bulb temperature, and involve parasitic energy losses for the large array of fans used. This loss in generation efficiency translates into increased fuel-cycle impacts. Because the impacts associated with aquatic ecology, water use, and water quality for the construction and operation of the proposed cooling system have been determined to be SMALL in Chapters 4 and 5, the review team determined that, although dry cooling eliminates water-related impacts, it is not environmentally preferable to the proposed alternative.

9.4.1.4 Combination Wet/Dry-Cooling Tower System

A combination mechanical draft wet/dry-cooling tower system uses both wet- and dry-cooling cells to limit consumption of cooling water, often with the added benefit of reducing plume visibility. Water used to cool the turbine generators generally passes first through the dry portion of the cooling tower where heat is removed by drawing air at ambient temperature over tubes through which the water is moving. Cooling water leaving the dry portion of the tower then passes through the wet tower where the water is sprayed into a moving air stream and additional heat is removed through evaporation and sensible heat transfer. When ambient air temperatures are low, the dry portion of these cooling towers may be sufficient to meet cooling needs. The use of the dry portion of the system would result in a loss in generating efficiency, which would translate into increased fuel-cycle impacts. Although a combination mechanical draft wet/dry-cooling tower system could reduce water-related impacts, the review team determined that the impacts associated with aquatic ecology, water use, and water quality for the building and operating the proposed cooling system were SMALL. The review team concluded that building and operating a combination wet/dry-cooling tower system would not be an environmentally preferable alternative for the LNP site.

9.4.1.5 Wet Natural Draft Cooling Towers

Wet natural draft cooling towers, which use about the same amount of water as the proposed design, induce airflow up through large (500 ft tall and 400 ft in diameter) towers by cascading hot water downward in the lower portion of the cooling tower. As heat transfers from the water to the air in the tower, the air becomes more buoyant and moves upward. This buoyant movement induces more air to enter the tower through its open base. The size of the cooling towers results both in a large visual and land-use footprint. The review team determined that natural draft cooling towers are not environmentally preferable to the proposed design because they result in equivalent impacts on the aquatic environment and their height would pose some risk of avian collisions.

9.4.2 Circulating-Water Systems

The review team evaluated alternatives to the proposed intake and discharge for the proposed cooling system, based on the water requirements of the proposed heat-dissipation system. The capacity requirements of the intake and discharge system are defined by the proposed heat-dissipation system. For proposed LNP Units 1 and 2, the proposed heat-dissipation system is a closed-cycle system with mechanical draft cooling towers. The review team considered alternatives for the water-supply sources for the normal heat-sink cooling system.

9.4.2.1 Water Supplies

The impacts associated with the proposed water supply, the CFBC, are discussed in Sections 4.2, 4.3, 5.2, and 5.3. Because PEF does not propose to use surface water for building the proposed units, the review team determined in Chapter 4 that the impacts of building the proposed units would be SMALL for both hydrologic and aquatic resources. The review team determined in Chapter 5 that the impacts of withdrawing water to operate the proposed units would be SMALL for both hydrologic and aquatic resources.

The review team considered alternative sources for the circulating-water system including water reuse, groundwater, and surface water. Alternative sources of surface water include freshwater and saltwater.

9.4.2.2 Water Reuse

Sources of water for reuse can either come from the plant itself or from other local water users. Sanitary wastewater-treatment plants are the most common source of water for reuse. Agricultural processing, industrial processing, and oilfield production can also provide significant supplies of water for reuse. Additional treatment (e.g., tertiary treatment, chlorination) may be required to provide water of appropriate quality for the specific plant need. Population is very low and there is little industry around the proposed LNP site, so no sources of water for reuse at the LNP site were identified (PEF 2009a). Therefore, the review team determined that water reuse would not be feasible and thus not an environmentally preferable alternative to PEF's proposed water supply.

9.4.2.3 Groundwater

During operation, PEF proposes to use groundwater for the raw-water system but not for the cooling-water system. The analysis of groundwater supply performed to support the siting and permitting of the wellfield for the raw-water system indicates that the groundwater resource could not meet the cooling-water demands of proposed LNP Units 1 and 2 without significant environmental impacts (PEF 2009a). Therefore, the review team determined that groundwater use for cooling-water system makeup water would not be an environmentally preferable alternative for water supply at the LNP site.

9.4.2.4 Surface Water

Surface-water supplies at the proposed LNP site are either saltwater from the CFBC or freshwater from the Withlacoochee River and Lake Rousseau. The Withlacoochee River is designated as an Outstanding Florida Water and therefore has regulatory protection (Fla. Admin. Code 62-302). In addition, the Withlacoochee River Basin Board has made the restoration of Lake Rousseau and the Lower Withlacoochee River a priority in its Fiscal Year 2006 Basin Priorities Statement. Both of these surface waters contribute to a major groundwater recharge area (PEF 2009e). Given that local and State regulators have focused their attention on protecting or restoring these resources and that the CFBC provides a virtually unlimited supply of water from the Gulf of Mexico and does not require the construction of an extensive pipeline, the review team concludes that other alternative water supplies would not be environmentally preferable to PEF's proposed water supply.

9.4.2.5 Intake Alternatives

Because water would be withdrawn from the CFBC, the alternatives for intake structures are limited. Water can be withdrawn from the CFBC either through radial collector wells or through an intake structure on the bank of the canal near the barge slip. The impacts associated with the proposed intake system are discussed in Sections 4.2, 4.3, 5.2, and 5.3.

A radial collector-well system was considered by the review team because in many cases it reduces the impact on aquatic resources and, when water is being withdrawn from turbid environments, it can reduce the water treatment needed before its introduction into the cooling system. A radial collector-well system consists of an excavated central concrete caisson with well screens projected laterally outward in a radial pattern (Riegert 2006). Radial collector wells slowly draw surface water through sediments and, thereby, filter out some sediment that might have required some treatment if the water had been directly withdrawn from the surface-waterbody. In general, collecting surface water in this way eliminates most of the direct operational impacts on aquatic ecosystems (e.g., entrainment and impingement) associated with water withdrawal. The staff determined that radial collector wells, which would induce flow through the sediments of the CFBC into lateral subterranean pipes extending from the shoreline out beneath the canal, would require multiple large structures near the shoreline. PEF did not consider such an alternative water source, but the review team independently determined that a radial collector-well system is not environmentally preferable to the proposed direct withdrawal from the CFBC due to the environmental impacts associated with excavating the caissons, drilling the laterals and building new shoreline structures associated with each well, and because the impacts associated with aquatic ecology for the proposed intake have been determined to be SMALL in Chapters 4 and 5. Therefore, the review team determines that there are no alternative intake designs that would be environmentally preferable to the proposed intake design.

9.4.2.6 Discharge Alternatives

The impacts associated with the proposed discharge system are discussed in Sections 4.2, 4.3, 5.2, and 5.3. Discharges for the normal cooling system can be constructed along the shoreline or offshore. Shoreline discharges release water into the shallow tidal zone with more limited mixing than would an offshore discharge. These shallow tidal areas can be important habitat and, due to the limited mixing, a shoreline discharge can influence the temperature and chemistry for a relatively large amount of this habitat. As discussed in Sections 5.2 and 5.3, the overall impacts of the offshore discharge option selected by PEF would be SMALL. In addition, creation of a new offshore discharge would require temporary disturbance of sensitive environments during construction of a pipeline in the Gulf of Mexico. Therefore, the review team determined that there were no alternative discharge designs that would be environmentally preferable to the proposed discharge design.

9.4.2.7 Water Treatment

Both inflow and effluent water may require treatment to ensure that they meet plant water needs and effluent water standards. PEF proposes to add chemicals to plant water to meet appropriate water-quality process needs. The chemistry of effluent water is regulated by the FDEP through the NPDES permitting process. The largest chemical inputs are required to maintain the appropriate chemistry in the cooling towers to preclude biofouling. The review team identified no environmentally preferable alternative to PEF's proposed chemical water treatment. The effluents from cooling-tower blowdown are specifically regulated in 40 CFR Part 423 by the EPA to protect the environment.

9.4.3 Service-Water System Alternatives

The review team evaluated alternatives to the proposed source of water for systems using freshwater within the LNP units. For proposed LNP Units 1 and 2, during plant operations, water would be withdrawn from groundwater wells to supply makeup water to the service-water system, and provide raw water to the potable-water supply, the demineralized-water system, for fire protection, and for media filter backwash (PEF 2009a). Four groundwater wells would be located south of the plant as shown in Figure 3-1. The review team considered surface-water alternatives for the water-supply source to meet these freshwater needs.

As mentioned above, surface-water supplies at the proposed LNP site are either saltwater from the CFBC or freshwater from the Withlacoochee River and Lake Rousseau. The Withlacoochee River is designated as an Outstanding Florida Water and therefore has regulatory protection (Fla. Admin. Code 32-602). In addition, the Withlacoochee River Basin Board has made the restoration of Lake Rousseau and the Lower Withlacoochee River a priority in its Fiscal Year 2006 Basin Priorities Statement. Given that local and State regulators have focused their attention on protecting or restoring these resources and that the CFBC provides a virtually unlimited supply of water from the Gulf of Mexico, the review team eliminated from further consideration the withdrawal of surface freshwater as a source of water for the service water system and considered instead the building of a desalination plant at the LNP site to meet the freshwater needs of the site by desalinating water from the CFBC.

A desalination (also called desalinization or desal) plant could be built on the LNP site. Water could be routed from the proposed circulating-water system intake structure and pipeline to the plant. PEF has estimated that plant operations would require an annual average total withdrawal of 1.58 Mgd (1097 gpm) of groundwater, and a potential maximum daily withdrawal of 5.8 Mgd (4028 gpm) (PEF 2009e) to meet freshwater needs. Desalination processes often require the withdrawal of twice as much saltwater to produce the needed freshwater (Ettouney and Wilf 2009), so between 2000 gpm and 8000 gpm would need to be withdrawn from the CFBC to meet the freshwater needs. PEF has indicated that the rate for water withdrawal from the CFBC to provide makeup water to the circulating-water system would be 84,780 gpm (Table 3-4). The potential added withdrawal to supply a desalination plant represents an increase withdrawal from the CFBC of approximately 3 percent for normal conditions and 9 percent for maximal conditions.

Discharge of brine from the desalination plant would likely be mixed with blowdown from the cooling tower basins for discharge through the Crystal River Discharge Canal (CRDC). The salt concentration of discharge stream would likely be about twice that of the CFBC salinity and be similar to salinity of the cooling-tower blowdown water. PEF has indicated that the blowdown rate for water from the cooling-tower basins to the CRDC would be 57,923 gpm (Table 3-4). The potential added discharge from a desalination plant (approximately 1000 gpm normal or 4000 gpm maximal) represents an increase of approximately 2 percent for normal conditions and 7 percent for maximal conditions.

Given that (1) the CFBC provides a virtually unlimited supply of water from the Gulf of Mexico, (2) the increase in withdrawal through the proposed intake structure would be a small increment, and (3) that the discharge from the would be similar in chemistry to the blowdown water from the cooling towers and a small incremental increase in discharge, the review team determined that the use of desalination to meet the plants need for freshwater is a viable alternative. While desalinisation is a viable alternative, because the impacts from the proposed intake structure are already SMALL, the review team determined that desalinisation is not environmentally preferable to the proposed intake structure.

9.4.4 Summary of System Design Alternatives

The review team considered alternative systems designs including alternative heat-dissipation systems and alternative intake, discharge, and water-supply systems. As discussed in the above sections, the review team identified no alternative that was environmentally preferable to the proposed plant systems design.

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10.0 Conclusions and Recommendations

The U.S. Nuclear Regulatory Commission (NRC) received an application from Progress Energy Florida, Inc. (PEF) for combined construction permits and operating licenses (COLs) for Levy Nuclear Plant (LNP) Units 1 and 2. The location of proposed LNP Units 1 and 2 is in Levy County, Florida, 7.9 mi east of the Gulf of Mexico and 30.1 mi west of Ocala, Florida. In its application, PEF specified the Westinghouse Electric Company, LLC AP1000 pressurized water reactor as the reactor design for LNP Units 1 and 2.

On June 2, 2008, PEF submitted a Site Certification Application to the Florida Department of the Environment (PEF 2008). The U.S. Army Corps of Engineers (USACE) received a copy of this application on June 30, 2008. In its March 16, 2009 Public Notice (USACE 2009), the USACE stated that the Environmental Resource Permit application contained in the Site Certification Application, along with its supporting documents, make up the Department of the Army permit application. On August 26, 2009 the Florida Department of Environmental Protection (FDEP) issued its Conditions of Certification for LNP Units 1 and 2, associated facilities, and transmission lines that were subsequently modified on January 12, 2010 and February 23, 2010 (FDEP 2010). The USACE is participating with the NRC in preparing this environmental impact statement (EIS) as a cooperating agency.

Section 102 of the National Environmental Policy Act of 1969, as amended (NEPA) (42 USC 4321 et seq.), directs that an EIS is required for major Federal actions that significantly affect the quality of the human environment. Section 102(2)(C) of NEPA requires that an EIS include information on the following:

- the environmental impact of the proposed action
- any adverse environmental effects that cannot be avoided should the proposal be implemented
- alternatives to the proposed action
- the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity
- any irreversible and irretrievable commitments of resources that would be involved if the proposed action is implemented.

NRC has implemented NEPA in Title 10 of the Code of Federal Regulations (CFR) Part 51. In 10 CFR 51.20, NRC requires preparation of an EIS for issuance of COLs. Subpart C of 10 CFR Part 52 contains the NRC regulations related to COLs.

The proposed actions related to the COL application are (1) the NRC issuance of COLs for construction and operation of two new nuclear units at the LNP site in Levy County, Florida, and (2) the USACE issuance of a permit pursuant to Section 404 of the Federal Water Pollution Control Act (also referred to as the Clean Water Act) (33 USC 1251, et seq) and Section 10 of the Rivers and Harbors Appropriation Act of 1899 (33 USC 401, et seq). If issued, the USACE permit would authorize the impact on waters of the United States, including wetlands, to construct the LNP electrical generation facility, and various associated, integral project components, including electrical transmission lines and substations, access roads, a barge slip, blowdown piplines, a make-up water pipeline, and cooling water intake structure.

The environmental review described in this EIS was conducted by a review team consisting of NRC staff, its contractor's staff, and staff from the USACE. During the course of preparing this EIS, the review team reviewed the ER submitted by PEF (2009a) and supplemental documentation; consulted with Federal, State, Tribal, and local agencies; and followed the guidance set forth in NUREG-1555, *Environmental Standard Review Plans* (NRC 2000), and NUREG-0800, *Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants* (NRC 2007). In addition, the NRC considered the public comments related to the environmental review received during the scoping process. The public comments are provided in Appendix D.

Included in this EIS are (1) the results of the NRC staff's preliminary analyses, which consider and weigh the environmental effects of the proposed action and of constructing and operating two new nuclear units at the LNP site, (2) mitigation measures for reducing or avoiding adverse effects, (3) the environmental impacts of alternatives to the proposed action, and (4) the NRC staff's recommendation regarding the proposed action based on its environmental review.

The USACE's role as a cooperating agency in the preparation of this EIS is to ensure to the maximum extent practicable that the information presented is adequate to fulfill the requirements of USACE regulations. The Clean Water Act Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material (40 CFR Part 230) contain the substantive environmental criteria used by USACE in evaluating discharges of dredged or fill material into waters of the United States. While the USACE concurs as part of the review team with the designation of impact levels for terrestrial or aquatic resource; in so far as waters of the United States are concerned, the USACE must conduct a quantitative comparison of impacts on waters of the United States as part of the 404(b)(1) analysis. USACE's Public Interest Review (PIR) (33 CFR 320.4) directs the USACE to consider a number of factors as part of a balanced evaluation process. USACE's PIR will be part of its permit decision document and will not be addressed in this EIS. The USACE will document its conclusion of the review process, including the requirement for compensatory mitigation, in accordance with 33 CFR Part 332, Compensatory Mitigation for Losses of Aquatic Resources, in its permit-decision document.

Environmental issues are evaluated using the three-level standard of significance – SMALL, MODERATE, or LARGE – developed by the NRC using guidelines from the Council on Environmental Quality (CEQ) (40 CFR 1508.27). Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, provides the following definitions of the three significance levels:

SMALL – Environmental effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE – Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

Mitigation measures were considered for each environmental issue and are discussed in the appropriate sections. During its environmental review, the review team considered planned activities and actions that PEF indicates it and others would likely take if PEF receives the COLs. In addition, PEF provided estimates of the environmental impacts resulting from the building and operation of two proposed new nuclear units on the LNP site.

10.1 Impacts of the Proposed Action

In a final rule dated October 9, 2007 (72 FR 57416), the Commission limited the definition of "construction" to those activities that fall within its regulatory authority (10 CFR 51.4). Many of the activities required to build a nuclear power plant are not part of the NRC action to license the plant. Activities associated with building the plant that are not within the purview of the NRC action are grouped under the term "preconstruction." Preconstruction activities include clearing and grading, excavating, erection of support buildings and transmission lines, and other associated activities. Because the "preconstruction" activities are not part of the NRC action, their impacts are not reviewed as a direct effect of the NRC action. Rather, the impacts of the preconstruction activities are considered in the context of cumulative impacts. Although the preconstruction activities are not part of the NRC action, they support or are requisite to the NRC action. In addition, certain preconstruction activities require permits from the USACE, as well as other Federal, State, and local agencies.

Chapter 4 describes the relative magnitude of impacts related to preconstruction and construction activities with a summary of impacts in Table 4-17. Impacts associated with operation of the proposed facilities are discussed in Chapter 5 and are summarized in Table 5-23. Chapter 6 describes the impacts associated with the fuel cycle, transportation, and decommissioning. Chapter 7 describes the impacts associated with preconstruction and construction activities and operation of LNP Units 1 and 2 when considered along with the cumulative impacts of other past, present, and reasonably foreseeable future projects in the geographic region around the LNP site.

10.2 Unavoidable Adverse Environmental Impacts

Section 102(2)(C)(ii) of NEPA requires that an EIS include information on any adverse environmental effects that cannot be avoided if the proposal is implemented. Unavoidable adverse environmental impacts are those potential impacts of the NRC action and the USACE action that cannot be avoided due to constraints inherent in utilizing the LNP site and its associated offsite facilities.

The unavoidable adverse environmental impacts associated with the granting of the COLs for LNP Units 1 and 2 would include impacts of construction, preconstruction and operation.

10.2.1 Unavoidable Adverse Impacts During Construction and Preconstruction

Chapter 4 discusses in detail the potential impacts from construction and preconstruction of the proposed Units 1 and 2 at the LNP site and presents mitigation and controls intended to lessen the adverse impacts. Table 10-1 presents the unavoidable adverse impacts associated with construction and preconstruction activities to each of the resource areas evaluated in this EIS, as well as the mitigation measures that would reduce the impacts. Those impacts remaining after mitigation is applied (e.g. avoidance and minimization, but not including compensatory mitigation) are identified in Table 10-1 as unavoidable adverse impacts. Unavoidable adverse impacts are the result of both construction and preconstruction activities, unless otherwise noted. The impact determinations in Table 10-1 are for the combined impacts of construction and preconstruction. However, the impact determinations for NRC-regulated construction are the same for all resource areas except land use, terrestrial and wetland ecosystems, physical and aesthetic impacts, and economic impacts. For impact determinations that differ for the combined construction and preconstruction activities and the NRC-regulated activities, the impacts from the NRC-regulated activities are also identified in Table 10-1.

The unavoidable adverse impacts are primarily attributable to preconstruction activities due to the initial land disturbance from clearing the land, land use, excavation, filling wetlands and waterways, impervious surface addition, dredging, and removal or demolition of three sites with historic or cultural value. NRC authorized construction activities partially contribute to most of the unavoidable adverse impacts.

The primary unavoidable adverse environmental impacts during building activities would be related to land use and terrestrial habitat loss, because approximately 627 ac of habitat on the LNP site would be permanently disturbed and about 150 ac would be temporarily disturbed, including approximately 403 ac of wetlands (PEF 2009b, PEF 2009c). Permanent and temporary impacts resulting from the offsite facilities could total 2008 ac, including up to 370 ac

Table 10-1. Unavoidable Adverse Environmental Impacts from Construction and Preconstruction

Resource Area	Impacts	Mitigation Measures	Unavoidable Adverse Impacts
Land Use	MODERATE (NRC-authorized construction impact level is SMALL)	Comply with requirements of applicable Federal, State, local permits, and Conditions of Certification	Approximately 627 ac disturbed on a long-term basis. About 1790 ac of land would be reclassified from existing uses to utility corridor use as a result of installing the transmission system to connect the new units to the grid.
Water Use	SMALL	Control erosion and contamination; monitor water levels and water quality in accordance with the FDEP Conditions for Certification	Drawdown of aquifers and redirection of recharge source water would occur, but impacts would be temporary.
Water Quality	SMALL	Implement best management practices (BMPs) and a site-specific stormwater pollution prevention plan (SWPPP)	Onsite and offsite water bodies would receive stormwater runoff during building phase.
		Comply with Federal and State permits and implementation of BMPs.	Dredging in the Cross Florida Barge Canal (CFBC) near the CWIS, barge slip, and at the blowdown discharge line crossing.
		Compliance with FDEP permitting rules and implementation of BMPs.	Inadvertent spills that seep into aquifers.
Ecological (terrestrial)	MODERATE (NRC-authorized construction impact level is SMALL)	Implement wetland mitigation plan, BMPs, Avian Protection Plan[(a)], and conduct other surveys as required by State and Federal agencies.	Permanent impacts would occur to approximately 627 ac of wildlife habitat on the LNP site, and up to 2008 ac for the offsite facilities. Total wetland impacts (onsite and offsite) could approach 773 ac. Wildlife and important species could be harmed by construction and preconstruction activities.

(a) Although the wetland mitigation plan is included as a "Mitigation Measure" in this table, the impacts included under "Unavoidable Adverse Impacts" do not reflect the contribution from compensatory mitigation measures.

Table 10-1. (contd)

Resource Area	Impacts	Mitigation Measures	Unavoidable Adverse Impacts
Ecological (aquatic)	SMALL	Implement BMPs; control erosion and sedimentation	Impacts to the CFBC aquatic resources due to in-water activities associated with CWIS, barge-unloading facility, and discharge pipelines. Impacts would be localized, temporary, and largely mitigable.
Socioeconomic Physical and Aesthetic	SMALL to MODERATE (NRC-authorized construction impact level is SMALL)	Alert local governmental agencies concerning needed road repairs.	Minor temporary impacts during building phase.
		Develop and implement a construction traffic management plan during building phase.	Noticeable impacts on traffic in Levy County during building phase.
			Noticeable aesthetic impacts from transmission corridor and lines during the building phase.
Demography	SMALL	None.	None.
Economic Impacts to Community	SMALL to MODERATE (beneficial) (NRC-authorized construction impact level is SMALL [beneficial])	None.	None.
Infrastructure and Community Services	SMALL TO MODERATE	Add infrastructure and personnel as necessary.	Some temporary shortages of facilities may occur during the building period.

Table 10-1. (contd)

Resource Area	Impacts	Mitigation Measures	Unavoidable Adverse Impacts
		Maintain communication with local government and planning officials so that ample time is given to plan for the influx of population and traffic during the building phase. Add modular classrooms, infrastructure, and personnel as necessary during building phase.	Some temporary infrastructure shortages in services, traffic congestion, and requirements for additional classrooms in education facilities during the building period.
Environmental Justice	SMALL	None.	None.
Historic and Cultural Resources	SMALL	Formal inadvertent discovery procedures are in place to minimize impacts on potential onsite historic and cultural resources. No mitigation plans in place but if any cultural resources are unavoidably impacted PEF is required to work with the Florida State Preservation Office (SHPO) on specific mitigation measures.	None.
Meteorology and Air Quality	SMALL	Compliance with Federal, State, and local regulations governing construction activities and construction vehicle emissions.	Dust emissions, noise, occupational injuries, traffic accidents.
Nonradiological Health	SMALL	Compliance with Federal, State, and local regulations governing construction activities and construction vehicle emissions, compliance with Federal and local noise-control ordinances, compliance with Federal and state occupational safety and health regulations, implementation of traffic management plan.	Dust emissions, noise, occupational injuries, traffic accidents.
Radiological Health	SMALL	Use of as low as reasonably achievable principles	Dose to construction workers on Unit 2 after Unit 1 startup.

Table 10-1. (contd)

Resource Area	Impacts	Mitigation Measures	Unavoidable Adverse Impacts
Nonradioactive Waste	SMALL	Implement BMPs to minimize waste generation. Manage wastes in accordance with Federal, State, and county requirements.	Consumption of some landfill capacity. Minor discharges to outfall and to atmosphere.

of wetlands. Offsite facilities include the cooling-water intake structure (CWIS), heavy-haul road; barge slip; associated structures for the intake and blowdown pipelines; transmission lines; and access roads to the LNP, transmission lines, and barge slip. Additional areas could be disturbed on a short-term basis as a result of temporary activities and facilities and laydown areas (PEF 2009a). Many of the upland and wetland habitats that would be affected by construction and preconstruction actions have been altered by prior land-use activities, particularly commercial forest management on the LNP site, and thus provide lower quality habitat for wildlife. Wildlife and important species could be harmed by habitat loss or alteration, hazards posed by clearing and other site-preparation activities, noise and disturbance, avian collisions with elevated structures, and increased traffic. Implementation of the conceptual mitigation plan would compensate for the loss or impairment of functions in wetlands affected by the LNP project. The higher-quality habitat provided by restored communities under the conceptual wetland mitigation plan would likely be beneficial to wildlife and many important species.

The Floridan aquifer could be affected during construction and preconstruction. However, the impacts would be localized and temporary. Building techniques to be used by PEF during excavation within the powerblock area would eliminate resultant dewatering impacts. The Upper Floridan aquifer may be affected because water for building activities will be obtained from wells screened within this aquifer. The FDEP conditions for certification require PEF to develop an environmental monitoring plan, which includes a hydraulic testing program during drilling and installation of the proposed water-supply wells to obtain site-specific hydraulic property estimates and determine whether the wellfield can meet groundwater usage requirements without significantly affecting water levels in the surficial aquifer. The FDEP conditions for certification require that PEF operate the wellfield in a way that limits drawdown in the surficial aquifer to levels which ensure no adverse impacts on wetlands. In addition, the alteration of the land surface at LNP Units 1 and 2 would cause a localized change in the recharge rate to these aquifers.

There are no streams onsite or plans for filling any streams.

No sites eligible for listing in the National Register of Historic Places would be adversely affected by the proposed action, and no mitigation measures are currently in place. However, PEF is required to work with the Florida State SHPO to develop specific mitigation measures, such as data recovery or documentation and interpretive plans. PEF also has agreed to develop and implement cultural resource specific procedures (PEF 2009a).

Socioeconomic impacts of building the proposed units would include an increase in traffic from construction workers, and demand pressure on some public services. No unusual resource dependencies on minority and low-income populations in the region were identified. Atmospheric and meteorological impacts include fugitive dust from land disturbing and building activities that can be mitigated by the dust-control plan. The building and maintenance of transmission corridors and lines would have a moderate impact on aesthetics.

10.2.2 Unavoidable Adverse Impacts During Operation

Chapter 5 provides a detailed discussion of the potential impacts from operation of the proposed Units 1 and 2 at the LNP site and presents mitigation and controls intended to lessen the adverse impacts. Table 10-2 presents the unavoidable adverse impacts on each of the resource areas evaluated in this EIS associated with operation of the two proposed units, and the mitigation measures that would reduce the impacts. Those impacts remaining after mitigation is applied (e.g. avoidance and minimization, but not including compensatory mitigation) are identified in Table 10-2 as unavoidable adverse impacts. The unavoidable adverse impacts from operation for land use would be minimal and are associated with making land unavailable for other uses until after decommissioning of the two proposed units.

Water-related impacts during operation would be mitigated through PEF's adherence to State permits for water withdrawal and discharge. The FDEP conditions of certification require that PEF operate the wellfield in a way that limits drawdown in the surficial aquifer to levels which ensure no adverse impacts on wetlands. Remaining adverse impacts on hydrological water-use and water-quality impacts during operation would be minimal and limited to increased water use, potential increases in sedimentation to bodies of surface water, and potential surface water and groundwater contamination from inadvertent spills.

Unavoidable adverse impacts on terrestrial ecology resources would include increased risks of bird collisions with structures and transmission lines, reduced wildlife use or avoidance of some habitats due to noise and disturbance, and minor impacts to vegetation from salt deposition near the mechanical draft cooling towers. Uncertainty exists regarding the potential for groundwater drawdown effects on wetlands. Assuming that PEF operates the wellfield in a manner that ensures no adverse impacts on wetlands as stated in the FDEP conditions of certification, the conceptual wetland mitigation plan is implemented, an avian protection plan is prepared and implemented, and BMPs are followed, terrestrial impacts during operation would be minor.

Table 10-2. Unavoidable Adverse Environmental Impacts from Operation

Resource Area	Impact	Mitigation Measures	Unavoidable Adverse Impacts
Land Use	SMALL	Adherence to local land-management plan.	Land would not be available for other use until after decommissioning of the entire LNP site, including the two proposed new units.
Water Use	SMALL	Compliance with State of Florida Conditions of Certification.	Modification of flow patterns in the CFBC because of the operation of Units 1 and 2.
		Compliance with State of Florida Conditions of Certification.	Groundwater use from the Floridan Aquifer because of operation of Units 1 and 2.
Water Quality	SMALL	Implement BMPs and Stormwater Management Plan.	Increased sediment load in stormwater and potential to contaminate surface and groundwater through inadvertent spills.
		Compliance with PEF's National Pollutant Discharge Elimination System (NPDES) permit.	Discharge of blowdown water to the Crystal River Discharge Canal.
Ecological (terrestrial)	SMALL to MODERATE	Implement conceptual wetland mitigation plan, BMPs, and Avian Protection Plan. Comply with State Conditions of Certification regarding wellfield operation.	Increased risks of avian collision mortality from structures and transmission lines, reduced use or avoidance of some habitats by wildlife, minor vegetation impacts from salt drift, and possible groundwater drawdown effects on wetlands.
Ecological (aquatic)	SMALL	PEF has taken measures to mitigate operation impacts.	Impacts on individual organisms are expected, but not on aquatic communities.
Socioeconomic			
Physical and Aesthetic	SMALL to MODERATE	Continue to implement strategies from the building	Minor levels of increased traffic.
			Aesthetic impacts from transmission corridors and lines.

Table 10-2. (contd)

Resource Area	Impact	Mitigation Measures	Unavoidable Adverse Impacts
Demography	SMALL	None.	Project-related population smaller than during peak construction years.
Economic Impacts on Community and Taxes	SMALL to LARGE (beneficial)	None.	None.
Infrastructure and Community Services	SMALL	None	Minor impact on traffic from additional workers. Continued impact on some community services in Marion County, which will not receive property tax payments from the facility that would enable expansion of service provision.
Environmental Justice	SMALL	None.	None.
Historic and Cultural Resources	SMALL	Formal inadvertent discovery procedures are in place to minimize impacts on potential onsite historic and cultural resources.	None.
Metorology and Air Quality	SMALL	Compliance with Federal, State, and local air quality permits and regulations.	Slight increase in certain criteria pollutants and carbon dioxide due to plant auxiliary combustion equipment (e.g., diesel engines, combustion turbines); plumes and drift deposition from cooling towers.

Table 10-2. (contd)

Resource Area	Impact	Mitigation Measures	Unavoidable Adverse Impacts
Nonradiological Health	SMALL	Use of antimicrobial agents in the cooling system, physical and administrative controls on exposure to cooling system discharge, compliance with Federal and local noise regulations, with Federal and State occupational safety regulations, and transmission-line design compliant with National Electric Safety Code standards.	Increase in etiological agent growth, cooling tower and pump noise, occupational injuries, acute and chronic electromagnetic field exposures.
Radiological Health	SMALL	Doses to members of the public would be maintained below NRC and U.S. Environmental Protection Agency (EPA) standards; workers' doses would be maintained below NRC limits and as low as reasonably achievable (ALARA); and mitigative actions instituted for members of the public would also ensure doses to biota other than humans would be well below National Council on Radiation and Measurements (NCRP) and International Atomic Energy Agency (IAEA) guidelines.	Small radiation doses to members of the public below NRC and EPA standards; ALARA doses to workers; and biota doses less than NCRP and IAEA guidelines.
Nonradioactive Waste	SMALL	All wastes disposed in compliance with applicable Federal, State, and local requirements.	Consumption of some landfill capacity. Minor discharges to outfall and to atmosphere.

Aquatic impacts would be minor during operation because PEF's adherence to its permits would likely result in minimal impacts on aquatic resources. Socioeconomic impacts would primarily increase the demand for services and traffic. However, increased tax revenue would support the increase in services. The review team did not identify any cultural resources that would be affected by operation of the proposed units. PEF has agreed to follow appropriate procedures if historic or cultural resources are discovered during operation activities. It is expected that air quality impacts would be negligible, and pollutants emitted during operations would be insignificant. Nonradiological and radiological health impacts would be minimal. Nonradiological health impacts to members of the public from operation, including etiological agents, noise, electromagnetic fields, occupational health, and transportation of materials and personnel would be minimal because PEF would apply controls and measures to ensure compliance with Federal and State regulations. Radiological doses to members of the public from operation of the two proposed units would be below annual exposure limits set to protect the general public.

Adverse socioeconomic impacts likely would be similar in character to those during the building phase but, aside from the aesthetic effects of the transmission corridor and lines, would be smaller due to the smaller project-related population and workforce and the fact that these impacts will follow the larger building period demand, which is likely to have resulted in adaptations and growth in the affected communities. Socioeconomic impacts would primarily be increased traffic, some damage to roads, an increase in the demand for housing and public services, along with increased employment opportunities and a substantial increase in tax revenue in Levy County once the first unit becomes operational.

10.3 Relationship Between Short-Term Uses and Long-Term Productivity of the Human Environment

Section 102(2)(C)(iv) of NEPA requires that an EIS include information on the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity.

The local use of the human environment by the proposed project can be summarized in terms of the unavoidable adverse environmental impacts of construction and operation and the irreversible and irretrievable commitments of resources. With the exception of the consumption of depletable resources as a result of plant construction and operation, these uses may be classed as short term. The principal short-term benefit of the plant is represented by the production of electrical energy. The economic productivity of the site, when used for this purpose, would be extremely large compared to the productivity from agriculture or other probable uses for the site.

The maximum long-term impact on productivity would result when the plant is not immediately dismantled at the end of the period of plant operation, and, consequently, the land occupied by the plant structures would not be available for any other use. However, the enhancement of regional productivity resulting from the electrical energy produced by the plant is expected to generate a correspondingly large increase in regional long-term productivity that would not be equaled by any other long-term use of the site. In addition, most long-term impacts resulting from land-use preemption by plant structures can be eliminated by removing these structures or by converting them to other productive uses. Once the units are shutdown the plant would be decommissioned according to NRC regulations. Once decommissioning is complete and the NRC license is terminated, the site would be available for other uses. The review team concludes that the negative aspects of plant construction and operation as they affect the human environment would be outweighed by the positive long-term enhancement of regional productivity through the generation of electrical energy.

10.4 Irreversible and Irretrievable Commitments of Resources

Section 102(2)(C)(v) of NEPA requires that an EIS include information about any irreversible and irretrievable commitments of resources that would occur if the proposed actions are implemented. The term “irreversible commitments of resources” refers to environmental resources that would be irreparably changed by the building or operation activities authorized by the Corps or NRC permit and licensing decisions, where the environmental resources could not be restored at some later time to the resource’s state before the relevant activities. “Irretrievable commitments of resources” refers to materials that would be used for or consumed by the new units in such a way that they could not, by practical means, be recycled or restored for other uses. The resources discussed in this section are the environmental resources discussed in Chapters 4, 5, and 6.

10.4.1 Irreversible Commitments of Resources

Irreversible commitments of environmental resources resulting from the construction, preconstruction and operation of Units 1 and 2, in addition to the materials used for the nuclear fuel, are described below.

10.4.1.1 Land Use

Land committed to the disposal of radioactive and nonradioactive wastes is committed to that use and cannot be used for other purposes. The land used for Units 1 and 2, with the exception of any filled wetlands, is not irreversibly committed because once Units 1 and 2 cease operations and the plant is decommissioned in accordance with NRC requirements, the land supporting the facilities could be returned to other industrial or nonindustrial uses.

10.4.1.2 Water Use

Approximately 28,600 gpm of cooling water would be lost from the circulating-water system and the service-water system through consumptive use (i.e., evaporation and drift) during operation.

10.4.1.3 Aquatic and Terrestrial Biota

Construction and preconstruction activities would cause temporary and long-term changes to both the aquatic and terrestrial biota at the plant site and facilities. Construction would temporarily adversely affect the abundance and distribution of local terrestrial flora and fauna on the LNP site and localized permanent loss of habitat associated with the construction footprint for LNP Units 1 and 2. Although wetlands would be permanently altered during construction and preconstruction, a conceptual mitigation plan has been developed to compensate for the loss or impairment of functions in all affected wetlands. Terrestrial habitats could be restored after decommissioning of the proposed reactors. Thus, no irretrievable loss of terrestrial habitats, including wetlands, would be expected. Although the terrestrial flora and fauna in the proposed construction footprint would be displaced for their lifetimes or suffer mortality during construction and operation, populations of these species would not be adversely affected, and no irretrievable loss of species would be expected. These impacts on terrestrial resources would be minimal and would not be expected to adversely affect the resource. In addition, no irretrievable loss of resources would be expected as a result of operations. The review team expects that no irretrievable commitment of resources affecting terrestrial habitats or species would be expected to occur associated with upgrades to the transmission corridor.

Construction and preconstruction activities would temporarily adversely affect the abundance and distribution of the aquatic community, including essential fish habitat (EFH), in the CFBC in the vicinity of the CWIS, barge slip, and discharge pipeline placement. These activities are temporary and largely mitigable. Operation activities are not expected to have adverse impacts on the abundance and distribution of the aquatic community, including EFH in the CFBC or Crystal Bay near shore area in the Gulf of Mexico. The review team expects that no irretrievable commitment of resources affecting habitat or individual species is expected to occur associated with the new transmission corridors. The aquatic habitat and aquatic populations would recover once Units 1 and 2 cease operations and the plant is decommissioned in accordance with NRC requirements.

10.4.1.4 Socioeconomic Resources

The review team expects that no irreversible socioeconomic commitments would be made to socioeconomic resources because they would be reallocated for other purposes once the plant is decommissioned.

10.4.1.5 Air and Water

During construction, dust and other emissions, such as vehicle exhaust, would be released into the air. During operations, vehicle exhaust emissions would continue, and other air pollutants and chemicals, including very low concentrations of radioactive gases and particulates, would be released from the facility into the air and surface water. Because these releases would conform to applicable Federal and State regulations, their impact on the public health and the environment would be limited. The review team expects no irreversible commitment to air or water resources because all Unit 1 and 2 releases would be made in accordance with duly issued permits.

10.4.2 Irretrievable Commitments of Resources

A study by the U.S. Department of Energy (DOE) (DOE/EIA 2004) on new reactor construction estimated the following quantities of materials would be required for a single reactor: 12,239 yd^3 of concrete, 3107 tons of rebar, 13,000,000 ft of cable, and 275,000 ft of piping. Therefore, about twice these amounts would be needed for proposed LNP Units 1 and 2 and considerably more would be required for all of the other site structures.

The review team expects that the use of construction materials in the quantities associated with those expected for LNP Units 1 and 2, while irretrievable, would be of small consequence with respect to the availability of such resources.

The main resource that would be irretrievably committed during operation of the new nuclear units would be uranium. The availability of uranium ore and existing stockpiles of highly enriched uranium in the United States and Russia that could be processed into fuel is sufficient (OECD, NEA, and IAEA 2008), so the irreversible and irretrievable commitment would be negligible.

10.5 Alternatives to the Proposed Action

Alternatives to the proposed actions are discussed in Chapter 9 of this EIS. Alternatives considered are the no-action alternative, energy production alternatives, alternative sites, system, and design alternatives.

The no-action alternative, described in Section 9.1, refers to a scenario in which the NRC would deny the request for the COL. If no other power plant were built or electrical power supply strategy implemented to take its place, the electrical capacity to be provided by the project would not become available, the benefits (electricity generation) associated with the proposed action would not occur, and the need for power would not be met.

Alternative energy sources are described in Section 9.2. Alternatives that would not require additional generating capacity are described in Section 9.2.1. Detailed analyses of coal- and natural-gas-fired alternatives are provided in Section 9.2.2. Other energy sources are discussed in Section 9.2.3. A combination of energy alternatives is discussed in Section 9.2.4. The NRC staff concluded that none of the alternative energy options were both (1) consistent with PEF's objective of building baseload generation units and (2) environmentally preferable to the proposed action.

Alternative sites are discussed in Section 9.3. The cumulative impacts of building and operating the proposed facilities at the alternative sites are compared to the impacts at the proposed Levy County site in Section 9.3.6. Table 9-31 contains the review team's characterization of cumulative impacts at the proposed and alternative sites. Based on this review, the NRC staff concludes that while there are differences in cumulative impacts at the proposed and alternative sites, none of the alternative sites would be environmentally preferable or obviously superior to the proposed Levy County site. The NRC's determination is independent of the USACE determination of a LEDPA pursuant to Clean Water Act Section 404(b)(1) guidelines. The USACE will conclude its analysis of both offsite and onsite alternatives in its Record of Decisions.

Alternative heat-dissipation and circulating-water system designs are discussed in Section 9.4. The NRC staff concluded that none of the alternatives considered would be environmentally preferable to the proposed system designs.

10.6 Benefit-Cost Balance

NEPA requires that all agencies of the Federal government prepare detailed environmental statements on proposed major Federal actions that can significantly affect the quality of the human environment. A principal objective of NEPA is to require each Federal agency, in its decision-making process, to consider the environmental impacts of each proposed major action and the available alternative actions. In particular, Section 102 of NEPA (42 USC 4321 et seq.) requires all Federal agencies to the fullest extent possible to do the following:

> (B) identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by title II of this Act, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations."

However, neither NEPA nor CEQ requires the costs and benefits of a proposed action to be quantified in dollars or any other common metric.

The intent of this section is not to identify and quantify all of the potential societal benefits of the proposed activities and compare these to the potential costs of the proposed activities. Instead, this section will focus on the benefits and costs of such magnitude or importance that their inclusion in this analysis can inform the decision-making process. This section compiles and compares the pertinent analytical conclusions reached in earlier chapters of this EIS. It gathers all of the expected impacts from building and operations of the proposed LNP Units 1 and 2 and aggregates them into two final categories: (1) the expected costs and (2) the expected benefits to be derived from approval of the proposed action. As such, costs and benefits include the costs and benefits of both preconstruction activities and NRC-authorized construction and operations activities.

Although the analysis in this section is conceptually similar to a purely economic benefit-cost analysis, which determines the net present dollar value of a given project, the intent of this section is to identify all potential societal benefits of the proposed activities and compare these to the potential internal (i.e., private) and external (i.e., societal) costs of the proposed activities. The purpose of this assessment is to determine if the benefits of the proposed activities outweigh the aggregate costs.

General issues related to PEF's financial viability and those of its parent organizations are outside NRC's environmental mission and authority and, thus, are not considered in this EIS. Issues related to the financial qualifications of PEF will be addressed in the staff's safety evaluation report. It is not possible to quantify and assign a value to all benefits and costs associated with the proposed action. This analysis, however, attempts to identify, quantify, and provide monetary values for benefits and costs when reasonable estimates are available.

Section 10.6.1 discusses the benefits associated with the proposed action. Section 10.6.2 discusses the costs associated with the proposed action. A summary of benefits is provided in Table 10-3. Section 10.6.3 provides a summary of the impact assessments, bringing previous sections together to establish a general impression of the relative magnitude of the proposed project's costs and benefits.

10.6.1 Benefits

The most apparent benefit from a power plant is that it generates power and provides thousands of residential, commercial, and industrial consumers with electricity. Maintaining an adequate supply of electricity in any given region has social and economic importance because adequate electricity is the foundation for economic stability and growth, and is fundamental to maintaining current standards of living. Because the focus of this EIS is on the proposed expansion of the LNP's generating capacity, this section focuses primarily on the relative benefits of the LNP option rather than the broader, more generic benefits of electricity supply.

Table 10-3. Summary of Benefits of the Proposed Action

Benefit Category	Description	Monetized Value or Impact Assessment
	Benefits	
Electricity generated	16,400,000 to 17,900,000 MWh per year for the 40-year life of the plant (assuming capacity factors in the range of 85 to 93 percent).	
Generating capacity	2200 MW(e) (two units at 1100 MW[e] each).	
Fuel diversity and energy security	Nuclear generation provides diversity to coal- and natural-gas-fired baseload generation.	
Tax revenues	PEF will pay property taxes to the State of Florida upon operation of the LNP. In addition, the State will collect sales and use taxes on locally purchased goods and services during construction. Finally, the operations workforce will generate Property taxes over the 40-year life of the plant.	$104 million in property taxes annually (Levy County would receive the majority of this tax revenue); $75 million in sales taxes statewide annually over an 8-year construction period;
Local economy	Increased jobs would benefit the area economically and increase the economic diversity of region (see Sections 4.4.3.1 and 5.4.3.1).	773 operations workers and 519 indirect jobs added over 40-year life of plant; $91 million income per year in the region during 40-year life of plant.
Technical or other non-monetary benefits	Fuel diversity would reduce exposure to supply and price risk associated with reliance on any single fuel source.	
Price volatility	Would lessen potential for fuel price volatility.	
Electrical reliability	Would enhance reliability of electricity supply.	

10.6.1.1 Societal Benefits

For the production of electricity to be beneficial to a society, there must be a corresponding demand, or “need for power,” in the region. Chapter 8 of this EIS defines and discusses the need for power in more detail. From a societal perspective, nuclear power offers two primary benefits relative to most other generating systems: (1) long-term price stability and (2) energy security through fuel diversity. These benefits are described in this subsection.

Long-Term Price Stability

Because of its relatively low and stable fuel costs, nuclear energy is a dependable generator of electricity that can provide electricity to the consumer at relatively stable prices over long periods of time. Unlike some other energy sources, nuclear energy is generally not subject to unreliable weather or climate conditions, unpredictable cost fluctuations, and is less dependent on foreign suppliers than other energy sources. Nuclear power plants are generally not subject to the fuel price volatility that affects natural gas and oil power plants. In addition, uranium fuel constitutes only 3 percent to 5 percent of the cost of a kilowatt-hour of nuclear-generated electricity. Doubling the price of uranium increases the cost of electricity by about 9 percent. Doubling the price of gas would add about 66 percent to the price of electricity, and doubling the cost of coal would add about 31 percent to the price of electricity (WNA 2010).

Energy Security Through Fuel Diversity

Currently, more than 70 percent of the electricity generated in the United States is generated with fossil-based technologies. Thus, non-fossil-based generation, such as nuclear generation, is essential to maintaining diversity in the aggregate power-generation fuel mix (DOE/EIA 2006). Nuclear power contributes to the diverse U.S. energy mix, hedging the risk of shortages and price fluctuations for any one power-generation system and reducing the nation's dependence on imported fossil fuels.

A diverse fuel mix helps to protect consumers from contingencies such as fuel shortages or disruptions, price fluctuations, and changes in regulatory practices. Chapter 8 of this EIS discusses the State of Florida's finding that a need exists for the LNP project as proposed by PEF. The proposed LNP units would generate approximately 2200 MW(e) net, which would help meet the region's baseload need. Assuming a reasonably low capacity factor of 85 percent, the plant's average annual electrical energy generation would be more than 16,400,000 MWh. A reasonably high-capacity factor of 93 percent would result in more than 17,900,000 MWh of electricity.

10.6.1.2 Regional Benefits

Regional benefits of the proposed construction and operation of LNP include enhanced tax revenues, regional productivity, and community impacts.

Tax Revenue Benefits

As discussed in Sections 4.4.3.3 and 5.4.3.3, once both units become operational, Levy County would receive a large proportion (the amount of which is currently being negotiated) of the expected $104 million in tax revenues collected annually over the 40-year license period. This stream of revenue represents about a 300-percent increase over recent Levy County total revenue levels.

The staff also determined that the State of Florida would collect about $75 million annually during construction in sales and use taxes for local purchases of nonexempt materials for use in the construction. These revenues would be shared back to the counties from the State and would not be expected to provide significant local revenues in the affected region. Florida does not collect income taxes.

Regional Productivity and Community Impacts

The new units would require an operating workforce of 773 people who would stimulate the creation of 519 additional indirect jobs (Sections 4.4 and 5.4) within the local three-county area, or a total of approximately 1292 new jobs within the local area that would be maintained throughout the life of the plant. The economic multiplier effect of the increased spending by the direct and indirect workforce created as a result of two new units would increase the economic activity in the region, most noticeably in the communities near the proposed site in Levy, Citrus, and Marion Counties (PEF 2009a). Sections 4.4.3.1 and 5.4.3.1 provide additional information about the economic impacts of constructing and operating proposed LNP Units 1 and 2 on the Levy County site.

10.6.2 Costs

Internal costs to PEF for LNP Units 1 and 2, as well as external costs to the surrounding region and environment, would be incurred during the preconstruction, construction, and operation of two new units at the Levy County site. A summary of the costs is provided in Table 10-4.

Table 10-4. Summary of Costs of Construction, Preconstruction, and Operation

Cost Category	Description	Impact Assessment[(a)]
	Internal Costs[(b)]	
Construction cost[(c)]	$14.1 billion for the two LNP Units (overnight capital cost – 2008$)	NA
Operating cost[(c)]	$83 to $111 per MWh (2008$); Fuel cost is about 0.7 cents per kWh[(d)]	NA
Transmission-line construction cost[(c)]	$2.5 billion (2008$)	NA
Spent fuel management[(e)]	Approximately 0.1 cents per kWh	NA
Decommissioning[(f)]	Approximately 0.1 to 0.2 cents per kWh	NA

Table 10-4. (contd)

Cost Category	Description	Impact Assessment[(a)]
	External Costs	
Land use	Disturbance of 777 ac of currently undeveloped land; 627 ac occupied on a long-term basis by the two new nuclear reactors and associated infrastructure. Offsite areas amounting to about 250 ac would be developed. Transmission-line construction would disturb about 1790 ac (see Sections 4.1 and 5.1).	MODERATE for preconstruction activities; SMALL for NRC-authorized construction activities
Air quality impacts	Air emissions from diesel generators, auxiliary boilers and equipment, and vehicles would have a small impact on workers and local residents. Emission sources would be operated intermittently, and emissions would be within Federal, State, and local air quality limits. Negligible impacts from sulfur dioxide, nitrogen oxide, carbon monoxide, carbon dioxide, and particulate emissions (relative to other baseload fossil-fired power generation) (Sections 4.7 and 5.7).	SMALL
Ecological impacts	Some cost to wildlife is anticipated due to mortality, and from the loss or alteration of habitats (including wetlands), during construction. However, these costs are not expected to adversely affect regional wildlife populations. Mortality to wildlife and aquatic biota during operations is expected to be minimal. PEF's adherence to its NPDES permit would likely result in balanced aquatic populations. No threatened or endangered terrestrial or aquatic species are likely to be adversely affected (see Sections 4.3 and 5.3).	MODERATE for preconstruction activities; SMALL for NRC-authorized construction activities; SMALL to MODERATE for operations.
Physical impacts	The physical impacts from building and operating the two units would be minor and occur within the boundaries of the site; they would have negligible effect on immediate neighborhoods (see Sections 4.4.1 and 5.4.1).	SMALL

1 **Table 10-4**. (contd)

Cost Category	Description	Impact Assessment[a]
Housing	Sufficient housing stock is available (see Sections 4.4.4.3 and 5.4.4.3).	SMALL
Transportation	Noticeable, intermittent congestion at a major intersection during building, minor during operations (see Sections 4.4.4.1 and 5.4.4.1).	SMALL for preconstruction activities; MODERATE during peak employment associated with NRC-authorized activities
Public services	Potential short-term noticeable strain on some community services in Levy and Marion Counties during the building period, with the greatest impacts expected during the years of peak workforce, minor during operations (see Sections 4.4.4.4 and 5.4.4.4).	SMALL for preconstruction activities; MODERATE during peak employment associated with NRC-authorized activities
Nonradioactive waste	Minor consumption of local or regional landfill space, offset by payment of tipping fees for waste disposal. Minor consumption of regional hazardous waste treatment or disposal capacity, offset by treatment and disposal costs (see Sections 4.10 and 5.10).	SMALL
Uranium fuel cycle	Minor impacts distributed at multiple locations throughout the United States from the mining, milling, and enrichment of uranium, from fuel fabrication, from transportation of radioactive materials, and from management of radioactive wastes (see Chapter 6).	SMALL

2

Table 10-4. (contd)

Cost Category	Description	Impact Assessment[a]
Aesthetics and recreation	Minor impacts on aesthetics and recreation from the population and activities associated with building and operating the two-units, with the exception of localized moderate, long-term impacts on aesthetics from the creation of additional transmission-line corridors (see Sections 4.4.1.4, 4.4.4.2, 5.4.1.4, and 5.4.4.2).	SMALL for NRC-authorized construction activities; MODERATE for preconstruction activities
Cultural resources	Minor impacts on cultural resources from impacts associated with building and operating the two-units. The exception is if siting for additional transmission-line corridors does not avoid those cultural resources, both currently known and those identified through project-related cultural resources inventory (Phase 1 investigations).	SMALL
Health impacts (nonradiological and radiological)	Minor estimated temperature increases would not significantly increase the abundance of thermophilic microorganisms. Radiological doses and nonradiological health hazards to the public and occupational workers would be monitored and controlled in accordance with regulatory limits (see Sections 4.8, 4.9, 5.8, and 5.9).	SMALL
Materials, energy, and uranium	Irreversible and irretrievable commitments of materials and energy, including depletion of uranium. Construction materials include concrete, aggregate, rebar, conduit, cable, piping, building supplies, tools. Equipment needs include cranes, cement trucks, excavation equipment, dump trucks, and graders.	SMALL
Hazardous and radioactive waste	Mixed waste stored, transported, treated, and disposed in compliance with both NRC and EPA regulations would consume some regional or national waste treatment or disposal capacity, offset by treatment and disposal costs (see Sections 4.10 and 5.10).	SMALL

Table 10-4. (contd)

Cost Category	Description	Impact Assessment[(a)]
Water use and water quality	LNP water usage during construction and operations would have a minor impact on the availability and quality of the water resource in the area. Planned usage includes water withdrawn from the Gulf of Mexico to meet operational makeup water requirements, and a relatively small amount of groundwater usage for construction and general plant operations. FDEP Conditions for Certification require that PEF develop and implement an environmental monitoring program that ensures no adverse impacts on wetlands, groundwater quality, and the availability of groundwater for other permitted users.	SMALL

(a) Impact assessments are listed for all impacts evaluated in detail as part of this EIS. The details on impact assessments are found in the indicated sections of this EIS.
(b) Internal costs are those incurred by PEF to implement proposed building and operation of the LNP Units 1 and 2, exclusive of financing costs. Note that no impact assessments are provided for these private financial impacts.
(c) PEF 2009a; construction costs are overnight capital costs.
(d) NRC staff calculation of price per kWh based on MIT (2009).
(e) U.S. used-fuel program is funded by a 0.1 cent/kWh.
(f) U.S. experience (WNA 2010).

Internal costs include all of the costs included in a total capital cost assessment – the direct and indirect cost to physically build the power plant (capital costs) plus the annual costs of operation and maintenance, fuel costs, waste disposal, and decommissioning costs. In accordance with the NRC staff's guidance in NUREG-1555 (NRC 2000), internal costs of the proposed project are presented in monetary terms. External costs include all costs imposed on the environment and region surrounding the plant that are not internalized by the company, such as a loss of regional productivity, environmental degradation, or loss of wildlife habitat. The external costs listed in Table 10-4 summarize environmental impacts on resources that could result from preconstruction, construction, and operation of the proposed LNP Units 1 and 2.

10.6.2.1 Internal Costs

The most substantial monetary cost associated with nuclear energy is the cost of capital. Nuclear power plants have relatively high capital costs for building the plant, but low fuel costs relative to alternative power-generation systems. The real prices of key heavy construction commodities, such as cement, steel, and copper, have fluctuated substantially in recent years, which could have a significant impact on nuclear plant capital costs (although it should be noted these price changes would affect construction costs for non-nuclear power plants as well).[(a)] Because of the large capital costs for nuclear power and the relatively long construction period before revenue is returned, servicing the capital costs of a nuclear power plant is a key factor in determining the economic competitiveness of nuclear energy. Construction delays can add significantly to the cost of a plant. Because a power plant does not yield profits during construction, longer construction times mean a longer time before any costs can be offset by revenues. Furthermore, the longer it takes to build the plant, the higher the interest expenses on borrowed construction funds will be. In general, because no new nuclear plants have been built in the United States in many years, there is a great deal of uncertainty about the true costs of a new unit, which can affect the cost of capital.

Construction Costs

In evaluating the monetary costs related to constructing LNP Units 1 and 2, PEF reviewed recently published literature and internally generated, site-specific information. These estimates are based on a number of studies that were conducted by government agencies, universities, and other entities; the estimates include a significant contingency to account for uncertainty. In its ER, PEF expressed the construction-cost estimate in terms of “overnight capital cost,” which is a commonly used approach in the construction industry. “Overnight capital cost” is a term used to describe the monetary cost of constructing large capital projects such as a power plant, where costs are exclusive of interest and escalation, but include engineering, procurement, and construction costs, as well as the owner's costs and contingencies. The owner’s costs include both preconstruction and construction activities, such as site work and preparation, CWISs and cooling towers, import duties on components, insurance, spare parts, transmission interconnection, development costs, project management costs, owner’s engineering, State and local permitting, legal fees, and staffing-related training.

In the ER PEF’s cost analysis was primarily based on the four following studies:

- Massachusetts Institute of Technology (MIT). 2009. *The Future of Nuclear Power*.
- University of Chicago. 2004. *The Economic Future of Nuclear Power*.
- U.S. Department of Energy (DOE). 2004. *Study of Construction Technologies and Schedules, O&M Staffing and Cost, Decommissioning Costs and Funding Requirements for Advanced Reactor Designs.*

(a) Although in real terms, the construction costs for large projects remained relatively flat from 1998 to 2002, various construction cost indices from such sources as the Electric Power Research Institute and McGraw Hill estimate real cost escalation for large power plant construction projects to be approximately 4 percent per year since 2002 (through 2007). This is based on actual field data as well as data on commodity costs, labor cost information, and other equipment (USDI/Reclamation 2008).

- Organization for Economic Co-Operation and Development and International Energy Agency (OECD/IEA). 2005. *Projected Costs of Generating Electricity, 2005 Update*.

In addition to the four studies referenced by PEF, the NRC staff reviewed two additional reports, one published by The Keystone Center titled *Nuclear Power Joint Fact-Finding* (Keystone 2007), which concluded, based upon alternative discount rates and construction times, that overnight construction costs range between $3600 and $4200 per kW(e). The second study is a 2009 update to the MIT study (MIT 2009) that revised capital cost estimates to $4000 per kW(e).

Capital costs are costs incurred during construction, including preconstruction, when the actual outlays for equipment and construction and engineering are made. The construction cost estimates provided in Table 10-4 are based on costs reported to the Florida Public Service Commission (FPSC) as part of the docket resulting in Final Order PSC-08-0518-FOF-EI and discussed in Chapter 8.

After consideration of these studies in the ER, PEF applied to the FPSC, petitioning for a "Determination of Need" under Section 403.519 of the Florida Statutes. As part of its determination, FPSC requires the petitioner to provide reasonably detailed cost estimates, which FPSC found the PEF had done according to the FPSC Final Order granting the need determination (FPSC 2008).

In the FPSC Final Order (FPSC 2008), FPSC found the in-service cost of proposed LNP Units 1 and 2 to be $14.1 billion. In addition, PEF estimates that transmission facilities needed to deliver the power from the proposed LNP would cost $2.5 billion (PEF 2009a). Based on standard utility industry approaches to developing transmission resources (FPSC 2008), FPSC found the PEF transmission cost estimates to be reasonable.

Costs reported to the FPSC record as part of the need determination reflected PEF's best estimate and include an allowance for funds used during construction (AFUDC). AFUDC costs reflect the financing costs incurred until the project becomes operational, and these costs are not included in the studies cited as background for determining PEF's costs in the PEF ER.

Operation Costs

Operation costs are frequently expressed as levelized cost of electricity, which is the lowest price per kWh of producing electricity that covers operating costs, annualized capital costs, and a reasonable profit. For nuclear power plants, overnight capital costs typically account for a third of the levelized cost, and interest costs on the overnight costs account for another 25 percent (University of Chicago 2004). PEF estimated that the levelized cost for LNP would be in the range of $36 to $83/MWh (3.6 to 8.3 cents/kWh) (PEF 2009a). In addition, the review team examined the update to the MIT study (MIT 2009) which re-evaluated the overnight levelized cost of electricity at 8.4 cents per kWh (2007$). In 2008 dollars, this yields an overall range of 3.8 to 8.6 cents per kWh. However, the Keystone Study estimates the levelized cost for their low and high construction cost estimates to range from $0.083 to $0.111/kWh (Keystone 2007). Factors affecting the range include choices for discount rate, construction duration, plant life span, capacity factor, cost of debt and equity, split between debt and equity financing, depreciation time, tax rates, and premium for uncertainty. Estimates include decommissioning.

Fuel Costs

The cost of fuel is included in the calculation of levelized cost. Based on the recent MIT study (MIT 2009), the review team estimates nuclear fuel costs to be 0.7 cents per kWh.

Waste Disposal

The back-end costs of nuclear power contribute a small share of total cost because of both the long lifetime of a nuclear reactor and the fact that provisions for waste-related costs can be accumulated over that time. Spent fuel management costs are estimated to be 0.1 cents per kWh (WNA 2010, DOE 2008). It should be recognized, however, that radioactive nuclear waste poses unique disposal challenges for long-term management. While spent fuel and radioactive nuclear waste are being stored successfully in onsite facilities, the United States has yet to implement final disposition of spent fuel or high-level radioactive waste streams created at various stages of the nuclear fuel cycle.

Decommissioning

NRC has requirements for licensees at 10 CFR 50.75 to provide reasonable assurance that funds would be available for the decommissioning process. Because of the effect of discounting a cost that would occur as much as 40 years in the future, decommissioning costs have relatively little effect on the levelized cost of electricity generated by a nuclear power plant. Decommissioning costs are about 9 percent to 15 percent of the initial capital cost of a nuclear power plant. However, when discounted, they contribute only a few percent to the investment cost and even less to generation cost. In the United States, they account for 0.1 to 0.2 cents per kWh (WNA 2010).

10.6.2.2 External Costs

External costs are social and/or environmental effects that would be caused by the construction of and generation of power by two new reactors at the LNP site. This EIS includes the review team’s analysis that considers and weighs the environmental impacts of constructing and operating new nuclear units at the LNP or at alternative sites and mitigation measures available for reducing or avoiding these adverse impacts. It also includes the NRC staff's recommendation to the Commission regarding the proposed action.

Environmental and Social Costs

Chapter 4 of this EIS describes the impacts of building the proposed LNP on the environment with respect to the land, water, ecology, socioeconomics, radiation exposure to construction workers, and measures and controls to limit adverse impacts during building of the proposed new units at the LNP site. Chapter 5 examines environmental issues associated with operation of the proposed new nuclear Units 1 and 2 for an initial 40-year period. Potential operational impacts on land use, air quality, water, terrestrial and aquatic ecosystems, socioeconomics, historic and cultural resources, environmental justice, nonradiological and radiological health effects, and postulated accidents are considered, along with applicable measures and controls that would limit these impacts during the 40-year operating period. In accordance with 10 CFR Part 51, all impacts identified in Chapters 4 and 5 have been analyzed, and a significance level of potential adverse impacts (i.e., SMALL, MODERATE, or LARGE) has been assigned.

Chapter 6 of this EIS addresses the environmental impacts from (1) the uranium fuel cycle and solid-waste management, (2) the transportation of radioactive material, and (3) the decommissioning of nuclear units at the LNP. Chapter 9 of this EIS includes the review team's review of alternative sites and alternative power generation systems.

Unlike electricity generated from coal and natural gas, normal operation of a nuclear power plant does not result in any emissions of air pollutants associated with global warming and climate change (e.g., nitrogen oxides, sulfur dioxide, or carbon dioxide) or methyl mercury. Combustion-based power plants are responsible for 40 percent of the carbon dioxide (DOE/EIA 2008), at least 70 percent of the sulfur dioxide, at least 21 percent of nitrogen oxides, and 51 percent of the mercury emissions from industrial sources in the United States (EPA 2009). Coal-fired plants generate 82 percent of the electric power industry's emissions (DOE/EIA 2008). Chapter 9 analyzes coal- and natural-gas-fired alternatives to the building and operation of proposed Units 1 and 2. Air emissions from these alternatives and nuclear power are summarized in Chapters 4, 5, and 9 of this EIS.

As mentioned previously, Table 10-4 summarizes the external costs (i.e., environmental impacts) associated with preconstruction, construction, and operation of the proposed LNP Units 1 and 2. Impacts on air quality, water use and water quality, housing, cultural resources, and radiological and nonradiological health all would be SMALL. Because the overall impact on these resources from the proposed project in its entirety would be SMALL, the NRC portion of the project (i.e., construction as defined in 10 CFR 51.4 and operation of the proposed new units) accordingly would also be SMALL.

The review team concluded that MODERATE impacts on land use, ecology, transportation, public services, and aesthetics and recreation would be possible. Land clearing and transmission-line corridor development activities would cause noticeable, but not destabilizing impacts from preconstruction activities. NRC-authorized activities represent only a minor portion of these impacts. Therefore the review team determined that impacts of NRC-authorized activities on land use and aesthetics and recreation would be SMALL. Noticeable impacts on transportation and public services would only be expected during project peak employment when the NRC-authorized activities would be occurring. Therefore, the review team concluded that impacts of NRC-authorized activities on transportation and public services would be MODERATE. The impacts of NRC-authorized construction on ecological resources would be SMALL and the impacts of operations on ecological resources would be SMALL to MODERATE.

10.6.3 Summary of Benefits and Costs

The internal costs to construct additional units appear to be substantial. However, PEF's decision to pursue this expansion implies it has concluded that the internal benefits of the proposed facility (production of 16,400,000 to 17,900,000 MWh per year for the 40-year life of the plant and 2200 MW of baseload capacity) outweigh the internal costs. Although no specific monetary values could reasonably be assigned to the identified societal benefits, it would appear the potential societal benefits of building the proposed LNP, including the primary benefit of the generated power and baseload capacity, are substantial. In comparison, the external socio-environmental costs imposed on the region appear to be relatively minor.

Table 10-4 includes a summary of both internal and external costs of the proposed activities at LNP Units 1 and 2, as well as the identified benefits. The table includes a reference to other sections of this EIS when more detailed analyses and impact assessments are available for specific topics.

On the basis of the assessments in this EIS, the construction and operation of the proposed LNP Units 1 and 2, with the mitigation measures identified by the review team, would have accrued benefits that most likely would outweigh the economic, environmental, and social costs. For the NRC-proposed action (NRC-authorized construction and operation) the accrued benefits would also outweigh the costs of construction and operation of Units 1 and 2.

10.7 Staff Conclusions and Recommendations

The NRC staff's preliminary recommendation to the Commission related to the environmental aspects of the proposed action is that the COLs should be issued. The NRC staff's evaluation of the safety and emergency preparedness aspects of the proposed action will be addressed in the Safety Evaluation Report that is anticipated to be published in 2011.

The staff's preliminary recommendation is based on (1) the ER submitted by PEF (2009a); (2) consultation with Federal, State, Tribal, and local agencies; (3) the review team's own independent review; (4) the staff's consideration of public scoping comments; and (5) the assessments summarized in this EIS, including the potential mitigation measures identified in the ER and the EIS. In addition, in making its preliminary recommendation, the NRC staff determined that none of the alternative sites assessed is obviously superior to the LNP site.

The NRC's determination is independent of the USACE's permit decision, which will be documented in the USACE's Record of Decision.

10.8 References

10 CFR Part 50. Code of Federal Regulations, Title 10 *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 52. Code of Federal Regulations, Title 10, *Energy*, Part 52, Licenses, Certifications and Approvals for nuclear Power Plants.

33 CFR Part 320. Code of Federal Regulations, Title 33, *Navigation and Navigable Waters*, Part 320, "General Regulatory Policies."

33 CFR Part 332. Code of Federal Regulations, Title 33, *Navigation and Navigable Waters*, Part 332, "Compensatory Mitigation for Losses of Aquatic Resources."

40 CFR Part 230. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 230, "Guidelines for Specification of Disposal Sites for Dredged or Fill Material."

40 CFR Part 1508. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 1508, "Terminology and Index."

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29 Florida Statutes 403.519. 2009. Florida Statute, Title 29, *Public Health*, Chapter 403, Environmental Control, Part 2, Electrical Power Plant and Transmission Line Siting, Section 519, "Exclusive Forum for Determination of Need." Accessed April 29, 2009 at http://www.leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=Ch0403/SEC519.HTM&Title=-%3E2005-%3ECh00403-%3ESection%20519#0403.519.

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Progress Energy Florida, Inc. (PEF). 2008. *Levy Nuclear Plant Units 1 and 2, Site Certification Application, Volumes 1 through 9*. St. Petersburg, Florida. Including Amendments and Supplemental Information. Available at http://www.dep.state.fl.us/siting/apps.htm#ppn1.

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Progress Energy Florida, Inc. (PEF). 2009b. Letter from Garry Miller, PEF, to NRC, dated September 3, 2009, regarding Supplement 5 to Response to Request for Additional Information Regarding the Environmental Review. Accession No. ML091740487.

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Appendix A

Contributors to the Environmental Impact Statement

Appendix A

Contributors to the Environmental Impact Statement

The overall responsibility for the preparation of this environmental impact statement was assigned to the Office of New Reactors, U.S. Nuclear Regulatory Commission (NRC). The statement was prepared by members of the Offices of New Reactors with assistance from other NRC organizations, the U.S. Army Corps of Engineers, Pacific Northwest National Laboratory, and Information Systems Laboratories.

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Laura Quinn	Office of New Reactors	Project Support
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Michelle Moser[(a)]	Office of New Reactors	Assistant Project Manager, Cultural Resources, Land Use, Cumulative Effects
Michelle Hart	Office of New Reactors	Severe and Design Basis Accidents
Kevin Quinlan	Office of New Reactors	Meteorology, Air Quality
David Sisk	Office of New Reactors	Demography
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Richard Emch	Office of New Reactors	Health Physics, Radioactive Waste Management, Nonradiological Health, Decommissioning, Uranium Fuel Cycle
Andrew Kugler	Office of New Reactors	Nonradiological Waste Management, Alternative System Designs, Alternative Sites
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Name	Affiliation	Function or Expertise
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Larry Berg		Meteorology, Air Quality
David Anderson		Need for Power
Vince Vermeul		Groundwater Use, Hydrology
Rajiv Prasad		Surface Water Use, Hydrology
Robert Bryce		Site Layout and Plant Description, Surface Water Use, Hydrology
Nancy Kohn		Site Layout and Plant Description, Hydrology
Lance Vail		Surface Water Use, Hydrology
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Bill Mendez	ICF International[(c)]	Nonradiological Health
Ralph Grismala	ICF International[(c)]	Nonradioactive Waste, Fuel Cycle
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(a) Staff member is no longer with the NRC Office of New Reactors.
(b) Pacific Northwest National Laboratory is operated by Battelle for the U.S. Department of Energy.
(c) ICF International and Sandy Cohen & Associates (SC&A) are a subcontractor to Information Systems Laboratories

Appendix B

Organizations Contacted

Appendix B

Organizations Contacted

The following Federal, State, regional, Tribal, and local organizations were contacted during the course of the U.S. Nuclear Regulatory Commission staff's independent review of potential environmental impacts from the construction and operation of two new nuclear units, Levy Nuclear Plant (LNP) Units 1 and 2, at the LNP site in Levy County, Florida:

Advisory Council on Historic Preservation, Washington, D.C.

AF Knotts Public Library, Yankeetown, Florida

Bronson City Council, Bronson, Florida

Bronson Public Library, Bronson, Florida

Chassahowitzka National Wildlife Refuge, Crystal River, Florida

Citrus County Commission, Inverness, Florida

Citrus County Environmental Health Division, Inverness, Florida

Citrus County School District, Inverness, Florida

Coastal Region Library, Crystal River, Florida

Dixie County Environmental Health Division, Cross City, Florida

Dunnellon Branch Library, Dunnellon, Florida

Florida Department of Environmental Protection, Tallahassee, Florida

Florida Department of Revenue, Tallahassee, Florida

Florida Department of Transportation, Tallahassee, Florida

Florida Division of Historical Resources, Office of Cultural and Historical Programs, Tallahassee, Florida

Florida Fish and Wildlife Conservation Commission, North Central Region, Lake City, Florida

Florida Fish and Wildlife Conservation Commission, Headquarters, Tallahassee, Florida

Gilchrist County Administration, Trenton, Florida

Goethe State Forest, Crystal River, Florida

Highlands County Children's Services, Sebring, Florida

Highlands County Cooperative Extension Service, Sebring, Florida

Highlands County Environmental Health Division, Sebring, Florida

Highlands County Human Services, Sebring, Florida

Inglis Town Commission, Inglis, Florida

Lafayette County Board of Commissioners, Mayo, Florida

Levy County School District, Bronson, Florida

Levy County Tax Collector, Bronson, Florida

National Marine Fisheries Service, Southeast Regional Office, St. Petersburg, Florida

Marion County School District, Ocala, Florida

Miccosukee Tribe, Miami, Florida

Muscogee Nation of Florida, Bruce, Florida

Perdido Bay Tribe of Lower Muscogee Creeks, Pensacola, Florida

Putnam County Environmental Health Division, Palatka, Florida

Seminole Nation of Oklahoma, Wewoka, Oklahoma

Seminole Tribe of Florida, Hollywood, Florida

Southwest Florida Water Management District, Brooksville, Florida

Taylor County Economic Development Department, Perry, Florida

U.S. Army Corps of Engineers, Jacksonville District, Panama City, Florida

U.S. Environmental Protection Agency, Region 4, Atlanta, Georgia

U.S. Fish and Wildlife Service, Jacksonville Field Office, Jacksonville, Florida

Appendix C

NRC and USACE Environmental Review Correspondence

Appendix C

NRC and USACE Environmental Review Correspondence

This appendix contains a chronological list of correspondence between the U.S. Nuclear Regulatory Commission (NRC) or the U.S. Army Corps of Engineers (USACE) and Progress Energy Florida, Inc. (PEF). Other correspondence related to the environmental review of PEF's application for combined licenses (COLs) and a USACE permit at the Levy Nuclear Plant (LNP) site in Levy County, Florida, is also included.

All documents, with the exception of those containing proprietary information, are available electronically from the Public Electronic Reading Room found on the Internet at the following web address: www.nrc.gov/reading-rm.html. From this website, the public can gain access to the NRC's Agencywide Documents Access and Management System (ADAMS), which provides text and image files of NRC's public documents. The ADAMS accession number or *Federal Register* citation for each document is included below.

June 30, 2008	Letter from Mr. Osvaldo Collazo, USACE, to Mr. John Hunter, PEF, regarding Department of the Army Permit to Construct a Barge Slip, Boat Ramp, Access Road, and Bridge to Connect the Slip/Ramp to County Road 40 (Accession No. ML090610068).
July 28, 2008	Letter from Mr. James Scarola, PEF, to NRC, regarding Application for Combined License for Levy Nuclear Power Plant Units 1 and 2, NRC Project Number 756 (Package Accession No. ML082260278).
July 28, 2008	Letter from Mr. James Scarola, PEF, to NRC, regarding Supplemental Meteorological Data in Support of Combined License Application for Levy Nuclear Power Plant Units 1 and 2 (Accession No. ML082260278).
August 8, 2008	Letter from Mr. Osvaldo Collazo, USACE, regarding Corps Request to Serve as a Cooperating Agency with the NRC as the Lead Agency in the Preparation of the EIS for the Levy Project (Accession No. ML082380171).

September 12, 2008	Letter from Mr. James Scarola, PEF, to NRC, regarding Levy Nuclear Plant Units 1 and 2 (LNP), NRC Project Number 756, LNP COLA Supplemental Information (Accession No. ML082660675).
September 15, 2008	Letter to Mr. James Scarola, PEF, from NRC, regarding Acknowledgment of Receipt of the Combined License Application for Levy County Nuclear Plant Units 1 and 2 and Associated Federal Register Notice (Accession No. ML082460287).
October 6, 2008	Letter to Mr. James Scarola, PEF, from NRC, regarding Acceptance Review for the Levy County Nuclear Power Plant Units 1 and 2 Combined License Application (Accession No. ML082760222).
October 6, 2008	*Federal Register* Notice of Acceptance for Docketing of An Application For Combined License for Levy County Nuclear Power Plant Units 1 and 2 Docket Nos. 52-029 and 52-030 (Accession No. ML082760254).
October 10, 2008	Letter to Mr. Osvaldo Collazo, USACE, from NRC, regarding Request to Cooperate with the Nuclear Regulatory Commission on the Environmental Impact Statement for the Levy Nuclear Plant, Units 1 and 2 Combined License Application (Accession No. ML082490566).
October 14, 2008	Letter to Ms. Lesa Ehlers, Coastal Region Library, Citrus County, from NRC, regarding Maintenance of Reference Materials at the Coastal Region Library Related to the Environmental Review of the Levy Nuclear Plant Combined License Application (Accession No. ML082401332).
October 14, 2008	Letter to Ms. Ann Fenton, Dunnellon Branch Library, from NRC, regarding Maintenance of Reference Materials at the Dunnellon Branch Library Related to the Environmental Review of the Levy Nuclear Plant Combined License Application (Accession No. ML082401350).
October 14, 2008	Letter to Ms. Sandy Moseley, Bronson Public Library, Levy County, from NRC, regarding Maintenance of Reference Materials at the Bronson Public Library Related to the Environmental Review of the Levy Nuclear Plant Combined License Application (Accession No. ML082480634).
October 17, 2008	Letter to Mr. James Scarola, PEF, from NRC, regarding Notice of Intent to Prepare and Environmental Impact Statement and Conduct Scoping Related to a Combined License Application for Levy Nuclear Plant, Units 1 and 2 (Accession No. ML082830024).

October 20, 2008	Memorandum to USACE, Jacksonville District, from CH2M Hill/Progress Energy, regarding Clean Water Act Jurisdictional Determination of Wetlands Located on Levy Nuclear Plant Site, Levy County, Florida (Accession No. ML090760467).
October 24, 2008	*Federal Register* Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process for Levy Nuclear Power Plant, Units 1 and 2, Combined License Application and Limited Work Authorization (Accession No. ML083010028).
November 5, 2008	Letter to Mr. Frederick Gaske, Director, Division of Historical Resources, State Historic Preservation Officer, Office of Cultural and Historical Programs, from NRC, regarding Request for Participation in the Scoping Process for the Proposed Levy County Nuclear Plant, Units 1 and 2, Combined License Application Review (Accession No. ML082740519).
November 5, 2008	Letter to The Honorable Chairman Billy Cypress, Miccosukee Tribe, from NRC, regarding Request for Participation in the Scoping Process for the Environmental Review of the Levy County, Units 1 and 2, Combined License Application (Accession No. ML082740531).
November 5, 2008	Letter to The Honorable Chairman Mitchell Cypress, Seminole Tribe of Florida, from NRC, regarding Request for Participation in the Scoping Process for the Environmental Review of the Levy County, Units 1 and 2, Combined License Application (Accession No. ML082740536).
November 5, 2008	Letter to Mr. David Bernhart, Assistant Regional Administrator for Protected Resources, National Marine Fisheries Service, Southeast Regional Office, from NRC, regarding Request for Participation in the Environmental Scoping Process and a List of Protected Species Within the Area Under Evaluation for the Levy Nuclear Plant, Units 1 and 2, Combined License Application Review (Accession No. ML082750414).
November 5, 2008	Letter to Mr. Jay Herrington, U.S. Fish and Wildlife Service, Jacksonville Field Office, from NRC, regarding Request for Participation in the Environmental Scoping Process and a List of Protected Species Within the Area Under Evaluation for the Levy Nuclear Plant, Units 1 and 2, Combined License Application Review (Accession No. ML082750418).

November 6, 2008	Letter to Mr. Don Klima, Office of Federal Agency Programs, Advisory Council on Historic Preservation, from NRC, regarding Request for Participation in the Scoping Process for the Proposed Levy County Nuclear Plant, Units 1 and 2, Combined License Application Review (Accession No. ML082740502).
November 6, 2008	Letter to Mr. Rolando Garcia, Regional Director North Central Region, Florida Fish and Wildlife Conservation Commission, from NRC, regarding Request for Participation in the Scoping Process and List of State Listed Protected Species for the Environmental Review for the Levy Nuclear Plant, Units 1 and 2, Combined License Application Review (Accession No. ML082750434).
November 6, 2008	Letter from Mr. James Scarola, PEF, to NRC, regarding Request for Withholding of Proprietary Information Related to Shearon Harris Nuclear Power Plants Units 2 and 3 and Levy Nuclear Power Plants Units 1 and 2 (Accession No. ML083240398). Note: Contains proprietary information and is not publicly available.
November 14, 2008	NRC Memorandum regarding Notice of Public Meeting to Discuss Environmental Scoping Process for the Levy Nuclear Plant, Units 1 and 2, Combined License Application (Accession No. ML082961065).
November 18, 2008	Letter from Mr. James Scarola, PEF, to NRC, regarding Supplemental Information for Hydrology Audit – Calculation Native Files, Levy Nuclear Power Plant Units 1 and 2 (Accession No. ML083300261).
November 24, 2008	Email correspondence from Mr. Mark Sramek, National Oceanic and Atmospheric Administration, to NRC, regarding Essential Fish Habitat Requirements for Species Managed by the Gulf of Mexico Fishery Management Council: Ecoregion 2, Tarpon Springs to Pensacola Bay, Florida, Levy Nuclear Plant Application (Package Accession No. ML091180050).
December 10, 2008	Email from Mr. Steve Terry, NAGPRA & Section 106 Coordinator for Mr. Fred Dayhoff, NAGPRA & Section 106 Representative, Miccosukee Tribe, to NRC, regarding Knowledge Cultural Resources Located in the Area of the Two New Proposed Nuclear Power Units (Accession No. ML090120781).

December 11, 2008	Email correspondence from Mr. Robert Hoffman, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Endangered Species Branch, to NRC, regarding NRC's November 5, 2008 Letter Requesting a List of Protected Species Within the Area Under Evaluation for the Levy Nuclear Plant, Units 1 and 2, Combined License Application Review (Accession No. ML083510905).
December 11, 2008	Letter from Mr. Frederick Gaske, Director and State Historic Preservation Officer, Division of Historical Resources, Florida Department of State, to NRC, regarding Response to Possible Impacts to Historic Properties Listed, or Eligible for Listing, in the National Register of Historic Properties, DHR No.: 2008-07149, Proposed Levy County Nuclear Plant, Unit 1 and 2, Levy County (Accession No. ML090650566).
December 17, 2008	Letter from Mr. James Scarola, PEF, to NRC, regarding Supplemental Information for Levy Environmental Audit – Geographic Information System Data (Accession No. ML090260730).
December 17, 2008	Email from Ms. Shelley Norton, National Oceanic and Atmospheric Association, to NRC, regarding Marine Mammal Strandings Information (Accession No. ML090120793).
December 18, 2008	Memorandum on Summary of August 21, 2008 Public Meeting on Levy County Combined License (Accession No. ML083510263).
December 19, 2008	Letter from Mr. James Scarola, PEF, to NRC, regarding Supplemental Information for Environmental Audit – Calculation Native Files (Accession Nos. ML083650409 and ML090210290).
December 19, 2008	Letter from Mr. Heinz J. Mueller, Chief, U.S. Environmental Protection Agency, to NRC, regarding Scoping Process Comments for the Levy Nuclear Plant Units 1 and 2 (Accession No. ML090400336).
December 23, 2008	NRC Memorandum on Summary of Public Scoping Meetings Related to the Combined Licenses Application Review for Levy Nuclear Plant, Units 1 and 2 (Accession No. ML083460121).
December 23, 2008	Letter from Ms. Mary Olson, Nuclear Information and Resource Service, to NRC, regarding Request for Extension of Public Comment Period and Scoping Comments (Accession No. ML090060933).

December 24, 2008	Letter to Ms. Linda Cohan, AF Knotts Public Library, regarding Maintenance of Reference Materials at the AF Knotts Public Library Related to the Environmental Review of the Levy Nuclear Plant Combined License Application (Accession No. ML083580064).
January 16, 2009	Letter to Ms. Mary Olson, Southeast Regional Coordinator, Nuclear Information and Resource Service, from NRC, regarding Request for an Extension of the Comment Period Associated with the Levy Nuclear Plant Environmental Scoping Process (Package Accession No. ML090080566).
January 16, 2009	Public Notice from the USACE regarding Elimination of the Inglis Lock Structure for Safety Concerns, Permit Application No. SAJ-2008-04617 (IP-SEG) (Accession No. ML090610055).
January 16, 2009	Letter from Mr. James Scarola, PEF, to NRC, regarding Supplemental Information for Environmental Audit – Information Needs with Attachments (Package Accession No. ML090750823).
February 3, 2009	Letter to Mr. Gordon Hambrick, USACE, from Mr. Jamie Hunter, PEF, regarding No Permit Required Request for Roller Compacted Test Pad (Accession No. ML090610058).
February 4, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Shearon Harris Nuclear Power Plant, Units 2 and 3, and Levy Nuclear Power Plant, Units 1 and 2, Contracts for Disposal of High-Level Radioactive Waste (Accession No. ML090400618).
February 5, 2009	Letter to Mr. Jamie Hunter, PEF, from Mr. Gordon Hambrick, USACE, regarding Request for Confirmation that a Department of the Army Permit Would not be Required for the Construction of a “Roller Compacted Concrete Test Pad” at the Proposed Levy Nuclear Plant Site, SAJ-2007-490 (NPR-GAH) (Accession No. ML090610047).
February 9, 2009	Letter from Ms. Charlene Vaughn, Advisory Council on Historic Preservation, to NRC, Notification and Request for Consultation and Participation in the Scoping Process for the Units 1 and 2 COL review for Levy County Nuclear Plant near Inglis, Florida (Accession No. ML090620074).

February 9, 2009	Letter from Mr. Dave L. Hankla, FWS, to NRC, regarding Request for Scoping Comments During the Scoping Comment Period and Information on Federally-Listed Species and Critical Habitat that may be in the Vicinity of the Project Site, the Associated Transmission Line Rights-of-Way, and the Alternative Sites (Accession No. ML090720063).
February 18, 2009	Letter to Mr. James Scarola, PEF, from NRC, regarding Levy County Nuclear Power Plant Units 1 and 2 Combined License Application Review Schedule (Accession No. ML090350045).
February 24, 2009	Letter to Mr. James Scarola, PEF, from NRC, regarding Request for Additional Information Regarding the Environmental Review of the Combined License Application for the Levy Nuclear Power Plant, Units 1 and 2 (Package Accession No. ML090500782).
March 13, 2009	Letter to Mr. James Scarola, PEF, from NRC, regarding Addendum to Request for Additional Information Regarding the Environmental Review of the Combined License Application for the Levy Nuclear Power Plant, Units 1 and 2 (Package Accession No. ML090610163).
March 16, 2009	Letter from Mr. James Scarola, PEF, to NRC, regarding Submittal of Site Selection Study in Accordance with 10 CFR 2.390 (Accession No. ML090830375). Note: Contains proprietary information and is not-publicly available.
March 16, 2009	Public Notice, USACE, Public Notice Describing the Levy Project and State and Federal Agency Responsibilities, Permit Application No. SAJ-2008-490 (IP-GAH) (Accession No. ML090890419).
March 17, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Supplemental Meteorological Data in Support of Combined License Application – Second Year of Data, Levy Nuclear Power Plant, Units 1 and 2 (Accession No. ML090830690).
March 17, 2009	Email correspondence from Florida Fish and Wildlife Conservation Commission, Division of Law Enforcement responding to U.S. Army Corps of Engineers Public Notice, Permit Application No. SAJ-2008-490 (IP-GAH) (Package Accession No. ML091230009).

March 23, 2009	Letter from Mr. Miles M. Croom, National Marine Fisheries Service, to Colonel Paul L. Grosskruger, District Engineer, Panama City Regulatory Office, Jacksonville District, USACE, regarding U.S. Army Corps of Engineers Public Notice, Permit Application No. SAJ-2008-490 (IP-GAH) (Accession No. ML091230014).
March 27, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Supplemental Information for Environmental Review: Native Files – Cooling Tower Plume and Thermal Plume Modeling (Package Accession No. ML090910125).
March 27, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Response to USACE Request for Additional Information Regarding the Environmental Review (Accession No. ML091320050).
March 27, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Response to USACE Request for Additional Information Regarding the Environmental Review (Accession No. ML090920287).
March 31, 2009	Letter from Mr. Harold R. Ross, President, Ross Hammock Ranch, to Mr. Gordon Hambrick, USACE, regarding Response to Corps Public Notice for the Levy Nuclear Plant Project, SAJ-2008-00490 (IP-GAH) (Accession No. ML091230015).
April 1, 2009	Email to/from Mr. Gordon Hambrick, USACE, to/from Mr. and Mrs. Vaughn, regarding Response, Comment Letters and Emails Received during the Corps Public Notice Period for the Levy Nuclear Plant Project, Progress Energy Florida, SAJ-2008-00490 (IP-GAH) (Accession No. ML091230010).
April 2, 2009	Email from Mr. James Scarola, PEF, to Mr. Gordon Hambrick, USACE, regarding Proprietary Submittal of Siting Study to USACE transmitting Letter regarding Submittal of Site Selection Study; Declaration of Trade Secretes, Commercial and Financial Records Under 32 CFR 518.139d) (Accession No. ML091910709).
April 9, 2009	Letter from Ms. Mary Ann Poole, Florida Fish and Wildlife Conservation Commission, to Colonel Paul L. Grosskruger, USACE, regarding USACE Public Notice, Permit Application No. SAJ-2008-490 (IP-GAH) (Accession No. ML091070009).

April 13, 2009	Letter to/from the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency, regarding Request for an Extension of the Comment Period for the Corps Public Notice for the Levy Nuclear Plant Project, Progress Energy Florida, Levy Nuclear Plant, SAJ-2008-00490 (IP-GAH) (Accession No. ML091230011).
April 13, 2009	Letter to Mr. Frank E. Mathews, Hopping Green & Sams, from David S. Hobbie, Chief, Regulatory Division, Jacksonville District, U.S. Army Corps of Engineers, regarding Potential Extent of Federal Jurisdiction on a Parcel Located at the Site of the Proposed Levy Nuclear Plant in Section 13, Township 16 South, Range 16 East, Inglis, Levy County, Florida (Accession No. ML091070118).
April 14, 2009	Limited Appearance Statement from Harold R. Ross, President, Ross Hammock Ranch, Inc., to NRC, regarding letter sent to the Department of the Army in Response to a Public Notice, Permit Application No. SAJ-2008-490 (IP-GAH), regarding the Progress Energy Levy County Florida Application (Accession No. ML091060221).
April 17, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Supplemental Meteorological Data in Support of Combined License Application – Two Year Chi Over Q Data (Package Accession No. ML091130410).
April 23, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Supplemental Information in Support of combined License Application – Purpose and Need Statement, Levy Nuclear Plant, Units 1 and 2 (Accession No. ML091180670).
April 23, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Supplemental Information in Support of Combined License Application Environmental Review, Levy Nuclear Plant, Units 1 and 2 (Package Accession No. ML091260523).
April 29, 2009	Email from Mr. Gordon Hambrick, USACE, to NRC, regarding Response, Comment Letters, and Emails Received during the Corps Public Notice Period for the Levy Nuclear Plant Project, Progress Energy Florida, Levy Nuclear Plant, SAJ-2008-00490 (IP-GAH) (Accession No. ML091230008).

April 30, 2009	Letter to Mr. James Scarola, PEF, from NRC, regarding Progress Energy Corporation – Request for Withholding of Proprietary Information Related to Shearon Harris Nuclear Power Plant Units 2 and 3 and Levy Nuclear Power Plant Units 1 and 2 (Accession No. ML091040203).
May 1, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Notification to Withdraw Request for a Limited Work Authorization, Levy Nuclear Plant, Units 1 and 2 (Accession No. ML091250350).
May 4, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Submittal of Site Selection Study – Redacted Version, Levy Nuclear Plant, Units 1 and 2 (Package Accession No. ML091340502).
May 6, 2009	Email to Mr. Paul Gagliano and Heinz Mueller, U.S. Environmental Protection Agency, from NRC, regarding Withdrawal of LWA-Levy Nuclear Plant (Package Accession No. ML091320700).
May 6, 2009	Letter to Colonel Paul L. Grosskruger, District Engineer, Jacksonville District, USACE, from Mr. Miles M. Croom, National Marine Fisheries Service, regarding National Marine Fisheries Comments to USACE Public Notice, Permit Application No. SAJ-2008-490 (IP-GAH) (Package Accession No. ML091320681).
May 12, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Response to Request for Additional Information Regarding the Environmental Review, Water Quality Sampling Data (Package Accession No. ML091380294).
May 13, 2009	Letter to Colonel Paul Grosskruger, District Commander, Jacksonville District, USACE, from Mr. James D. Giattina, Director, Water Protection Division, Region 4, U.S. Environmental Protection Agency, regarding response to USACE Public Notice, SAJ-2008-490 (IP-GAH) (Package Accession No. ML091350064).
May 28, 2009	Scoping Summary Report Related to the Environmental Scoping Process for the Levy Nuclear Power Plant, Units 1 and 2 Combined License Application (Accession No. ML091260469).

June 5, 2009	Letter to Colonel Paul Grosskruger, District Commander, Jacksonville District, USACE, from Mr. James D. Giattina, Director, Water Protection Division, Region 4, U.S. Environmental Protection Agency, regarding response to USACE Public Notice, SAJ-2008-490 (IP-GAH) (Package Accession No. ML091660065).
June 8, 2009	Letter to Mr. Harold Ross, Ross Hammock Ranch, Inc., from NRC, regarding Mr. Ross' comments to NRC in response to the USACE Public Notice dated March 16, 2009 (Accession No. ML091340646).
June 12, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Response to Request for Additional Information Regarding the Environmental Review (Package Accession No. ML091740487).
June 23, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Supplement 1 to Response to Request for Additional Information Regarding the Environmental Review, Serial NPD-NRC-2009-107 – Supplemental Information for Environmental Audit Calculation Native Files (Accession No. ML091760672).
June 23, 2009	Letter to Mr. James Scarola, Progress Energy, from NRC, regarding Supplemental Request for Additional Information Regarding the Environmental Review, (Package Accession No. ML091560119).
June 26, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Response to Request for Additional Information Letter No. ER-USACE-RAI Addendum Related to the Environmental Review, Serial NPD-NRC-2009-125 – Response for RAI USACE-11 (Package Accession No. ML091830462).
July 17, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Response to Supplemental Request for Additional Information Regarding the Environmental Review- Native Figure Files (Package Accession No. ML92240694).
July 20, 2009	Letter to Mr. James Scarola, PEF, from NRC, regarding Progress Energy Corporation – Request for Withholding of Proprietary Information Related to Levy Nuclear Power Plant Units 1 and 2 (Package Accession No. ML091770185).

July 20, 2009	Email correspondence from Ms. Cindy Mulkey, Florida Department of Environmental Protection, to NRC, regarding coastal zone consistency (Accession No. ML092290072).
July 22, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Response to Supplemental Request for Additional Information Regarding the Environmental Review- USACE RAI-12 and USACE RAI-13 (Accession No. ML092080076)
July 22, 2009	Letter from Mr. Robert Kitchen, Progress Energy, to NRC, regarding Update of Responses to Request for Additional Information Letter (Accession No. ML092050071).
July 24, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Supplement 2 to Response to Request for Additional Information Regarding the Environmental Review (Accession No. ML092100297).
July 24, 2009	NRC Memorandum regarding Summary of the Environmental Site Audit and Alternative Sites Visit Related to the Review of the Combined License Application for Levy Nuclear Plant, Units 1 and 2 (Accession No. ML091250294).
July 29, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Supplement 3 to Response to Request for Additional Information Regarding the Environmental Review (Package Accession No. ML092240661).
July 29, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Response to Supplemental Request for Additional Information Regarding the Environmental Review- Hydrology 5.3.2.1-2 (Accession No. ML092150337).
July 29, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Response to Supplemental Request for Additional Information Regarding the Environmental Review- Water Quality Sampling Data- Spring 2009 (Accession No. ML092150336).
August 12, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Response 3 to Supplemental Request for Additional Information Regarding the Environmental Review- Hydrology 4.1.1-1 (Package Accession No. ML092260771).

August 25, 2009	Letter to Mr. Steve Terry, Miccosukee Tribe, from NRC, regarding Response to Scoping Comments to Support the Environmental Review of the Levy County, Units 1 and 2, Combined License Application (Accession No. ML092120229).
August 26, 2009	Letter from Mr. Robert Kitchen, Progress Energy, to NRC, regarding Response to Supplemental Request for Additional Information Regarding the Environmental Review- Replacement Fast Web Viewable Figures (Package Accession No. ML092240694).
August 31, 2009	Letter to Chief Micco Bobby Johns Bearheart, Perdido Bay Tribe, Southeastern Lower Muscogee Creek Indians, from NRC, regarding Request for Information for the Environmental Review of the Levy County, Units 1 and 2, Combined License Application (Accession No. ML092120271).
August 31, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Response 4 to Supplemental Request for Additional Information Regarding the Environmental Review (Package Accession No. ML092460206).
August 31, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Supplemental Information Related to Environmental Review - Figure Native Files and CREC 1993/1994 Annual Salt Drift Report (Accession No. ML092470545).
September 3, 2009	Letter to Mr. James Scarola, Progress Energy Florida, from NRC, regarding the Summary of Teleconferences Related to Supplemental RAIs for the Environmental Review (Accession No. ML092240046).
September 3, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Response 5 to Supplemental Request for Additional Information Regarding the Environmental Review (Package Accession No. ML092570297).
September 25, 2009	Letter from Mr. Douglas Bruner, NRC, to Progress Energy regarding Supplemental Request for Additional Information Regarding the Environmental Review of the Combined License Application for the Levy Nuclear Power Plant, Units 1 and 2 (Package Accession No. ML092650231).

October 2, 2009	Letter from Mr. Garry Miller, Progress Energy, to NRC, regarding Progress Energy Florida's Submittal of COL Application, Revision 1 (Accession No. ML092860397).
October 5, 2009	Letter from David Hobbie, Chief, Regulatory Division, USACE, to Progress Energy Florida, regarding SAJ-2008-00490 (JD2-GAH) Jurisdictional Verification "Approved" and "Preliminary" (Accession No. ML092890651).
October 9, 2009	Letter from Mr. Garry. Miller, Progress Energy, to NRC, regarding Supplemental Request for Additional Information Regarding the Environmental Review – Hydrology 4.1.1-1 (Package Accession No. ML092920466).
October 12, 2009	Letter from Mr. Robert Kitchen, Progress Energy, to NRC, regarding Roadmap of Changes in Combined License Application, Rev. 1 (Accession No. ML092890169).
October 13, 2009	Letter from Mr. Robert Kitchen, Progress Energy, to NRC, regarding Schedule for Response to Environmental RAIs, Serial NPD-NRC-2009-217 (Accession No. ML092890091).
October 22, 2009	Letter from Mr. John Elnitsky, Progress Energy, to NRC, regarding Supplemental Information Related to Environmental Review - Figure Native Files (Package Accession No. ML093010543).
October 22, 2009	Letter from Mr. John Elnitsky, Progress Energy, to NRC, regarding Supplemental Information – Water Quality Sampling Data- Summer 2009 (Accession No. ML093010265).
October 26, 2009	Letter from Mr. Robert Kitchen, Progress Energy, to Mr. Gordon Hambrick, USACE, regarding Progress Energy Florida, SAJ-2008-490 (IP-GAH) (Accession No. ML093070175).
November 23, 2009	Letter from Mr. John Elnitsky, Progress Energy, to NRC, regarding Supplement 6 to Response to Request for Additional Information Regarding the Environmental Review (Accession No. ML093380309).
December 2, 2009	Letter from Mr. John Elnitsky, Progress Energy, to NRC, regarding Response to Supplemental Request for Additional Information Regarding the Environmental Review- Hydrology 4.1.1-1 (Package Accession No. ML093441135).

December 3, 2009	Letter from Douglas Bruner, NRC, to Progress Energy regarding the Summary of Teleconferences Discussing Responses to Requests for Additional Information for the Environmental Review of the Levy Nuclear Power Plant Combined License Application (Package Accession No. ML092860080).
December 14, 2009	Letter from Mr. John Elnitsky, Progress Energy, to NRC, regarding Response to Supplemental Request for Additional Information Regarding Environmental Review (Package Accession No. ML093620182).
January 20, 2010	Letter from Mr. Frank Akstulewicz, NRC, to Progress Energy regarding the Levy County Nuclear Power Plant Units 1 and 2 Combined License Application Revised Environmental Review Schedule (Accession No. ML100070638).
January 29, 2010	Letter from Mr. John Elnitsky, Progress Energy, to NRC, regarding Supplement 1 to Response to Supplemental Request for Additional Information Regarding Environmental Review (Package Accession No. ML100470895).
January 29, 2010	Letter from Mr. John Elnitsky, Progress Energy, to NRC, regarding Supplement 7 to Response to Request for Additional Information Regarding Environmental Review (Accession No. ML100470866).
January 29, 2010	Letter from Mr. John Elnitsky, Progress Energy, to NRC, regarding Supplement 7 to Response to Request for Additional Information Regarding Environmental Review (Accession No. ML100470867).
January 29, 2010	Letter from Mr. John Elnitsky, Progress Energy, to NRC, regarding Supplemental Information Related to Environmental Review – Figure Native Files (Accession No. ML100470866).
February 16, 2010	Letter from Mr. John Elnitsky, Progress Energy, to NRC, regarding Supplement 2 to Response to Supplemental Request for Additional Information Regarding the Environmental Review (Accession No. ML100500662).
February 22, 2010	Letter from Mr. John Elnitsky, Progress Energy, to NRC, regarding Supplement 3 to Response to Supplemental Request for Additional Information Regarding Environmental Review (Accession No. ML100560115).

April 12, 2010	Letter from Mr. John Elnitsky, Progress Energy, to NRC, regarding Supplement 8 to Response to Request for Additional Information Regarding the Environmental Review (Accession No. ML101050114).
March 5, 2010	Letter from Mr. Gordon Hambrick, USACE, to PEF, regarding USACE Response to PEF's Section 404(b)(1) Guidelines Analysis for LNP (Accession No. ML100750229).
March 11, 2010	Letter from Mr. Gordon Hambrick, USACE, to PEF, regarding Correction to USACE Response to PEF's Section 404(b)(1) Guidelines Analysis for LNP (Accession No. ML100750229).
March 31, 2010	Letter from Mr. Gordon Hambrick, USACE, to Progress Energy, Regarding USACE Response to Progress Energy Carolinas on Confidentiality Request for Levy Alternative Sites (Accession No. ML100900218).
April 29, 2010	Letter from Mr. Robert Kitchen, Progress Energy, to NRC, regarding Levy Units 1 and 2, Notification of Modification Submitted for LNP SCA (Accession No. ML101230331).
May 11, 2010	Letter from Mr. John Elnitsky, Progress Energy, to NRC, regarding Supplemental Response to Supplemental Request for Additional Information Regarding the Environmental Review – Hydrology 5.3.2.1-2 (Accession No. ML101410224).
May 27, 2010	Letter from Mr. Robert Schaaf, NRC, to Chief Leonard Harjo, Principal Chief, Seminole Nation of Oklahoma, regarding Request for Comment on the Environmental Review of the Levy Nuclear Plant Units 1 and 2 Combined License Application (Accession No. ML1013106220).
May 27, 2010	Letter from Mr. Robert Schaaf, NRC, to Ms. Anne Tucker, Chairwoman, Muscogee Nation of Florida, regarding Request for Comment on the Environmental Review of the Levy Nuclear Plant Units 1 and 2 Combined License Application (Accession No. ML101370530).
June 14, 2010	Letter from Mr. Douglas Bruner, NRC, to Progress Energy, regarding Summary of Teleconferences to Discuss Requests for Additional Information Regarding the Environmental Review of the Combined License Application for Levy Nuclear Plant Units 1 and 2 (Package Accession No. ML100960539).

June 30, 2010	Letter from Mr. Robert Kitchen, Progress Energy, to Mr. Gordon Hambrick, USACE, regarding Response to Comments Received on the Levy Nuclear Units 1 and 2 Section 404(b)(1) Alternatives Analysis, Revision 3 (Accession No. ML1018206450).
July 16, 2010	Letter from Mr. Douglas Bruner, NRC, to Progress Energy, regarding Proprietary Review of Sections of the Draft Environmental Impact Statement Associated with Alternative Sites for Levy Nuclear Power Plant Units 1 and 2 (Accession No. ML101940176).
July 20, 2009	Letter from Mr. Robert Kitchen, Progress Energy, to NRC, regarding Proprietary Review of Sections of the Draft Environmental Impact Statement Associated with Alternative Sites for Levy Nuclear Plant (Accession No. ML102030028).

Appendix D

Scoping Comments and Responses

Appendix D

Scoping Comments and Responses

On October 24, 2008, the U.S. Nuclear Regulatory Commission (NRC) published a Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process in the *Federal Register* (73 FR 63517). The Notice of Intent notified the public of the staff's intent to prepare an environmental impact statement (EIS) and conduct scoping for the combined construction permits and operating licenses (COL) application received from Progress Energy Florida, Inc. (PEF) for two units, identified as Units 1 and 2, to be located at the Levy Nuclear Plant (LNP) site. The LNP site is located approximately 4 mi north of the Levy-Citrus County border, 7.9 mi east of the Gulf of Mexico, and 30.1 mi west of Ocala, Florida. The NRC invited the applicant; Federal, Tribal, State, and local government agencies; local organizations; and individuals to participate in the scoping process by providing oral comments at the scheduled public meeting and/or submitting written suggestions and comments no later than December 23, 2008.

D.1 Overview of the Scoping Process

The scoping process provides an opportunity for public participants to identify issues to be addressed in the EIS and highlight public concerns and issues. The Notice of Intent identified the following objectives of the scoping process:

- Define the proposed action that is to be the subject of the EIS.
- Determine the scope of the EIS and identify significant issues to be analyzed in depth.
- Identify and eliminate from detailed study those issues that are peripheral or that are not significant.
- Identify any environmental assessments and other EISs that are being prepared or will be prepared that are related to, but not part of, the scope of the EIS being considered.
- Identify other environmental review and consultation requirements related to the proposed action.
- Identify parties consulting with the NRC under the National Historic Preservation Act, as set forth in 36 CFR 800.8(c)(1)(i).
- Indicate the relationship between the timing of the preparation of the environmental analyses and the Commission's tentative planning and decision-making schedule.

- Identify any cooperating agencies and, as appropriate, allocate assignments for preparation and schedules for completing the EIS to the NRC and any cooperating agencies.
- Describe how the EIS will be prepared and include any contractor assistance to be used.

Two public scoping meetings were held at the Florida National Guard Armory in Crystal River, Florida, on December 4, 2008. Approximately 100 people attended the afternoon scoping meeting, and approximately 90 attended the evening session. The scoping meetings began with NRC staff members providing a brief overview of the COL process and the NEPA process. After the NRC's prepared statements, the meeting was open for public comments. Fifty-two attendees provided either oral comments or written statements that were recorded and transcribed by a certified court reporter. In addition to the oral and written statements provided at the public scoping meeting, 4 letters and 30 emails were received during the scoping period.

Transcripts for both the afternoon and evening scoping meetings can be found in the NRC Agencywide Document Access and Management System (ADAMS) under accession numbers ML083520102 and ML083520105, respectively. ADAMS is accessible from the NRC website at http://www.nrc.gov/reading-rm/adams/web-based.html (in the Public Electronic Reading Room; note: the URL is case-sensitive). Additional comments received later in letters or emails are also available. A meeting summary memorandum (ML083460121) was issued December 23, 2008.

At the conclusion of the scoping period, the NRC staff reviewed the scoping meeting transcripts and all written material received during the comment period and identified individual comments. These comments were organized according to topic within the proposed EIS or according to the general topic if outside the scope of the EIS. Once comments were grouped according to subject area, the staff determined the appropriate response for the comment. The staff made a determination on each comment that it was one of the following:

- a comment that was actually a question and introduced no new information
- a comment that was either related to support or opposition of combined licensing in general (or specifically the LNP COL) or made a general statement about the COL process. In addition, it provided no new information and did not pertain to 10 CFR Part 52.
- a comment about an environmental issue that
  - provided new information that would require evaluation during the review
  - provided no new information.
- a comment that was outside the scope of the COL, which included, but was not limited to
  - a comment on the safety record of the applicant.

Preparation of the EIS has taken into account the relevant issues raised during the scoping process. The comments received on the draft EIS will be considered in the preparation of the final EIS. The final EIS, along with the staff's Safety Evaluation Report (SER), will provide much of the basis for the NRC's decision on whether to grant the LNP COL.

The comments related to this environmental review are included in this appendix. They were extracted from the *Levy Nuclear Plant Combined License Scoping Summary Report (ML091260469)* and are provided for the convenience of those interested specifically in the scoping comments applicable to this environmental review. The comments that are outside the scope of the environmental review for the proposed LNP site are not included in this appendix. These include comments related to the following:

- safety
- emergency preparedness
- NRC oversight for operating plants
- security and terrorism
- support or opposition to the licensing action, licensing process, nuclear power, hearing process, or the applicant.

More detail regarding the disposition of general or out-of-scope comments can be found in the Scoping Summary Report. To maintain consistency with the Scoping Summary Report, the comment source identification (ID) and comment number along with the name of the commenter used in that report are retained in this appendix.

Table D-1 identifies, in alphabetical order, the individuals who provided comments during the scoping period, their affiliation (if given), and the ADAMS accession number that can be used to locate the correspondence. Although all commenters are listed, the comments presented in this appendix are limited to those within the scope of the environmental review. Table D-2 lists the comment categories in alphabetical order and commenter names and comment numbers for each category. The balance of this appendix presents the comments themselves with NRC staff responses organized by topic category.

Table D-1. Individuals Providing Comments During Scoping Comment Period

Commenter	Affiliation (if stated)	Comment Source and ADAMS Accession #	Correspondence ID Number
Albert, Pamela		Meeting Transcript (ML083520105)	0015
Arnason, Deb		Email (ML090060934)	0039
Barnwell, Martha	Progress Energy Florida	Meeting Transcript (ML083520102)	0014
		Meeting Transcript (ML083520105)	0015
Berger, Betty		Meeting Transcript (ML083520105)	0015
Berger, Sarah		Email (ML083640014)	0020
Bullock, Wade		Email (ML083510834)	0013
Burrell, Troy	Burrell Engineering	Meeting Transcript (ML083520102)	0014
Cannon, Renate		Meeting Transcript (ML083520102)	0014
Casey, Emily	Environmental Alliance of North Florida	Meeting Transcript (ML083520105)	0015
Cheek, Ken		Meeting Transcript (ML083520102)	0014
Cox, Lesley		Email (ML083640026)	0029
Craig, Avis		Email (ML090060936)	0035
Damato, Dennis		Meeting Transcript (ML083520105)	0015
Davis, Suellyn		Email (ML083470118)	0009
Dickinson, Josh		Email (ML083470113)	0006
Dickinson, Sally		Email (ML083470113)	0006
Douglas, Amanda	Nature Coast Business Development Council	Meeting Transcript (ML083520102)	0014
Edison, Jeff	Levy County Schools	Meeting Transcript (ML083520102)	0014
Eppes, Thomas		Meeting Transcript (ML083520102)	0014
		Letter (ML090480055)	0043
Foreman, Patricia		Email (ML090060937)	0036
		Meeting Transcript (ML083520102)	0014
Frink, Ken	Burrell Engineering	Meeting Transcript (ML083520102)	0014
Garvin, Bill		Email (ML083640012)	0018
Haghighat, Alireza		Email (ML083470108)	0005
Harris, Mac		Meeting Transcript (ML083520102)	0014
Hernandez, Michael		Meeting Transcript (ML083520102)	0014
		Meeting Transcript (ML083520105)	0015
Heywood, Harriet		Email (ML083640013)	0019
Highsprings, Jojo		Email (ML083640019)	0023

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Table D-1. (contd)

Commenter	Affiliation (if stated)	Comment Source and ADAMS Accession #	Correspondence ID Number
Hilliard, Dan		Meeting Transcript (ML083520102)	0014
Hodges, Alan	University of Florida	Meeting Transcript (ML083520105)	0015
Hollins, Dixie	Hollinswood Ranch	Meeting Transcript (ML083520105)	0015
Hopkins, Norman	Unnamed environmental organizations	Meeting Transcript (ML083520102)	0014
		Meeting Transcript (ML083520105)	0015
Horgan, Wendy		Email (ML083640024)	0028
Johannesen, Francine	Marion County Building Industry Association	Letter (ML083500251)	0010
Jones, Art		Meeting Transcript (ML083520102)	0014
Karson, Annabeth		Email (ML083640030)	0031
Kirk, Susan	City of Crystal River	Meeting Transcript (ML083520102)	0014
Klutho, Mark		Meeting Transcript (ML083520105)	0015
Latimer, Al	Enterprise Florida	Meeting Transcript (ML083520102)	0014
Lewis, Maloni		Meeting Transcript (ML083520105)	0015
Maidhof, Gary	Citrus County Department of Development	Meeting Transcript (ML083520102)	0014
		Meeting Transcript (ML083520105)	0015
Malwitz-Jipson, Merrillee		Email (ML083640018)	0006
		Email (ML083640018)	0042
Marmish, John	United Way of Citrus County	Meeting Transcript (ML083520102)	0014
Marraffino, Paul		Meeting Transcript (ML083520102)	0014
McCray-Holly, Katrice	Community Action Foundation of Citrus County	Meeting Transcript (ML083520105)	0015
Medlin, Ted		Email (ML083460103)	0040
Michaels, Edward		Email (ML083640016)	0021
Miller, Joan		Email (ML083640011)	0017
Miller, Ron		Email (ML083640011)	0017
Moore, Brian		Meeting Transcript (ML083520105)	0015
Mucci, Matt	Advocacy for the Tampa Bay Partnership	Meeting Transcript (ML083520102)	0014
Mueller, Heinz J	Environmental Protection Agency	Letter (ML090400336)	0044
Murphy, Joe	Gulf Restoration Network	Meeting Transcript (ML083520105)	0015
Musser, Marcie		Email (ML083470117)	0008
Nelson, Tami		Email (ML083640023)	0027
Olson, Mary		Email (ML090060933)	0038
Pernu, Dorothy	Seven Rivers Regional Medical Center	Meeting Transcript (ML083520105)	0015

Table D-1. (contd)

Commenter	Affiliation (if stated)	Comment Source and ADAMS Accession #	Correspondence ID Number
Peters, Michael		Meeting Transcript (ML083520105)	0015
Renfro, E. E.	Meadowcrest Community Association	Email (ML090060935)	0034
Roberts, Preston		Meeting Transcript (ML083520102)	0014
Roff, Rhonda		Email (ML083640028)	0030
Russell, John	Self	Meeting Transcript (ML083520102)	0014
Slaback, Laura	Levy County Public Education Foundation	Meeting Transcript (ML083520102)	0014
Smith, Bobbie	Levy County Schools Foundation	Meeting Transcript (ML083520102)	0014
Smith, Robert		Meeting Transcript (ML083520102)	0014
Stewart, Anita		Meeting Transcript (ML083520105)	0015
Sullivan, Jennifer		Meeting Transcript (ML083520105)	0015
Terry, Steve	Miccosukee Tribe	Email (ML090120781)	0037
Towles Ezell, Joy		Email (ML083640022)	0026
Tulenko, James		Letter (ML083500252)	0011
		Meeting Transcript (ML083520102)	0014
Tyler, Janice		Meeting Transcript (ML083520102)	0014
Vianello, Mark	Marion Technical Institute	Meeting Transcript (ML083520102)	0014
Waldron, Theresa	Nature Coast Sierra Group	Meeting Transcript (ML083520102)	0014
		Email (ML083640010)	0016
Walther, Robert	Clean and Safe Energy Coalition	Meeting Transcript (ML083520102)	0014
		Meeting Transcript (ML083520105)	0015
Wapner, Howard		Email (ML083640021)	0006
Welker, Randy	Economic Development Council for Citrus County	Meeting Transcript (ML083520102)	0014
Wheeler, Leonard		Email (ML083640020)	0024
Whiteley, Naomi		Email (ML083470116)	0007
Wilansky, Laura Sue		Email (ML083640031)	0032
Williamson, John	Environmental Radiation Section of the Florida Department of Health, Bureau of Radiation Control	Meeting Transcript (ML083520105)	0015

Table D-2. Comment Categories with Associated Commenters and Comment ID Numbers

Comment Category	Commenter (Comment ID Number)
Accidents – Severe	• Cox, Lesley (0029-3)
	• Davis, Suellyn (0009-4)
	• Heywood, Harriet (0019-8)
	• Musser, Marcie (0008-12)
	• Olson, Mary (0038-12)
	• Wilansky, Laura Sue (0032-12)
Alternatives – Energy	• Arnason, Deb (0039-2) (0039-7) (0039-9)
	• Barnwell, Martha (0014-7) (0014-10) (0015-13) (0015-14)
	• Berger, Betty (0015-94)
	• Cox, Lesley (0029-5) (0029-6)
	• Davis, Suellyn (0009-5)
	• Dickinson, Josh (0006-4) (0006-11)
	• Dickinson, Sally (0006-4) (0006-11)
	• Eppes, Thomas (0014-73) (0014-75) (0014-76) (0014-77) (0014-78) (0014-79)
	• Foreman, Patricia (0036-3)
	• Frink, Ken (0014-38)
	• Haghighat, Alireza (0005-2)
	• Hernandez, Michael (0014-135)
	• Heywood, Harriet (0019-10)
	• Highsprings, Jojo (0023-1)
	• Hopkins, Norman (0014-57) (0014-58) (0014-59) (0015-111)
	• Horgan, Wendy (0028-5)
	• Klutho, Mark (0015-44)
	• Malwitz-Jipson, Merrillee (0006-4) (0006-11) (0042-2)
	• Mucci, Matt (0014-105)
	• Mueller, Heinz J (0044-2)
	• Musser, Marcie (0008-2) (0008-4) (0008-13)
	• Olson, Mary (0038-6) (0038-7) (0038-18)
	• Roberts, Preston (0014-94) (0014-95) (0014-96) (0014-97)
	• Roff, Rhonda (0030-10)
	• Russell, John (0014-68)
	• Stewart, Anita (0015-79) (0015-80)
	• Sullivan, Jennifer (0015-58)
	• Towles Ezell, Joy (0026-2) (0026-8)
	• Tulenko, James (0014-20)
	• Waldron, Theresa (0016-2)
	• Walther, Robert (0014-109) (0014-110) (0015-47)
	• Wapner, Howard (0006-4) (0006-11)
	• Welker, Randy (0014-29)
	• Whiteley, Naomi (0007-2)
	• Wilansky, Laura Sue (0032-10)

Table D-2. (contd)

Comment Category	Commenter (Comment ID)
Alternatives – Sites	• Albert, Pamela (0015-54) • Barnwell, Martha (0014-12) • Casey, Emily (0015-31) • Jones, Art (0014-147) (0014-152) (0014-155) • Mueller, Heinz J (0044-1) • Peters, Michael (0015-96) • Towles Ezell, Joy (0026-3) • Tyler, Janice (0014-158)
Benefit – Cost Balance	• Barnwell, Martha (0014-11) (0015-15) • Davis, Suellyn (0009-2) • Dickinson, Josh (0006-8) • Dickinson, Sally (0006-8) • Eppes, Thomas (0043-1) (0043-3) (0043-4) (0043-5) • Foreman, Patricia (0036-1) • Heywood, Harriet (0019-1) (0019-3) (0019-4) • Hodges, Alan (0015-69) • Hopkins, Norman (0014-56) (0015-110) • Malwitz-Jipson, Merrillee (0006-8) • Miller, Joan (0017-1) • Miller, Ron (0017-1) • Moore, Brian (0015-104) • Musser, Marcie (0008-3) • Olson, Mary (0038-19) • Roberts, Preston (0014-98) • Tulenko, James (0011-6) • Wapner, Howard (0006-8) • Wilansky, Laura Sue (0032-1) (0032-11) (0032-13)
Cumulative Impacts	• Barnwell, Martha (0015-10) • Casey, Emily (0015-32) • Dickinson, Josh (0006-2) • Dickinson, Sally (0006-2) • Hilliard, Dan (0014-185) • Horgan, Wendy (0028-2) • Malwitz-Jipson, Merrillee (0006-2) • Murphy, Joe (0015-114) • Olson, Mary (0038-2) (0038-21) • Peters, Michael (0015-98) • Smith, Robert (0014-34) • Towles Ezell, Joy (0026-5) • Wapner, Howard (0006-2)
Decommissioning	• Russell, John (0014-66) • Wilansky, Laura Sue (0032-9)

Table D-2. (contd)

Comment Category	Commenter (Comment ID)
Ecology – Aquatic	• Cox, Lesley (0029-10) • Davis, Suellyn (0009-3) • Dickinson, Josh (0006-7) • Dickinson, Sally (0006-7) • Hopkins, Norman (0014-55) (0015-109) • Malwitz-Jipson, Merrillee (0006-7) • Murphy, Joe (0015-116) • Musser, Marcie (0008-10) (0008-11) • Wapner, Howard (0006-7)
Ecology – Terrestrial	• Casey, Emily (0015-29) • Marraffino, Paul (0014-115) (0014-179) • Murphy, Joe (0015-113) (0015-122) • Smith, Robert (0014-35)
Health – Non-Radiological	• Marraffino, Paul (0014-117) (0014-118) (0014-183) • Medlin, Ted (0040-5) • Sullivan, Jennifer (0015-64)
Health – Radiological	• Cannon, Renate (0014-128) • Cox, Lesley (0029-7) • Dickinson, Josh (0006-5) • Dickinson, Sally (0006-5) • Hopkins, Norman (0014-54) (0015-106) (0015-107) • Malwitz-Jipson, Merrillee (0006-5) • Marraffino, Paul (0014-119) (0014-181) • Olson, Mary (0038-20) (0038-23) • Roberts, Preston (0014-93) • Roff, Rhonda (0030-1) (0030-6) • Wapner, Howard (0006-5) • Williamson, John (0015-4) (0015-5)
Historic and Cultural Resources	• Terry, Steve (0037-1)
Hydrology – Groundwater	• Berger, Betty (0015-93) • Berger, Sarah (0020-3) • Casey, Emily (0015-25) (0015-27) (0015-28) (0015-30) (0015-33) • Cox, Lesley (0029-9) • Hopkins, Norman (0014-53) (0015-105) • Olson, Mary (0038-10) (0038-13) • Roberts, Preston (0014-92) • Roff, Rhonda (0030-3) (0030-5) (0030-9) • Tyler, Janice (0014-156) • Waldron, Theresa (0014-165) (0014-166) (0014-167) (0014-168) (0014-172) • Wilansky, Laura Sue (0032-3)

Table D-2. (contd)

Comment Category	Commenter (Comment ID)
Hydrology – Surface Water	• Arnason, Deb (0039-5) • Barnwell, Martha (0015-16) • Berger, Betty (0015-91) • Berger, Sarah (0020-2) • Cannon, Renate (0014-126) • Casey, Emily (0015-24) (0015-26) • Cox, Lesley (0029-8) • Dickinson, Josh (0006-6) • Dickinson, Sally (0006-6) • Frink, Ken (0014-41) • Hilliard, Dan (0014-184) (0014-186) • Hopkins, Norman (0015-108) • Jones, Art (0014-148) (0014-149) (0014-153) • Malwitz-Jipson, Merrillee (0006-6) • Marraffino, Paul (0014-116) (0014-182) • Moore, Brian (0015-103) • Murphy, Joe (0015-115) (0015-119) • Musser, Marcie (0008-9) • Olson, Mary (0038-8) (0038-14) (0038-16) • Roff, Rhonda (0030-2) (0030-4) (0030-8) • Wapner, Howard (0006-6) • Wilansky, Laura Sue (0032-2) (0032-4)
Land Use – Site and Vicinity	• Craig, Avis (0035-2) • Medlin, Ted (0040-1) (0040-8) • Welker, Randy (0014-27)
Land Use – Transmission Lines	• Albert, Pamela (0015-88) • Barnwell, Martha (0015-17) • Marmish, John (0014-143) • Peters, Michael (0015-97)
Need for Power	• Barnwell, Martha (0014-6) (0014-8) (0015-11) (0015-12) • Bullock, Wade (0013-1) • Craig, Avis (0035-5) • Foreman, Patricia (0014-50) • Johannesen, Francine (0010-2) (0010-3) • Jones, Art (0014-154) • Maidhof, Gary (0014-131) (0015-1) • Mucci, Matt (0014-103) • Olson, Mary (0038-15) • Pernu, Dorothy (0015-8) • Walther, Robert (0014-108) (0015-46) (0015-48)
Process – COL	• Cheek, Ken (0014-138) • Hilliard, Dan (0014-187)

Table D-2. (contd)

Comment Category	Commenter (Comment ID)
	• Mueller, Heinz J (0044-3) • Murphy, Joe (0015-112)
Process – NEPA	• Cannon, Renate (0044-127) • Olson, Mary (0038-1) • Murphy, Joe (0015-118) (0038-1) • Terry, Steve (0037-2)
Site Layout and Design	• Berger, Betty (0015-92) • Jones, Art (0014-151)
Site Redress	• Mueller, Heinz J (0044-4)
Socioeconomics	• Arnason, Deb (0039-8) • Barnwell, Martha (0014-13) (0014-14) (0015-18) • Berger, Sarah (0020-4) • Bullock, Wade (0013-3) • Cheek, Ken (0014-139) • Douglas, Amanda (0014-61) • Edison, Jeff (0014-1) (0014-3) (0014-4) • Foreman, Patricia (0014-46) (0014-48) (0014-49) (0036-2) • Frink, Ken (0014-37) (0014-40) (0014-44) • Garvin, Bill (0018-1) • Haghighat, Alireza (0005-5) • Hernandez, Michael (0015-52) • Hodges, Alan (0015-66) (0015-67) (0015-68) (0015-70) (0015-71) (0015-72) • Hollins, Dixie (0015-86) • Hopkins, Norman (0014-52) • Klutho, Mark (0015-42) • Latimer, Al (0014-80) (0014-82) (0014-84) • Marmish, John (0014-145) • Medlin, Ted (0040-2) (0040-3) (0040-6) • Michaels, Edward (0021-1) (0021-3) (0021-4) (0021-5) • Mucci, Matt (0014-102) (0014-104) • Murphy, Joe (0015-117) (0015-120) (0015-121) • Musser, Marcie (0008-8) • Pernu, Dorothy (0015-9) • Russell, John (0014-63) (0014-64) • Smith, Robert (0014-36) • Stewart, Anita (0015-77) • Sullivan, Jennifer (0015-55) (0015-63) (0015-78) • Tulenko, James (0011-8) (0014-25) • Tyler, Janice (0014-160) • Vianello, Mark (0014-88) (0014-176) • Waldron, Theresa (0014-169) (0014-171)

Table D-2. (contd)

Comment Category	Commenter (Comment ID)
	• Walther, Robert (0014-112) (0015-49)
	• Welker, Randy (0014-26) (0014-30)
Transportation	• Medlin, Ted (0040-7)
	• Wilansky, Laura Sue (0032-7)
Uranium Fuel Cycle	• Arnason, Deb (0039-4)
	• Cannon, Renate (0014-125) (0014-130)
	• Cox, Lesley (0029-2) (0029-4)
	• Dickinson, Josh (0006-3) (0006-9)
	• Dickinson, Sally (0006-3) (0006-9)
	• Eppes, Thomas (0014-71) (0014-72) (0043-2)
	• Heywood, Harriet (0019-5)
	• Horgan, Wendy (0028-3)
	• Klutho, Mark (0015-37)
	• Malwitz-Jipson, Merrillee (0006-3) (0006-9)
	• Moore, Brian (0015-102)
	• Musser, Marcie (0008-5) (0008-14)
	• Olson, Mary (0038-3) (0038-5) (0038-9) (0038-11)
	• Russell, John (0014-67)
	• Sullivan, Jennifer (0015-61)
	• Towles Ezell, Joy (0026-7)
	• Waldron, Theresa (0014-162)
	• Wapner, Howard (0006-3) (0006-9)
	• Wilansky, Laura Sue (0032-6) (0032-8)

D.2 In-Scope Comments and Responses

The in-scope comment categories are listed in Table D-3 in the order that they are presented in this EIS. In-scope comments and responses are included following the table. Parenthetical numbers shown after each comment refer to the Comment ID number (document number-comment number) and the commenter name.

Table D-3. Comment Categories in Order as Presented in this Report

D.2.1	Comments Concerning Process – COL
D.2.2	Comments Concerning Process – NEPA
D.2.3	Comments Concerning Site Layout and Design
D.2.4	Comments Concerning Land Use – Site and Vicinity
D.2.5	Comments Concerning Land Use – Transmission Lines

Table D-3. (contd)

D.2.6	Comments Concerning Hydrology – Surface Water
D.2.7	Comments Concerning Hydrology – Groundwater
D.2.8	Comments Concerning Ecology – Terrestrial
D.2.9	Comments Concerning Ecology – Aquatic
D.2.10	Comments Concerning Socioeconomics
D.2.11	Comments Concerning Historic and Cultural Resources
D.2.12	Comments Concerning Health – Nonradiological
D.2.13	Comments Concerning Health – Radiological
D.2.14	Comments Concerning Accidents
D.2.15	Comments Concerning the Uranium Fuel Cycle
D.2.16	Comments Concerning Transportation
D.2.17	Comments Concerning Decommissioning
D.2.18	Comments Concerning Site Redress
D.2.19	Comments Concerning Cumulative Impacts
D.2.20	Comments Concerning the Need for Power
D.2.21	Comments Concerning Alternatives – Energy
D.2.22	Comments Concerning Alternatives – Sites
D.2.23	Comments Concerning Benefit-Cost Balance

D.2.1 Comments Concerning Process – COL

Comment: I trust that the NRC and Progress Energy will bring us a responsible design. (**0014-138** [Cheek, Ken])

Comment: For these reasons I have rendered this presentation. I find these apparent inconsistencies unsettling. I do not object to the proposed project in a conceptual sense. However, I pointedly request the various agencies involved in this process hold the State and Applicant to strict interpretation of Federal Statutes and exercise due diligence in this review. The State's determined need for this project is met by a real need to preserve resources in this region. They are very interdependent issues. (**0014-187** [Hilliard, Dan])

Comment: The Gulf Restoration Network (GRN) has deep and profound concerns about the potential environmental impacts that could result from this project being permitted. We strongly urge all local, State, and Federal agencies involved in any and all levels or aspects of permitting this project to fully and completely analyze all potential environmental risks from this project and deny permitting if any environmental review demonstrates a potential threat to Florida's natural resources or regional water systems, supply, or hydrogeology (both in terms of quality and quantity). (**0015-112** [Murphy, Joe])

Response: *The licensing process for combined license (COL) applications is specified in Title 10 CFR Part 52. The environmental review process associated with new reactor licensing includes a detailed review of an applicant's COL application to determine the environmental effects of building and operating the nuclear power facility for up to 40 years. After review of the application against the regulations and regulatory guidance, a mandatory hearing or optional contested hearing will be held where the decision is made about whether or not it is appropriate to grant the license. Safety issues as well as environmental issues will be evaluated before a decision is reached on an application.*

Comment: EPA also has questions about the approval process of certain construction activities mentioned in LNP's Limited Work Authorization (LWA) and Site-Redress Plan. It is our understanding that the LWA may be approved by the NRC prior to all (or most) environmental permits being obtained. Approval of the LWA could therefore potentially authorize site development and deep/shallow foundation construction for the LNP site, to include all or some of the following tasks:

- Installing waterproofing beneath the mud mat under the nuclear islands.
- Installing rebar in the nuclear island concrete foundations.
- Erecting safety-related concrete placement forms.
- Installing Turbine Building foundation drilled shafts.
- Installing Annex Building foundation drilled shafts.
- Installing Radwaste Building foundation drilled shafts.
- Installing circulating water piping between the cooling tower basins and the entrance point to the turbine building condensers. Installing the raw water system intake structure and make-up line to the cooling tower basin.

It is our understanding that the NRC could grant approval of the LWA for the above work prior to approval of the following applications and permits:

- Approval of the application to the NRC for a COL;
- Approval of the application to the State of Florida for site certification;
- Approval of any required National Pollutant Discharge Elimination Permit(s) (NPDES) for water discharge;
- Approval of the Prevention of Significant Deterioration (PSD) air permit;
- Approval of a 316(b) demonstration for the proposed cooling water intake;
- Approval of the U.S. Army Corps of Engineers (USACE) Section 404 and Section 10 permits to construct structures in wetlands and regulated waterways;

- Approval of hazardous waste management and disposal plans;
- Approval of the determination of consistency under the requirements of the Coastal Zone Management Act to ensure the LNP is consistent with existing federal and state coastal zone management plans.

The EIS should clarify whether approval of the LWA can actually occur before most, or all, of the applications and permits mentioned above are approved. (**0044-3** [Mueller, Heinz J])

Response: *By letter to the NRC dated May 1, 2009, Progress Energy provided notification to withdraw their request for a LWA.*

D.3 Comments Concerning Process – NEPA

Comment: After the survey is completed, please continue to consult with us as this project develops. Thank you for consulting with the Miccosukee Tribe. (**0037-2** [Terry, Steve])

Response: *The NRC has initiated consultation with the Miccosukee Tribe in accordance with Section 106 of the National Historic Preservation Act of 1966 and NEPA and will continue to do so throughout the EIS process.*

Comment: I understand that Progress Energy says it is collaborating with local agencies to ensure the plant has no significant adverse impacts on resources or nearby wells. I would like to know which local agencies. (**0014-127** [Cannon, Renate])

Response: *Interactions between Progress Energy and local agencies is outside the purview of NRC's environmental review of the COL application. The NRC has initiated informal consultation with a variety of Federal and State agencies during the environmental review in accordance with the National Environmental Policy Act (NEPA). A list of agencies and organizations contacted will be provided in Appendix B of the EIS. Adverse impacts on surface water and groundwater resources will be addressed in Chapters 4 and 5 of the EIS.*

Comment: In recognition of the Holiday season and the fact that the Progress Energy proposal is in a league of its own - the only "green fields" site not previously licensed for nuclear construction - NIRS asks the Commission to extend the comment period by a minimum of 30 days. We regret that we have not made this request sooner, however it is in the interests of the provisions of the National Environmental Policy Act that affected parties be able to participate in this process fully. The fact that more than half of this comment period falls in the range of Thanksgiving and Christmas/Chanukah/Buddha's Enlightenment/Winter Solstice (NIRS members, including those in Florida, do celebrate across this spectrum) means that people have had to either forgo family celebration or forgo participation in this process. If extension is granted we would appreciate a direct notice of this fact (828-675-1792/ nirs@main.nc.us) and we will notify NIRS members and members of the public with whom we are in contact in Florida. (**0038-1** [Olson, Mary])

Response: *The commenter requests an extension to the scoping comment period. The NRC established the time period for comments on the scope of the environmental review for new licenses to balance the Commission's goal of ensuring openness in the regulatory processes, with its goal of ensuring that the NRC's actions are effective, efficient, realistic, and timely. While the NRC staff believes that the 60 days provided were sufficient for the comment period, the NRC also considered additional comments that were submitted after the scoping period ended to the extent practicable.*

Comment: Please conduct a full consultation with the National Marine Fisheries Service, the Gulf of Mexico Fisheries Management Council, and the Florida Fish and Wildlife Conservation Commission. (**0015-118** [Murphy, Joe])

Response: *In accordance with NEPA, the NRC has initiated informal consultation with a variety of Federal and State agencies during the environmental review. Agencies with which NRC is consulting include the US Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and the Florida Fish and Wildlife Conservation Commission (FFWCC). Impacts on the aquatic environment will be addressed in Chapters 4 and 5 of the EIS.*

D.4 Comments Concerning Site Layout and Design

Comment: I believe that the plant is way too big. I mean, Progress Energy hasn't built any nuclear plants in over thirty years, there's just been nothing built in this country. So if you are going to start building nuclear plants again let's start out with something really small. (**0014-151** [Jones, Art])

Response: *The NRC staff will review the need for power and alternatives analyses for the proposed LNP Units 1 and 2 and these analyses will be discussed in Chapters 8 and 9 of the EIS. The external appearance of the proposed facility will be addressed in Chapter 3 of the EIS.*

Comment: Progress Energy states they will barge building supplies up the Barge Canal. A barge has never been able to use the canal due to the twelve-foot depth and the available width. It was one tried it half loaded and it went aground. So I don't understand how they figured this if they didn't know about the barge in April that went aground. (**0015-92** [Berger, Betty])

Response: *Plant construction, including transportation of materials, will be described in Chapter 3 of the EIS.*

D.5 Comments Concerning Land Use – Site and Vicinity

Comment: We the undersigned, are opposed to the Progress Energy railroad line being placed on the old abandoned railroad bed at the south end of The Villages of Rainbow Springs. (**0040-1** [Medlin, Ted])

Comment: We feel the railroad spur in its proposed location will have an irreversible negative impact on our environment, on our property values and on the quality of our lives. (**0040-8** [Medlin, Ted])

Response: *Progress Energy filed a Notice of Amendment on November 26, 2008, to the State of Florida Site Certification Application (SCA), to amend the SCA to withdraw all of those sections of the SCA which addresses the proposed 13-mile corridor in Levy and Marion Counties, Florida. Additionally, the Progress Energy response to information need CR-5, by letter dated January 16, 2009 to NRC, states that the rail line has been removed from the plan.*

Comment: I was the President of the Community Reuse Organization for the Fernald Feed Plant that was a uranium processing plant in Ohio. And, as you know, we've dismantled most of those plants. And this past summer if you go to this plant you will see a field in an area that is truly wildlife oriented. It is completely returned to its use. Now, is that something we would like to always happen with our power plants in the future? And I would say no, we would like to be able to use these as long as we can and continue to use them so that they are productive and whatever. But I think it does answer the question: Can we return certain sites to pristine conditions, and I would argue yes as we saw there. Again, my background is also in brownfield redevelopment, and I've seen the successful redevelopment of sites that are dirty from what we have done in industry and we've been able to accomplish those tasks. (**0014-27** [Welker, Randy])

Response: *Should the Levy Plant be built, the NRC will require decommissioning of the facility when it permanently ceases operation. Land-use impacts of plant construction will be discussed in Chapter 4 of the EIS, and land-use impacts of plant operation will be discussed in Chapter 5.*

Comment: The site is as well suited to accommodate the proposed use in an area of sparse population. (**0035-2** [Craig, Avis])

Response: *Land use impacts of construction and operation of proposed LNP Units 1 and 2 will be discussed in Chapters 4 and 5 of the EIS.*

D.6 Comments Concerning Land Use – Transmission Lines

Comment: I have also had the opportunity to participate on the community working group which was composed of community and business leaders and local citizens. Our task was to find a route for the transmission lines through Citrus County. And many other counties have similar groups meeting, whether it be Levy, or Hernando I believe had them. And we all worked in conjunction, trying to figure out the best route for these transmission lines. We all voted for everything to be buried below the ground so we didn't have to look at them. That didn't work. That was a very expensive alternative. But we all concluded that the best routes were probably the present routes that we have going through the county, and maybe to tie that in with those lines and with the Suncoast Parkway that's coming up through the county. And the purpose was we wanted to see less impact on to our established communities so that the lines did not disrupt that. (**0014-143** [Marmish, John])

Comment: This site also works well with our transmission facilities like the ones we have existing in our plant facility to help bring this generation to our other customers in our thirty-five counties, as well as serving our customers here in Levy and Citrus. (**0015-17** [Barnwell, Martha])

Comment: All we ask, I think, is that you keep us informed as far as the environmental audit to see impacts on our property. Right now it shows the lines will be going about through our living room. So a good share of our five acres may become transmission lines. I don't know. But anyway, all we ask is that you, you know, keep us informed and best of luck to you. (**0015-88** [Albert, Pamela])

Comment: What we are looking at, folks, is the largest land grab via eminent domain for the new distribution network, which I believe is probably unneeded, in the history of the state. Levy County has had multiple county officials formally involved in ruling on the zoning and other issues involving this plant indicted for bribery at the Federal level most recently. (**0015-97** [Peters, Michael])

Response: *Environmental impacts associated with construction and operation of any planned new transmission line rights-of-way will be addressed in Chapters 4 and 5 of the EIS. The analysis will address any potential impacts associated with upgrades to the existing lines if required. The NRC does not have any regulatory authority regarding the implementation of Federal, State, or local guidelines in siting, constructing, or operating transmission lines. The EIS will address any known or proposed activities that could impact the site or transmission corridor environmental conditions and proposed mitigation measures, as appropriate.*

D.7 Comments Concerning Hydrology – Surface Water

Comment: The vast amounts of water consumed in cooling would make a mockery of State efforts to conserve water. These plants would consume our personal drinking water at an unsustainable rate. (**0006-6** [Dickinson, Josh] [Dickinson, Sally] [Malwitz-Jipson, Merrillee] [Wapner, Howard])

Comment: I worked for the Texas Water Development Board. Bringing me to another point. The agency was not called Water Commission. We had that, too. It said development, meaning there wasn't enough around. And Florida is heading in the right direction, the same direction at an alarming rate. (**0014-126** [Cannon, Renate])

Comment: I am confused by the assertion that the Withlacoochee River does not contribute to the CFBC by the applicant. Within the SCA is a veritable treasure trove of hydrological information, including many pages of data gleaned from USGS stations regarding system flows in the river. There are two engineered discharge points at Lake Rousseau. One is the Inglis Bypass Spillway, which contributes all flows to the Lower Withlacoochee River. It typically provides an average of slightly more than 1,000 CFS to that outstanding Florida water. The second is the Inglis Dam located on the southwest portion of the lake. It provides for water level management on the lake by allowing SWFWMD to discharge excessive water into the CFBC through the upper segment of the Lower Withlacoochee River during high rainfall events. Due to documented leakage there is a contribution of a minimum additional flow of 70 CFS to the segment of the river which discharges in the CFBC and this is a continuous contribution. Within the SCA the applicant has clearly identified contributions to the CFBC for a 35 year period, which during one event exceeded 6,000 CFS (SCA Table 2.3-6 sheets 1 & 2). Monthly mean contributions to the CFBC over the Inglis Dam are in the range of 400 CFS per the applicant's submission. (**0014-186** [Hilliard, Dan])

Comment: We [Progress Energy] have chosen Levy County as our preferred site for several reasons. And one of those is a sufficient supply of cooling water, a critical factor in the operation of a nuclear plant. The preferred site was chosen because it has ample water supply to support the plant without affecting other water usage and requirements in the area. The cooling water for the plant will be supplied by salt water intake coming from the Gulf of Mexico. (**0015-16** [Barnwell, Martha])

Comment: Just like with the economy the world is beginning to realize that we are now experiencing the starting point of a global water crisis. People are slowly cutting back on unnecessary water usage and are starting to make wise choices on when and where to consume water. Globally people are suffering from the lack of clean and fresh water and there is no government that can bail us out of this crisis. Everyone is learning that we cannot continue with business as usual. All over the world people are having to make difficult choices concerning how much water they can obtain for food, cleanliness, health, and industry needs. The choices made today will affect the future of not only many generations of humans to come but the health of all our ecological systems on this planet. This country is in an important period where change does need to occur. (**0015-24** [Casey, Emily])

Comment: The vast amounts of water consumed in cooling would make a mockery of State efforts to conserve water. (**0029-8** [Cox, Lesley])

Comment: And frankly, we need the water that would be used by these plants for other purposes in our state, which already experiences regular droughts, and employs extensive water use restrictions throughout much of the year. (**0032-4** [Wilansky, Laura Sue])

Comment: Given the likelihood that we are entering a period of reduced availability of fresh water - NRC must project not only the environmental impact of such sacrifice of fresh water - but also the human impact in terms of the whole fresh water system in the area, and the economic impact. Is it possible that the profit margin on that freshwater could in only a decade or two actually be greater for a corporation like Progress? (**0038-14** [Olson, Mary])

Comment: [P]lease enlist a climate crisis expert to help you with the assumptions you use when you project water availability. (**0038-16** [Olson, Mary])

Comment: This proposed sacrifice (and approval of an activity that will likely garner public subsidy) must be weighed against a full disclosure of the methodology of projecting supply of cooling water over the course of the license period. A disclosure of the ways in which climate change has or has not been factored and an explanation of either choice. (**0038-8** [Olson, Mary])

Comment: [Nuclear energy] evaporates millions of gallons of water PER DAY. (**0039-5** [Arnason, Deb])

Response: *The construction and operation of a nuclear plant involves the consumption of water. The staff will independently assess the impact of these consumptive water losses on the sustainability of both the local and regional water resources. This assessment will consider both current and future conditions, including changes in water demands to serve the needs of the future population and changes in water supply resulting from climate variability and climate change. While NRC does not regulate or manage water resources, it does have the responsibility under NEPA to assess and disclose the impacts of the proposed action on water resources. The staff's assessment of the impacts on the sustainability of water resources will be presented in Chapters 4 and 5 of the EIS for construction and operation, respectively.*

Comment: The Waccasassa River Drainage Basin is a precious resource; the presence of nuclear power reactors within the basin could seriously jeopardize its well-being. Water withdrawal and discharge will cause hydrological alterations in surrounding freshwater streams, lakes, the Cross Florida Barge Canal, groundwater, and the Gulf of Mexico. (**0008-9** [Musser, Marcie])

Comment: [W]e love our water here in Crystal River. Kings Bay is made up of over thirty freshwater springs and it is a manatee sanctuary here in the winter. Anything that has any danger of interrupting the flow of fresh water into those springs is something that we are absolutely opposed to. (**0014-148** [Jones, Art])

Comment: I think the plant, the location of this plant is just in a bad, bad, bad location. As Mr. Hopkins pointed out, it's at the top of the -- what was the word he used -- point true metric concentric circles that brings water down. So it is one of the highest points in this area and the water flows south into Crystal River. And then you have Rainbow River right next to it over in Marion County. (**0014-149** [Jones, Art])

Comment: Mr. Hopkins was talking about tritium going into the environment and tritium into the water. I mean, it just doesn't make sense. I think that the Rainbow Springs, and Kings Bay, and Crystal River, and this whole area around here in the water is absolutely priceless. (**0014-153** [Jones, Art])

Comment: In the SCA it is stated by the applicant that the project will be consistent with the Coastal Zone Management Act as administered by the State's CZMP. It is stated there are no known federal permits required that do not have comparable state permit requirements. While such programs may be properly administered by the State as part of the Act, it is necessary that diligent Federal oversight be administered. I say this because the Federal Government has a vested interest in preserves located nearby such at the Big Bend Sea Grasses Preserve. A component parcel, the Waccasassa Bay State Preserve, is a National Natural Landmark. My concerns are precipitated by assertions made by the applicant which seem unfounded or in conflict with elements of Florida Administrative Code which relate to the State's Coastal Zone Management Program. It is stated in Volume 5 of the SCA, Appendix 10.2.2:

- That the CREC (Crystal River Energy Complex) discharge canal is a Class III surface water and that discharge from the proposed Levy County project will integrate water discharge with that of the CREC.
- That the expected LNP discharge will be cooler than the existing CREC discharge.
- Also in Volume 5, that the Withlacoochee River is not contributing to the CFBC.
- In Volume 8 of the SCA are found depictions of thermal plume models which clearly delineate expansive distribution of heated water from these discharges.

Copies of these extracted assertions are submitted with this presentation. What concerns me, and I admit freely that I simply may not have found reference within the volumes of the application, is this: The waters beyond the discharge canal have a higher classification under Florida Administrative Code and this does not appear to be recognized in the applicant's submission. The impact of their discharge cannot reasonably be considered only in context of the discharge canal. This is certainly a matter for the state to resolve, yet if I understand our purpose here today, oversight of the process is a Federal responsibility.

62-302.400 (FAC) Classification of Surface Waters, Usage, Reclassification, Classified Waters

Class II Coastal Waters - From the southern side of the Cross Florida Barge Canal southward to the Hernando County line, with the exception of Crystal River (from the southern shore at the mouth of Cedar Creek to Shell Point to the westernmost tip of Fort Island), Salt River (portion generally east and southward along the eastern edge of the islands bordering the Salt River and Dixie Bay to St. Martins River), and St. Martins River from its mouth to Greenleaf Bay. (**0014-184** [Hilliard, Dan])

Comment: [I]t is my understanding also there is a very serious concern about the impact upon the nearby waters in the Gulf of Mexico, just in the act of construction. (**0015-103** [Moore, Brian])

Comment: My second concern is with regard to the cooling waters for the plant. It is clear from Progress Energy literature that most water used at any new plant on the Levy County site will cycle between the Cross Florida Barge Canal and the Gulf at between 100 and 130 million gallons per day, together with a million gallons a day drawn from the freshwater aquifer. It is estimated that 60% of barge canal water would go to the Gulf with 40% released to the atmosphere. Heat, tritium and other pollutants would thus be vented to the air and directly into Withlacoochee Bay and Gulf coastal waters. (**0015-108** [Hopkins, Norman])

Comment: What are the impacts to coastal wetlands habitat, estuaries, and seagrass beds from degraded water quality in the region and from this project (discharges of high temperature water, etc.)? What are the impacts to the Withlacoochee River, coastal wetlands habitats, estuaries, and seagrass beds from reduced fresh water flows resulting from changes in hydrologic patterns and increased groundwater pumping related to this project that lead to less fresh water reaching the coastal ecosystems? How will reduced fresh water flows resulting in high salinity impact these systems? What will the combined impact of reduced flow/higher salinity and increased temperatures via plant discharges do to surrounding natural systems? (**0015-115** [Murphy, Joe])

Comment: What will the cumulative impact of this project be on the surrounding state sovereign submerged lands along the coast, and the public lands in the greater region (Goethe State Forest, Waccasssa Bay State Preserve, etc.) How will those publicly owned lands be potentially negatively impacted in terms of reduced recreational use, habitat loss, changes in hydrologic patterns regionally, lessened economic contributions to the region, and overall reduced ecological function? How will reduced freshwater flows to the coast (leading to higher salinity), and potentially degraded water quality of waters reaching the coast impact the Big Bend Seagrasses Aquatic Preserve and any aquatic resources of state or Federal importance in the region? How will discharges of high temperature water impact the Big Bend Seagrasses Aquatic Preserve? (**0015-119** [Murphy, Joe])

Comment: The locations of the proposed Levy 1 and 2 nuclear power plants would be in the area of the single most important recharge zone for southern Levy County and thus for the Waccasassa Bay, the Big Bend sea grass beds, the Withlacoochee River and its watershed, the

Goethe state forest, the Gulf Hammock wildlife management area, the Rainbow Springs watershed area, the aquiculture area and of utmost importance the area would be for that it provides fresh drinking water to the inhabitants of most of the southern part of Levy County, part of Marion County, and the northern part of Citrus County. (**0015-26** [Casey, Emily])

Comment: I am requesting that the EIS examine and clearly explain to the residents of Levy and Citrus counties and the surrounding region, the difference between the conditions now and the conditions if the new nuclear units reach full operation as proposed. I am interested in the conditions specifically due to the two new reactors and associated operations, without regard for the decommissioning of the coal fired unit at Crystal River. Please express the detailed quantitation and any assumptions made for the calculations of [t]hermal discharges, zone of influence clearly displayed on a map image, and limits which will be applied to the facility. (**0030-2** [Roff, Rhonda])

Comment: I am requesting that the EIS examine and clearly explain to the residents of Levy and Citrus counties and the surrounding region, the difference between the conditions now and the conditions if the new nuclear units reach full operation as proposed. I am interested in the conditions specifically due to the two new reactors and associated operations, without regard for the decommissioning of the coal fired unit at Crystal River. Please express the detailed quantitation and any assumptions made for the calculation of [z]one of influence of surface water withdrawal, incorporating the Florida Department of Environmental Protection's Phase II Florida Aquifer Vulnerability Assessment for Levy and Citrus counties. (**0030-4** [Roff, Rhonda])

Comment: There are many reasons why building new nuclear plants at the Levy site is a terrible idea. One of the big reasons is the impact this would have on water in Florida. Development and population growth in Florida have made water a very big issue here, and it's vital for us to protect the ever-dwindling sources of fresh water we still have. Two new nuclear plants on this site that has never had any power plant, let alone nuclear plants that will use massive amounts of water, is a very bad idea indeed. The water in this area is connected to a large freshwater resource for Florida, and the plant construction alone would damage these resources. (**0032-2** [Wilansky, Laura Sue])

Response: *Chapter 2 of the EIS will describe the current hydrological condition at the proposed site. Chapters 4 and 5 of the EIS will describe the methods and results of the evaluation of impacts on water resources from the construction and operation of the proposed action. Included will be consideration of impacts on fresh waterbodies, groundwater, and the Gulf of Mexico. The NRC staff's review will be performed over a range of climate conditions including drought. The staff will consider the opportunity to mitigate possible impacts by considering alternative plant cooling systems. The NRC staff will address cumulative surface water and groundwater impacts in Chapter 7 of the EIS. The release of radionuclides to the environment resulting from normal operations, along with associated impacts, will be described in Chapter 5 of the EIS. The NRC staff's Safety Evaluation Report will address the* *consequences of an accidental release of radionuclides. Because the State of Florida is the primary regulatory authority over water use and water quality, the staff will work closely with state agencies. Representatives of several state agencies attended the site audit and discussed their specific concerns with the staff. Because construction and operation of the proposed action also have an impact on water quality and aquatic ecology, the staff will closely coordinate these reviews.*

Comment: I would just like to propose be considered for the Environmental Impact Statement ... that there be a robust stormwater system, stormwater management system; that it be a closed system, meaning that any rainfall that falls on the site doesn't run off on the surface but is dealt with with DRA's and with bio-remediation and other methods. (**0014-116** [Marraffino, Paul])

Comment: Specifically a "closed" robust stormwater system for the property should be designed to keep all rainwater on site for the highest level of remediation defined by the water district. No stormwater, including a 100-year storm event, should leave the site without treatment or remediation. (**0014-182** [Marraffino, Paul])

Response: *The construction and operation of a nuclear plant involves management of stormwater on the site. The staff assessment of stormwater management plans prepared by the applicant will be presented in Chapters 4 and 5 of the EIS for construction and operation, respectively.*

Comment: They [Progress Energy] are also going to use the Barge Canal as their intake water. Again, it is an aspect that is there; why not make use of it. And they are also going to use the Barge Canal as the, not the conduit, but the pathway to get to the discharge points which are existing discharge points on the existing power plant. (**0014-41** [Frink, Ken])

Comment: Well, they are going to pull water from the Barge Canal several miles from the Gulf. There are dilution channels that branch off and possibly could bring salt water into public water supply and many private wells. The Barge Canal is presently not as salty as the Gulf because they send water over the Inglis main dam to try and lower the amount of salt. (**0015-91** [Berger, Betty])

Comment: They plan to draw water from the Gulf up the Barge Canal beginning their piping about 7 miles inland. The Barge Canal has periodic flushes of fresh water to keep it diluted so as not to put salt water into the Floridan aquifer, where the entire area draws their drinking water. This plan actually pulls the Gulf water inland as completely salty and not diluted. If they draw from the Gulf they MUST start their enclosed piping at the Gulf and NOT inland. (**0020-2** [Berger, Sarah])

Response: *Chapter 5 of the EIS will describe the methods and results of the evaluation of water quality impacts from the operation of the proposed plant. Included will be consideration of impacts on the Cross Florida Barge Canal and on groundwater along the canal and in the vicinity of the Levy site. Because the State of Florida is the primary regulatory authority over water quality, NRC staff will work closely with state agencies. Additionally, Chapter 9 of the EIS will evaluate alternative cooling systems.*

Comment: In addition to the assessment of chemical loadings, I am requesting an analysis of the impact of the predicted rising sea temperatures on the effectiveness of the cooling system. (**0030-8** [Roff, Rhonda])

Response: *As part of the NRC's environmental review, the staff will independently assess the impact of operation of the plant cooling system including consideration of current and future conditions resulting from climate variability and climate change. The staff's assessment of the impacts will be presented in Chapter 5 of the EIS.*

D.8 Comments Concerning Hydrology – Groundwater

Comment: There's quite a few items that we, as a community, need to be aware of. We are situated on a hydraulic part of the sand hill. Everyone has heard of the karst and how fragile it is. We are at a downhill position from I believe it is north of Levy. (**0014-165** [Waldron, Theresa])

Comment: My first concern is concerning the siting of the facility which is proposed in Levy County. The proposal is to put it on top of the highest level of ground water pressure for miles around, which means that everything that gets generated there is going to go out into the river systems which are fed with fresh water from that very location. (**0014-53** [Hopkins, Norman])

Comment: The environmental review that we are here for today is extremely important to me because I'm a farmer. I have a farm and I'm familiar with aquifers and how they work, and the water flow, and I can even hear it in places on my property. And once you poison those aquifers we're all done and Florida is going to lose its glitter. And the aquifers run all the way across the state and a lot of people draw water from them. (**0014-92** [Roberts, Preston])

Comment: My first concern is regarding the siting of the proposed plant. From a potentiometric map, of which this is a copy, the site appears to be at the highest potentiometric level for miles around. Such that ground water flows out to such environmentally sensitive features as the Rainbow, Withlacoochee, Crystal River/Kings Bay and Wekiva River systems and state parks. That locality is considered to be the source of fresh water to the Crystal River system, and is due to be verified next year. (**0015-105** [Hopkins, Norman])

Comment: It is a very karst area and that means that the thin limestone covering of the Floridian aquifer has lots of holes in it, and there is also sinkholes, in fact, in that surrounding area. And this is Exhibit 2. The red shows all the sinkhole areas or at least within 787 feet of a sinkhole area. And this is right in here. And water can flow and will flow in many different directions. It just depends on the amount of water in the system at any given time. (**0015-28** [Casey, Emily])

Comment: I am requesting that the EIS examine and clearly explain to the residents of Levy and Citrus counties and the surrounding region, the difference between the conditions now and the conditions if the new nuclear units reach full operation as proposed. I am interested in the conditions specifically due to the two new reactors and associated operations, without regard for the decommissioning of the coal fired unit at Crystal River. Please express the detailed quantitation and any assumptions made for the calculations for [a]mount of Discharge to Groundwater itemized by chemical species, limits which will be applied, and zone of influence. (**0030-3** [Roff, Rhonda])

Comment: The further risk of permanent groundwater contamination posed by operating nuclear plants here is very high. We have seen this kind of contamination again and again around other nuclear plants all over the country, including right here at Turkey Point in Florida. It is simply not worth the risk to our irreplaceable Florida water resources! (**0032-3** [Wilansky, Laura Sue])

Comment: Please assess the sacrifice zone that NRC will be creating by this license action. ...for instance - licensee contaminates ground water - since NRC has not been able to prevent this at dozens of currently licensed sites, it should be assumed to have a reasonable likelihood of happening at Levy. (**0038-10** [Olson, Mary])

Comment: Since the site is on top of karsts - spring recharge areas - the sacrifice must assess the loss of this natural water resource regardless of any spill, contamination or accident - simply by construction. (**0038-13** [Olson, Mary])

Response: *The EIS will evaluate the impact of the proposed plants on groundwater quality and availability. A description of the current groundwater resources will be provided in Chapter 2 of the EIS. The impact of construction at the Levy site will be addressed in Chapter 4 of the EIS. The impact of operating the proposed plants at the Levy site will be addressed in Chapter 5 of the EIS, including the impacts to the environment resulting from the release of radionuclides during normal operations. The NRC staff will evaluate the consequences of an accidental release of radionuclides in its Safety Evaluation Report, and releases from postulated accidents, such as design-basis accidents, will be evaluated in the EIS.*

Comment: I don't think the public understands. It doesn't matter the money, the house, the jewels you own, when we run out of water we are out of life. And there is no guarantee that the millions of gallons of water that these new plants are planning to use are not going to be affecting the down flow of the aquifer. And everyone that is on the down flow, which would be everyone practically, our wells could be contaminated. (**0014-167** [Waldron, Theresa])

Comment: In addition to the assessment of chemical loadings, I am requesting an analysis of the competing demand for groundwater under the worst-case scenario buildout analysis for the year 2060 as produced by 1000 Friends of Florida. (**0030-9** [Roff, Rhonda])

Response: *The NRC staff will describe and evaluate the impacts of any use of groundwater on local groundwater users during construction and operation of the proposed plants in Chapters 4 and 5 of the EIS. The NRC staff will review the consequences of an accidental release of radionuclides in the staff's Safety Evaluation Report, and releases from postulated accidents, such as design-basis accidents, will be evaluated in the EIS.*

Comment: I am concerned about our groundwater. We have a unique system with the Florida aquifer and it is our drinking water. That is a great concern to me. (**0014-156** [Tyler, Janice])

Comment: [T]his central part of Florida only receives the water that we receive from rain. We don't get it from any other location. We don't get it from snow fall, or another river, or anything else. Central Florida is totally dependent for drinking water from rain which goes through our wetlands that are being destroyed every day. They are being purified and filtered to go into our private aquifer. This aquifer only feeds Central Florida. North Florida has its own aquifer. (**0014-166** [Waldron, Theresa])

Comment: We don't know when that water is going to get the salt intrusion from the Gulf. There is -- I want that in writing, too -- a guarantee that you're not going to be destroying our wells. Because I live in the country I don't have city water. I have the best water I have ever had in my life. I have a private well on the Florida aquifer. (**0014-168** [Waldron, Theresa])

Comment: And if you are going to build the plants, are you also going to voluntarily build us a de-sal plant? Just go ahead and do it for community service and guarantee there is water because in ten years I don't think there will be. (**0014-172** [Waldron, Theresa])

Comment: The only way our environment is ever going to be able to recover from the water deficit is to allow the earth's ecological banking system to work. Where can this banking system be found and what types of resources are needed to make this accounting system functional? The recharge areas which allow water from rainfall to percolate into the Floridian aquifer quickly and the wetlands, which hold, or in parentheses I have (save) water after the rainfall event, must be protected now. (**0015-25** [Casey, Emily])

Comment: This small red zone right down in here, the southern part of Levy County, is a part of the Floridian aquifer's vulnerability assessment map. It shows an area where the groundwater's quality and quantity are extremely vulnerable. (**0015-27** [Casey, Emily])

Comment: From Cedar Key through an area north of Bronson and over to Daytona Beach it is now known that the aquifer only receives water from rainfall. The monitoring well set up north of this area, north of the proposed area, by the USGS shows that the system is at a critical stage for water quantity a lot of the year. The less rainfall the less water that goes into the system. The less water in the system, along with the extremely high increases in consumption, can and will be catastrophic to this area. We tend to think of countries that have lots of oil under their feet as being rich. We should understand that an area with fresh, clean water has a treasure under their feet and it must not be wasted any more. (**0015-30** [Casey, Emily])

Comment: It has been estimated that to provide water needs for all uses through the year 2030, the world would need to invest at least $1 trillion a year on technologies towards that end. By not placing more demands on our fragile Floridian aquifer but to restore habitat and allow nature to work as it was intended to do it provides a cost-free system to obtain the most precious commodity that we all need, clean and fresh water. (**0015-33** [Casey, Emily])

Comment: Their [Progress Energy's] draw of fresh water from the Floridan aquifer is unaccounted for presently, but it could be astronomical. Across Highway #19 from them is the Tarmac King Road proposed mine, drawing 22 million gals of water/day from the Floridan to wash their lime rock. There are 194 private shallow wells in the area, plus four public water supplies and more wells. The Southwest Florida Water Management District has put out printed material stating that this area of the Floridan aquifer is fed only by rainfall due to the high ridges surrounding it. AND IT'S NOT RAINING! Water is more important to people than lime rock and certainly more than nuclear plants, which are not environmentally friendly. (**0020-3** [Berger, Sarah])

Comment: These plants would consume our personal drinking water at an unsustainable rate. (**0029-9** [Cox, Lesley])

Comment: I am requesting that the <u>EIS examine and clearly explain to the residents of Levy and Citrus counties and the surrounding region, the difference between the conditions now and the conditions if the new nuclear units reach full operation as proposed</u>. I am interested in the conditions specifically due to the two new reactors and associated operations, without regard for the decommissioning of the coal fired unit at Crystal River. Please express the detailed quantitation and any assumptions made for the calculation of [z]one of influence of groundwater withdrawl, incorporating the Florida Department of Environmental Protection's Phase II Florida Aquifer Vulnerability Assessment for Levy and Citrus counties. (**0030-5** [Roff, Rhonda])

Comment: There is a shortage of water. Across the highway from Progress Energy is plans for Tarmac Mine pumping 22 billion gallons of water a day to wash their lime rock. For 100 years this area of the Floridian aquifer is fed only by rainfall and it is not raining. According to SWFWMD they have applied to SWFWMD -- this is Tarmac -- they have applied to SWFWMD that they are only using 500,000 gallons. SWFWMD is just counting what they are consuming.

They are not counting what they are pumping out, making it turbid, pumping it back in the aquifer. Not pristine water that they pumped out. ...Anyway, it will be turbid, conceal the crevices of the karst limestone. We won't have what they took out. Blasting is with ammonium nitrate and oil. Nitrate is infiltrating the area's springs already. Do they need more? (**0015-93** [Berger, Betty])

Response: *The NRC staff will describe and evaluate the impacts of any use of groundwater on local groundwater users during construction and operation of the proposed plants in Chapters 4 and 5 of the EIS. Changes in the availability of the water resource by competing demands and long-term variability will be addressed in Chapter 7 of the EIS, cumulative impacts on water use and quality.*

D.9 Comments Concerning Ecology – Terrestrial

Comment: Surrounding the vulnerable recharge area -- since I equate it to economics I call that the area where money can be spent quickly -- it is the most important asset Florida has, the wetlands. And that's the savings account. (**0015-29** [Casey, Emily])

Response: *The impacts on wetlands and groundwater recharge resulting from construction and operation of proposed LNP Units 1 and 2 will be discussed in Chapters 4 and 5 of the EIS. The discussion will include an analysis of the possible effects of groundwater changes on wetlands in the region.*

Comment: What are the potential impacts of habitat loss and disruption, heavy industrial activity on this site, and related projects in the greater region resulting from the proposed Progress Energy Nuclear Power Plant to year round and migratory bird species (neotropical migrants and songbirds, swallowtail kites, etc.) who currently use the greater Nature Coast and Levy County region (the term Nature Coast henceforth shall be used in this document to refer to the coastal and inland ecosystems that stretch from just north of Tampa Bay to the Wakulla County region)? Please conduct a detailed study and full analysis of all State and Federally listed and protected species, both year round and migratory species. (**0015-113** [Murphy, Joe])

Response: *The impacts on resident and migratory birds, including but not limited to Federally and State-listed species, resulting from construction and operation of the proposed LNP will be discussed in Chapters 4 and 5 of the EIS. Cumulative impacts on birds will be addressed in Chapter 7 of the EIS.*

Comment: In terms of regional listed species (State and Federal) and their habitats and wildlife corridors we request that the Nuclear Regulatory Commission request a full site review and regional review and consultation with the U.S. Fish and Wildlife Service (USFWS) and the Florida Fish and Wildlife Conservation Commission (FFWCC). We also request that the

Nuclear Regulatory Commission fully and independently review past relevant biological and species site/regional data from the Florida Natural Areas Inventory (FNAI), any current or past wildlife surveys conducted by FFWCC for the region, any current or past documents or species surveys conducted by the property's previous owners. Lastly it is imperative the publicly funded site/regional surveys be conducted with State or Federal biologists as part of the environmental review. (**0015-122** [Murphy, Joe])

Response: *In order to determine Federally and State-listed species to be evaluated in the EIS, the NRC has started informal consultation with the US Fish and Wildlife Service (FWS), National Marine Fisheries Service (NMFS), and the Florida Fish and Wildlife Conservation Commission (FFWCC). These agencies provided NRC with information on listed species that they believe should be addressed in the EIS. All relevant studies and species surveys for Federally and State-listed species from the project vicinity will be reviewed and incorporated into Chapter 2 of the EIS. The results of the NRC's assessment will be reported in a Biological Assessment that will be forwarded to the appropriate services. Additionally, the NRC staff will describe impacts to protected species in Chapters 4 and 5 of the EIS. The NRC will consult with the FWS and the NMFS regarding potential impacts identified in the biological assessment.*

Comment: I'm here to speak just for myself and my wife, Sandra, and narrow it to the Lake Rousseau and your neighbor to the new proposed site for the nuclear power plant. When the dam was put on Lake Rousseau in 1906, it raised the water level and created a lot of islands, marshes and other things that are a wonderful breeding site for many birds in the community. Thousands and thousands of breeding pairs are located there. The Office of Greenways and Trails has been a good steward of this property along with other state agencies. And the question is now that we have a major development being proposed could this large site have an impact on this location. And we, of course, want to minimize that impact because we like birds there. My wife and I do, at least. (**0014-115** [Marraffino, Paul])

Comment: For over a hundred years Lake Rousseau with its vast area of marshes, islands and hummocks, has provided breeding opportunities for a wide variety of birds. With the current stewardship of the Office of Greenways and Trails and other state agencies, nesting populations have grown and flourished. Many of the breeding populations are listed species that require special attention for protection from the environmental impact of large-scale development. The Levy County Nuclear Power Plant that is under development is near Lake Rousseau and, without measured discipline, could have a negative impact on the water quality and breeding potential of this extraordinary area. (**0014-179** [Marraffino, Paul])

Response: *Impacts on water levels and water quality in Lake Rousseau resulting from construction and operation of the proposed LNP, including any associated impact on breeding bird populations and their habitats, will be addressed in Chapters 4, 5, and 7 of the EIS.*

Comment: [O]n the outside border of their property are you all going to require a fence to border their property all the way around to cut off the movement of the wild game to the State Forest and surrounding people. (**0014-35** [Smith, Robert])

Response: *Discussion of impacts on wildlife, including wild game, resulting from any proposed fencing around the LNP site will be discussed in Chapters 4 and 5 of the EIS.*

D.10 Comments Concerning Ecology – Aquatic

Comment: Discharges of hot water will harm Gulf estuarine ecosystems and fisheries. (**0006-7** [Dickinson, Josh] [Dickinson, Sally] [Malwitz-Jipson, Merrillee] [Wapner, Howard])

Comment: The water discharged from the nuclear plant would be hotter than what is withdrawn. Temperature changes negatively affect the fish, plant, and animal life that depend on healthy water systems. (**0008-10** [Musser, Marcie])

Comment: We have done enough damage to our environment and the animals. The hotter water released by this plant would increase not lessen our disastrous impact there. (**0009-3** [Davis, Suellyn])

Comment: My concern in this regard is the impact upon the marine food web nurtured in our offshore sea grass meadows, and the impact upon dependent professional and recreational fisheries. Power plants are notoriously damaging to sea grasses when venting to such waters. (**0015-109** [Hopkins, Norman])

Comment: Discharges of hot water will harm Gulf estuarine ecosystems and fisheries. (**0029-10** [Cox, Lesley])

Response: *The NRC staff will assess impacts on aquatic biota and ecosystems in the Gulf of Mexico from thermal discharges from proposed LNP Units 1 and 2 in Chapter 5 of the EIS.*

Comment: The water intake system will likely increase salinity in the upper reaches of the Cross Florida Barge Canal, as well as threaten fish and fish larvae, among other aquatic organisms. (**0008-11** [Musser, Marcie])

Response: *The NRC staff will assess impacts on aquatic biota in the Cross Florida Barge Canal from water intake operations for proposed LNP Units 1 and 2 in Chapter 5 of the EIS.*

Comment: My second concern is with regard to the cooling waters of the plant. Huge quantities of water are going to be cycled from the Cross Florida Barge Canal and put back to the -- into the Gulf. My concern in this regard is the possible impact upon the marine food web which is nurtured in our offshore sea grass meadows, and the impact upon the dependent professional and recreational fisheries. Power plants are notoriously damaging to sea grasses when venting to such waters. (**0014-55** [Hopkins, Norman])

Comment: What are the impacts to State and Federally listed marine species, game fish, and commercial fisheries that depend on healthy and functional coastal estuaries and seagrass beds in this region? Specifically please review and provide analysis of the potential negative impacts to scallops, mullet, sea trout, redfish, oysters, clams, jacks, grouper, sheepshead, shrimp, blue crab, manatee, sea turtles, sturgeon and other important estuary oriented species in the region. (**0015-116** [Murphy, Joe])

Response: *The NRC staff will assess the effects of the withdrawal and discharge of cooling water for the proposed nuclear power plants on aquatic biota, including protected species and species that are recreationally, commercially, or otherwise important, inhabiting the Cross Florida Barge Canal and the Gulf of Mexico in Chapter 5 of the EIS.*

D.11 Comments Concerning Socioeconomics

Comment: This project is essential for the economy and prosperity of citizens of the State of Florida. (**0005-5** [Haghighat, Alireza])

Comment: Finally, the Levy Nuclear plant will be a major source of economic income for both the civil government and the citizens of Levy county through taxes and excellent employment opportunities. (**0011-8** [Tulenko, James])

Comment: I have conversed with many, many people in our county about the proposed power plant. Everyone I have spoken to, without exception, is in favor of the plant. We absolutely want the jobs and the tax base it will bring to our area. (**0013-3** [Bullock, Wade])

Comment: Levy County is excited about these opportunities for our kids. I am interested in the -- mostly interested in our human environment because that’s what I deal with all the time in our schools. (**0014-1** [Edison, Jeff])

Comment: As an economic development organization, we feel this would be the most significant infrastructure investment in decades. It is no secret that our region and our state is growing and making sure that it is smart growth is a pivotal step. (**0014-102** [Mucci, Matt])

Comment: The plan for two new reactors would mean a significant amount of jobs which would head our economy back in the right direction. (**0014-104** [Mucci, Matt])

Comment: But there are other benefits of a nuclear power plant to our local economy. It supports high paying jobs directly at the plant. The Levy plant will provide thousands of construction jobs and many permanent jobs to the region. Furthermore it is estimated that for every job created at a nuclear plant, three more are created in the surrounding community. Three more. Those are Levy jobs. Those are not exportable. They will not go overseas. Better schools, roads, and other civic improvements are also products of nuclear energy and nuclear energy will save Floridians $1 billion a year once up and running. (**0014-112** [Walther, Robert])

Comment: [T]he economic benefits for Levy County will provide a great tax base, job growth, local services, and there are many other benefits that Levy County will also experience. Quite frankly we will have about 800 jobs at our two combined units which will generate about 1,000 to 2,000 indirect jobs as well as 3,000 jobs during construction. (**0014-13** [Barnwell, Martha])

Comment: I believe the economic impact to the area is very important. (**0014-139** [Cheek, Ken])

Comment: But the investment in the plant is only part of our investment. The other part is in our community because we strive to be an excellent neighbor in Levy County, and we strive to continue the strong partnership that we have. (**0014-14** [Barnwell, Martha])

Comment: I think that in summation that the things that they are going to bring to you is greater employment to Levy County, but we hope that all the employees live in Citrus County. ...[I]t will enhance the quality of life for both counties. (**0014-145** [Marmish, John])

Comment: [W]hat is going to happen for property devaluation when you run your transmission lines through people's, near people's homes because of health purposes? Is there any monetary compensation? (**0014-160** [Tyler, Janice])

Comment: [T]here are estuaries that will be destroyed in the bend area of Florida once you open that up to sprawl. (**0014-169** [Waldron, Theresa])

Comment: Bringing construction and everything to Levy County, bringing money, jobs. After the construction is done, how many local people will you be employing with a high school diploma and maybe a year of technical school? Will that be adequate for any of your jobs or will you be bringing in highly-trained college educated people from other plants in other areas? Our area does not have a lot four, six, eight year diplomas hanging around for you to just suck up and employ. So that, I believe, is a fallacy. (**0014-171** [Waldron, Theresa])

Comment: The building of these reactors will be an integral part of strengthening and growing our region's economy. It is my belief that the economic impact will be positive; providing thousands of well-paying jobs, many of which can be filled by current and future students. (**0014-176** [Vianello, Mark])

Comment: [T]he Levy Nuclear Plant will be a major source of economic income for both the civil government and the citizens of Levy County through taxes and excellent employment opportunities. (**0014-25** [Tulenko, James])

Comment: I'm the Executive Director for the Economic Development Council for Citrus County. And obviously, we don't want the plant to go to Levy; we want it to go to Citrus County. (**0014-26** [Welker, Randy])

Comment: [Progress Energy employees] are our Little League coaches, they are our school advisory council members, and we greatly look forward to working with Progress Energy in the opportunities that we have in the field of nuclear and technical education. (**0014-3** [Edison, Jeff])

Comment: I'm concerned about our economy. Our economy is in need of this type of use that is economical and beneficial to our community as well as the United States. From what I understand, this power plant currently that we live in this area with and who has been a very good citizen for our community, is the third largest producer of power in the country. (**0014-30** [Welker, Randy])

Comment: [W]hat kind of information do you all have on the devaluing of the adjoining properties to a nuclear power plant. (**0014-36** [Smith, Robert])

Comment: I would like to touch on three aspects of what we see good things about this project. First and foremost is the positive impact we see in the community. You know, I moved here back in the mid-seventies and we've been visiting Citrus County since the early seventies. And I've watched how all five of those plants, particularly the nuclear power plant up there, has transformed this community. Citrus County has always been a retirement, a slow-moving community with a severe lack of meaningful jobs. It's mostly been support jobs. And this one particular project is going to bring, just during the construction of it, I'm hearing over 3,000 skilled laborers, plus all the ancillary, you people that are going to be supporting those people. And then also they have like over 800 full-time jobs that support these plants on a fulltime basis for probably the next eighty or a hundred years. And this doesn't even account for the ripple effect, the secondary jobs needed to support those folks. (**0014-37** [Frink, Ken])

Comment: But this plant offers a lot of economic and job opportunities for the kids and the families of Levy County, both directly working here at the facilities here now and in the future, and the spin- off businesses that are going to result from the nuclear power plants. (**0014-4** [Edison, Jeff])

Comment: As proven in the past with Crystal River 3, it [the Levy plant] will ultimately be embraced by the community and have a lasting positive impact on both the environment and our local economy. (**0014-44** [Frink, Ken])

Comment: [E]conomic development is about creating sustainable wealth and improving quality of life in our communities. This is done by increasing prosperity, creating high quality jobs, creating new personal income, advancing private enterprise, productive use of local businesses and resources, and broadening the tax base. We believe -- myself, along with the Council believes that this project is going to create an opportunity for that to take place in this entire county. (**0014-61** [Douglas, Amanda])

Comment: [A] couple thousand jobs that have been described as being generated by the construction and operation of this plant, both direct and indirect, will be far and away eclipsed by the numbers of quality jobs for the kinds of people, the people with the skill sets that would accommodate these jobs, that are missing in action today with declining construction in a declining economy. (**0014-64** [Russell, John])

Comment: As we work to diversify the state's economy and create jobs, which is our mission, we have strategically focused our business retention and recruitment efforts on industries that offer great high growth potential and pay higher than average state wages. Clean energy is one of the sectors that we focus on. (**0014-80** [Latimer, Al])

Comment: As Enterprise Florida works to attract new businesses to the state and helps existing businesses to expand, we recognize the many benefits of nuclear power companies. It is generally accepted that businesses function best in an environment where things are predictable and certain. Nuclear generated power can provide low stable cost electricity which helps businesses avoid uncertainty. (**0014-82** [Latimer, Al])

Comment: The jobs that will be generated by the construction of this nuclear plant will be high wage jobs. Those jobs will help raise the state average wage and improve the quality of life for not only this community but for the entire state. (**0014-84** [Latimer, Al])

Comment: I would also like to say that I think it will be important for the economic development. What's being proposed here in Levy County will be a tremendous benefit to our students, to students in North Central Florida and to adults in North Central Florida as well. I think they are a tremendous positive economic impact. (**0014-88** [Vianello, Mark])

Comment: The economic benefits of this plant are terrific. The large local investment will allow the county and residents to make investments through increased tax base, new jobs, enhanced local services and a variety of other benefits that local businesses will receive through our plant that we anticipate building here. Levy County can expect to see about 800 permanent jobs with the two units. In addition to that, 1,000 to 2,000 ancillary jobs will be created and we anticipate during construction 3,000 jobs will be needed, or 3,000 people will be needed on site at its peak for construction. But our investment doesn't just stop with the plant. Our investment, as you have heard already, also involves the community and being a good partner and a good steward.

We strive to be a good steward and a good neighbor in the communities we serve. (**0015-18** [Barnwell, Martha])

Comment: But there are other benefits of nuclear energy to the local economy. It supports high paying jobs directly at the plant. In fact, the Levy plant will provide thousands of construction jobs and many permanent jobs to the region. Furthermore it is estimated that for every permanent job that is created at the plant, three more jobs will be created in the surrounding community. That's three more Levy jobs. They can't be exported. Better schools, roads, and other civic improvements are also products of nuclear energy and nuclear energy will save Floridians $1 billion a year once up and running. $1 billion a year once up and running. (**0015-49** [Walther, Robert])

Comment: Homestead Florida also happens to be, according to U.S. News and World Report, the fastest growing city in the United States of America with 50,000 residents or less. That's indicative, at least to me and to that community that having Turkey Point in that area has not been a detriment to population growth. It certainly hasn't been a detriment to the economy. Despite the housing slowdown, it is still very populated. We have restaurants going up everywhere. There is a Chili's that was just built down the street from my home. And nuclear power has not been a detriment. (**0015-52** [Hernandez, Michael])

Comment: This is an expensive and dangerous proposition. Scientists in their studies can be biased towards whoever is funding them. If they dangle jobs in front of you, what kind of jobs? What is your health worth to you to look the other way? (**0015-63** [Sullivan, Jennifer])

Comment: Local spending on plant construction and power generation operations are considered to be new economic activities that represent additional final demand, and thus will generate secondary or spin-off effects for the local and state economies. (**0015-66** [Hodges, Alan])

Comment: For example, purchases of concrete for construction, which they use a lot of in a nuclear plant, gives rise to new demand for aggregate materials which, in turn, stimulates purchases of inputs from mining operations. Another type of spinoff effect is the personal consumption expenditures made by industry employees for food, clothing, housing, transportation and so forth and are model accounts for the different spending patterns that occur by households of different income levels. (**0015-67** [Hodges, Alan])

Comment: Typically, the total impacts of a new development project on a regional economy may be one and-a-half to two-and-a-half times the value of the original spending. Somebody else mentioned three times. That would be a bit unusual. But it all depends on what the structure of your local area is on how these spinoff effects play out. (**0015-68** [Hodges, Alan])

Comment: At this point it has not yet been determined how much of that investment will occur in the local area or what this will contribute toward the assessed value of property in Levy County. Estimating construction expenditures in this case is made difficult because of the rapidly changing prices for commodities, and also the fact that there have not been any new nuclear plants built in the U.S. in over thirty years. (**0015-70** [Hodges, Alan])

Comment: Based on data currently available, there would be about 2,900 workers on site at the peak of construction, including Progress Energy personnel and contract employees. And based on staffing patterns for other similar large projects, we can estimate that about sixty percent of those contract employees would reside in the local area. (**0015-71** [Hodges, Alan])

Comment: Once in operation, the plant is expected to have 800 to 900 permanent employees, all of whom would presumably reside in the local area and therefore would be spending their income locally. These are, of course, it's been mentioned, very well-paying jobs. Roughly half of those positions are expected to receive annual salaries in excess of $70,000 and an overall average of about $65,000, which is more than double the current average annual earnings in this three-county area of about $31,000. (**0015-72** [Hodges, Alan])

Comment: I am also the President-Elect of the Citrus County Chamber of Commerce, 1200 members. And we are so excited about what this will boost the economy, jobs, schools, education, and the opportunity for our educated people to stay here in this area and have a good job. (**0015-86** [Hollins, Dixie])

Comment: We believe that the development of the nuclear power project in Levy County will bring jobs and economic benefit, not just to Levy County, but also the surrounding communities. We welcome Progress Energy's initiative in bringing a balanced approach to the future energy demands of Florida in our region. (**0015-9** [Pernu, Dorothy])

Comment: Property owners will lose part of the investment they have made in their homes as property values drop and homes become more difficult to sell. (**0040-6** [Medlin, Ted])

Response: *These comments generally refer to potential positive or negative socioeconomic impacts. Socioeconomic impacts of construction and operation will be addressed in Chapters 4 and 5 of the EIS.*

Comment: Our nation is in a recession and the prediction is that it will be a deep and long one. Floridians need ways to reduce their electric bills through energy efficiency and conservation and cannot afford the rate increases that will occur if Progress builds a risky new nuclear plant. (**0008-8** [Musser, Marcie])

Comment: I am a retired senior citizen living on a fixed income. And after what the Energy Commission did and the income today, I can't afford groceries. And it is getting bad and it is getting worse. I've been a professional all my life but at my age nobody wants to hire me. (**0014-46** [Foreman, Patricia])

Comment: There was an article published in the Chronicle on October the 27th by Chris Van Ormer, a wonderful article. Charges Jolt Customers. The utility has virtually no risk if the plant does not come to fruition. It does not have to return our moneys that they want to start collecting in January. To me that is very, very unfair. (**0014-48** [Foreman, Patricia])

Comment: I am not afraid of a nuclear plant but since no one can tell me where the electrical is going from Crystal River, I have, on the QT -- question: I'm told it goes to Chicago and the big cities. Now, if that's true, or maybe if it isn't true, wherever it goes on the grid, charge them. Let them pay for another nuclear plant because I'm tired of it. Everybody is coming along and raiding my kitchen cabinets. It's like I went before the Board for the water, so they've raised it $10. And then they send me a letter telling me the water is poisoned and it has been for a year. So I take it to my doctor and I say, Hey, what am I supposed to do?" He says, Honey, I don't know. I don't know how it will affect you because it will affect everybody different." (**0014-49** [Foreman, Patricia])

Comment: First of all ... the levy of the charges on the customers to help pay for the facility. What, in effect, they are being asked to do is to contribute to the capital base of Progress Energy for nothing. And two letters have already been written to the Governor concerning this. But essentially there is one easy answer. And that is that Mr. Lyash, or Lash, or, I'm sorry, I don't know how to pronounce his name, should do one thing. And that is not to make the levy. That is the simplest way of eliminating it. I've had suggestions that we get together and put together a class action suit and get a petition and so on and so forth, but really that is going to take an enormous amount of time and expense. But the simple way is not to charge the levy. (**0014-52** [Hopkins, Norman])

Comment: [T]he basic issue is it's as if the future will stand still over the interval from breaking ground to putting this plant on line and, indeed, charging present customers for the privilege of doing so. This is not right. (**0014-63** [Russell, John])

Comment: The hole gets deeper and here what do we have? The article in the paper here, Costly Fuel, Bigger Buildings. I'm going to the Commission meetings in Hillsborough and Pinellas County, the School Board meetings, and I'm reminding all the senior citizens: You're paying and there's going to be a big jump in the utility bills. You are paying for these power plants and you are doing it for the investors. And a lot of the senior citizens, they're not going to see a lot of that electricity. They will be dead and buried. This is a crime. (**0015-42** [Klutho, Mark])

Comment: But although it is more expensive to move this energy so far and it is more wasteful to move it, the customer is going to pay for that anyway. (**0015-55** [Sullivan, Jennifer])

Comment: If the Levy County nuclear reactor is private enterprise, why is Progress Energy passing on the cost of the planned nuclear reactor to its customers in the way of a rate hike in their power bills? Why, if the customers are paying for this enterprise, do they not own it? Is Progress Energy prepared to pay millions of dollars to repair a nuclear plant should it fail after a hurricane, or would the cost of that repair also be passed on to the Progress Energy consumers and customers? (**0015-77** [Stewart, Anita])

Comment: In this time of the super big bailouts, citizens are becoming very weary of footing the bills for the major corporation and their own government. And we can make a perfect example of what happened after Hurricane Andrew when Florida Power and Light's Turkey Point Nuclear Plant, who failed during the storm, one smoke stack was imploded not shortly after the storm itself, and the company paid out $90 million to make the repairs to get the plant back on line. Many people don't know that happened but my source was an article by Tom Dubuque out of the Miami Herald. And my research is still ongoing regarding who actually paid the $90 million. (**0015-78** [Sullivan, Jennifer])

Comment: I would like to voice my strong opposition to Progress Energy's increase to cover, in advance, the cost of new nuclear power plants. I do not feel it is just for them to charge their existing customers in advance for new equipment. In the past bond issues have been used to fund this type of project and I believe it should continue that way. (**0018-1** [Garvin, Bill])

Comment: What is VERY important and seems to be legal is the addition of 25% surcharge on all electric bills beginning in January and extending into infinity. There are presently people without heat in this area, as they had to choose between that and buying food. Their children are barefoot and jobs are gone. The number will be increased unless the Dept. of Energy does something to block this surcharge imposed years before nuclear plant building is completed. (**0020-4** [Berger, Sarah])

Comment: Senior Citizens cannot afford this increase per month on electric bills. Plus, we will not be given the nuclear energy (electric) in our homes. (**0036-2** [Foreman, Patricia])

Comment: [I]t will not be tolerated by the citizens of Florida to be taxed to pay billions for nuclear power plants or charged as customers for something that a private company would never find profitable without public money. (**0039-8** [Arnason, Deb])

Response: *The NRC regulates the nuclear industry to protect public health and safety within existing policy. Issues related to the rate adjustments are outside of the NRC's mission and authority and will not be addressed in the EIS. This authority and responsibility is most often the role of state regulatory authorities such as public service commissions. However, the socioeconomic impacts of construction and operation will be addressed in Chapters 4 and 5 of the EIS.*

Comment: [T]his project up in Citrus and Levy Counties, is what it is going do is it going to make use of the defunct Cross Florida Barge Canal. That's a project, in my opinion, they stopped back in the seventies, probably never should have been built, but here is an organization that is going to come in and make lemonade out of lemons. This project, what it is going to do is it is going to utilize the transportation aspects of the Cross Florida Barge Canal to bring in their heavy equipment and what not. And I don't know if you could find that somewhere else, but it is going to take down, or take away the wear and tear on the local transportation. (**0014-40** [Frink, Ken])

Comment: In reference to Progress Energy Florida, Inc's LWA and COL to build Units 1 and 2 of its LNP site, the following are considerations that must be addressed: Whereas the Town of Inglis, FL lies less than five miles directly south of the proposed site, and whereas the Town of Inglis is populated by approximately 1,700 residents, and whereas the Inglis Police Department's budget is less than $400,000/yr with slightly less than 24/7 coverage, and whereas the Inglis Fire and Rescue Dept is solely staffed by volunteers with old equipment, and whereas the demands on these two departments of the Town of Inglis will be dramatically overburdened if such a permit is granted. (**0021-1** [Michaels, Edward])

Comment: Currently, less than 28% of the households in the Town of Inglis pay ad valorum taxes. We are a very poor town, with extremely high unemployment, and a high percentage of retirees. The burden of a sudden influx of workers and ancillary businesses to the area will overstress the aforementioned departments to a point of breaking. We simply will not be able to protect and serve our current residents, nor the influx of people that these plants will bring to our town, at the level of service that our residents have come to expect. The Town of Inglis is currently a one stop-light town. Our way of life will dramatically change, and we should not be expected to pay for the myriad changes that one company will immediately and forever bring to us for their benefit. Our town is not even a part of their customer base. (**0021-3** [Michaels, Edward])

Comment: The only possible scenario that would provide us with the capabilities to protect and serve our residents at the current level, once this sudden change befalls us, would be if PEF supplies us with a substantial amount of cash, before construction commences, to supplement our departments, and further, a yearly enforceable commitment to maintain the levels needed, once they have been achieved. (**0021-4** [Michaels, Edward])

Comment: Furthermore, our road and maintenance departments will also be stressed beyond their current capacity. It is imperative that these issues be resolved before PEF can be given a permit. (**0021-5** [Michaels, Edward])

Comment: Having trains cross Highway 41 may block emergency vehicles from homes and medical facilities, making it less safe for all residents in Dunnellon, Rainbow Springs and all adjoining areas. (**0040-2** [Medlin, Ted])

Comment: The already-heavy traffic on Highway 41 will become worse with a second Dunnellon railroad crossing and the resulting train delays. (**0040-3** [Medlin, Ted])

Response: *Socioeconomic impacts such as impacts on transportation and local infrastructure associated with the construction and operation of proposed LNP Units 1 and 2 will be addressed in Chapters 4 and 5 of the EIS.*

Comment: Please analyze the negative impacts this project could have on the clam industry and attempts to develop an expanded local, sustainable aquaculture industry in the Nature Coast. (**0015-117** [Murphy, Joe])

Comment: What are the negative economic impacts to the region, the Nature Coast, and the Gulf Coast of Florida that will result from coastal ecosystems harmed by polluted runoff (high high temperature) and reduced freshwater flow/higher salinity to the coast? What will the economic and social impacts be to the recreational and commercial fishing industry along the Gulf Coast of Florida due to reduced function in coastal estuaries? Please consider these questions in the context of the economic impacts coastal related activities in Florida (see 2006 FFWCC estimates below):

- Saltwater Fishing - $6.0 billion, 59,000 jobs
- Freshwater Fishing - $2.2 billion, 19,000 jobs
- Total Fishing - $8.1 billion, number one in the nation
- Commercial Fishing - $576 million, 9,000 jobs
- Boating Industry - $18.4 billion, 220,000 jobs (**0015-120** [Murphy, Joe])

Comment: What will the negative economic impacts to Levy County, Citrus County, and the Nature Coast be from reduced ecotourism, reduced local fishing activity, and loss of seasonal visitors who engage in wildlife viewing and outdoor recreational activities? These questions directly relate to the growing ecotourism and wildlife viewing industry in Florida, and along the Nature Coast. In a recently released report the FFWCC reported that: In 2006, 3.3 million Floridians viewed wildlife at or near their homes, and 1.6 million Floridians and tourists traveled around Florida for the sole purpose of wildlife viewing. These viewers generated more than $3 billion in total economic impact throughout Florida. Retail sales account for approximately $1.8 billion of this total. While other areas of the economy may be experiencing a downswing the FWC's report finds retail sales for wildlife-viewing activities have almost doubled from $1.575 billion in 2001. Overall, 4.2 million people participated in some form of wildlife viewing in Florida in 2006. (**0015-121** [Murphy, Joe])

Response: *The NRC staff will consider the potential effect of construction and operation of proposed LNP Units 1 and 2 on local fishing, wildlife viewing and outdoor recreational activities,* *as well as potential socioeconomic impacts of changes in the volume of these industries. These topics will be addressed in Chapters 4 and 5 of the EIS.*

D.12 Comments Concerning Historic and Cultural Resources

Comment: We [the Miccosukee Tribe] have no direct knowledge of any cultural resources located in the area of the two new proposed nuclear power units. However, we recommend that a Phase I Cultural Resources Survey be conducted of the area to ascertain if there are any cultural resources which may be impacted by this project. (**0037-1** [Terry, Steve])

Response: *Evaluation of historical, archaeological, and other cultural resources is part of the NRC staff's assessment. The results of the Phase I Cultural Resources Surveys for the project site will be summarized in Chapter 2 of the EIS. Impacts and mitigation measures on historic and cultural resources will be addressed in Chapters 4 and 5 of the EIS.*

D.13 Comments Concerning Health – Nonradiological

Comment: I would just like to propose be considered for the Environmental Impact Statement ... that there be minimum use of pesticides and herbicides on the site and that within 150 feet of any water source, such as a stream, lake, or large ponds, that there be a pesticide and herbicide free zone within 150 feet of that area. (**0014-117** [Marraffino, Paul])

Comment: I would just like to propose be considered for the Environmental Impact Statement ... to control hazardous materials in a very robust way, including diesel fuel and other petroleum products that are on the site. (**0014-118** [Marraffino, Paul])

Comment: In addition the use of pesticides and herbicides should be minimized to the lowest level practical. There should be a pesticide and herbicide free zone within 150 feet of any lake, river, stream or pond. Finally control of hazardous material including diesel fuel should used and stored in a manor the prevents them from entering the groundwater system. (**0014-183** [Marraffino, Paul])

Response: *Protection of human and ecological health will be assured by compliance with all applicable State and Federal regulations governing the use of pesticides and herbicides and with the storage and control of diesel fuel and other hazardous materials. Issues associated with herbicide and pesticide use and diesel fuel and hazardous materials storage during the construction and operations phases will be addressed in Chapters 4 and 5 of the EIS, respectively.*

Comment: You can listen online to the archives of today's Democracy Now. This show presented today shows studies of the poisons that workers, civilians and soldiers were exposed to, supposedly regulated, and the repercussions are these. One example was the Vietnam Agent Orange. And then there is what is known as the Kuwait Cough from the Gulf War II, or Gulf War I, rather. And now there is a chromium poison by KBR, Kellogg, Brown and Root. They used to be an affiliate of Halliburton. Anyway, that's in the Gulf War, too. But these things have been happening. (**0015-64** [Sullivan, Jennifer])

Response: *Workers at the site will be protected by compliance with all applicable Federal and State occupational and safety standards related to exposures to toxic substances. Occupational safety and health issues arising in the construction phase will be addressed in Chapter 4, and issues arising during the operations phase will be addressed in Chapter 5 of the EIS.*

Comment: Some Woodlands property owners will have trains operating along the edges of their yards, in close proximity to their homes, and would threaten their tranquility. (**0040-5** [Medlin, Ted])

Response: *Progress Energy filed a Notice of Amendment on November 26, 2008, to the State of Florida Site Certification Application (SCA), to amend the SCA to withdraw all of those sections of the SCA which addresses the proposed 13-mile corridor in Levy and Marion Counties, Florida. Additionally, the Progress Energy response to information need CR-5, by letter dated January 16, 2009 to NRC, states that the rail line has been removed from the plan.*

D.14 Comments Concerning Health – Radiological

Comment: I would just be interested as a matter of point that somebody give some data from this conference on what the radiation testing is around the current nuke plant here in Crystal River. Do some drilling and take some bore samples out of the wells around here and let's just see how they have changed since they've been there for thirty years. I will guarantee you that there is going to be some things here that you are probably not going to want to divulge. (**0014-93** [Roberts, Preston])

Response: *This comment relates to the Radiological Environmental Monitoring Program (REMP) and the airborne and liquid radioactive effluents from the existing Crystal River Energy Complex and proposed LNP. Chapter 2 of the EIS will discuss the radiological environment around the LNP, Chapter 5 will address the release of effluents during operation and the impacts from these releases, and Chapter 7 will address cumulative impacts, including those from the existing Crystal River Energy Complex.*

Comment: There should be test wells around the site. There should be an early development that be measured at a base level and then on a regular basis measure a large selection of items that would be of concern for health reasons and so on. (**0014-119** [Marraffino, Paul])

Response: *This comment relates to the Radiological Environmental Monitoring Program (REMP) and the airborne and liquid radioactive effluents from proposed LNP Units 1 and 2. Chapter 2 of the EIS will discuss the radiological environment around LNP and Chapter 5 will address the monitoring of effluent releases during operation and the impacts from these releases.*

Comment: With the existing Progress Energy Nuclear Power Plant in Crystal River and at other locations, health physics is a paramount consideration for system management. At the new Levy County plant, monitoring and protection of ground water should be performed at the same level of discipline as the radioactive element in the core facility. This should be required for the potable water requirements of the populace of surrounding communities. Added to the human requirement is the need to protect the water quality and natural habitat of Lake Rousseau. (**0014-181** [Marraffino, Paul])

Response: *Chapter 2 of the EIS will discuss the radiological environment and monitoring conducted around the Levy Nuclear Plant. Chapter 5 of the EIS will address the release of effluents during operation, the impacts from these releases, and radiological monitoring during operations.*

Comment: The Bureau of Radiation Control is responsible for performing a radiological environmental monitoring program around all the nuclear plants in the state of Florida. (**0015-4** [Williamson, John])

Response: *This comment addresses activities conducted by the Florida State Department of Health, Bureau of Radiation Control. Radiological monitoring for proposed LNP Units 1 and 2 will be addressed in Chapter 5 of the EIS.*

Comment: We've been monitoring Crystal River since, I believe, 1969, approximately seven years before they ever first started the plant up. If anyone is interested in getting reports of this environmental monitoring, I encourage you to talk to me after the meeting. I can provide you a business card. You can contact me and I would be happy to provide any of the reports that you like. (**0015-5** [Williamson, John])

Response: *This comment is related to the environmental monitoring program for the nuclear plant at the Crystal River Energy Complex and is not directly related to this environmental review. Radiological monitoring for proposed LNP Units 1 and 2 will be addressed in Chapter 5 of the EIS.*

Comment: I would just like to quote, first of all, from some Progress Energy document: Tritium, which is a hydrogen radioactive isotope, is a byproduct of generating electricity at nuclear power plants. All nuclear power plants release tritium into both the water and air. The U.S. Environmental Protection Agency regulates the acceptable level of tritium concentrations in ground water and drinking water, no matter where it comes from." Now, it is quite clear from the documentation that tritium will not go in through, into a human's body from outside it normally. But if it is ingested in any way, that's a different question. But also I'm not sure -- and, in fact, I don't know, whether the EPA regulations safeguard microorganisms on which the ecology depends. Now, don't get me wrong. Tritium is the stuff which enables our waters to be seen in the dark. But don't get me wrong. I'm not suggesting that the algae, the fish, the other organisms are going to glow in the dark and that will reduce the need for more generating capacity. I'm not saying that. But also I'm not saying that the algae, the plankton, or the fish will either glow, nor will they grow arms and legs, but they could die, they could get bigger and they could poison whatever eats them. (**0014-54** [Hopkins, Norman])

Comment: In Progress Energy's own words: "'Tritium *(a hydrogen radioactive isotope)* is a byproduct of generating electricity at nuclear power plants. All nuclear plants release tritium into both the water and air. The U.S. Environmental Protection Agency (EPA) regulates the acceptable level of tritium concentrations in ground water and drinking water". To site that plant precisely where the potentiometric groundwater level is highest for miles around does not seem sensible to me. Tritium, with a half life of more than 12 years, cannot be contained. While emissions are unlikely to be externally harmful to humans, if ingested or otherwise absorbed internally tritium is an issue. (**0015-106** [Hopkins, Norman])

Response: *These comments concern emissions of tritium and health effects that may result from such emissions. Emission estimates will be based on the revision of the AP-1000 Design Control Document referenced in the COL application; these emission estimates are anticipated to be conservative (that is, to overestimate emissions). The NRC staff will evaluate human health and environmental impacts of the emissions in the EIS, and the results of this analysis will be presented in Chapter 5.*

Comment: Evidence exists that there is NO such thing as a safe dose of radiation, from release in the predictable periodic accidents or from the continual low grade emissions of radiation from existing and nuclear future plants. Any radiation released is more than a zero impact. (**0006-5** [Dickinson, Josh] [Dickinson, Sally] [Malwitz-Jipson, Merrillee] [Wapner, Howard]) (**0029-7** [Cox, Lesley])

Comment: In addition to the comparison of wastes and emissions people living on the Nature Coast of Florida deserve to know in specific terms (measurable units) the amount of radioactivity that will be released from the site as:

- radioactive air emissions - including routine and batch releases

- including both projections of total source term and also concentration

- other pollutants with or without radioactive mixing
- releases of liquid radioactive wastes - and other chemicals released together or separately, with total amounts and projected concentration
- release of heat to both air and water - and amount of water that will leave the site as vapor (**0038-20** [Olson, Mary])

Comment: Assuming that Part 20 is being fully implemented and enforced - and no, I am not attacking the rule - though we would like to - and assuming ALARA is being added on top, why have two studies in the last couple of years found a direct (statistically significant) correlation between distance of residence from a nuclear power plant and incidence of leukemia? Please include and account for these studies in your finding of impact. (**0038-23** [Olson, Mary])

Response: *These comments relate to radiation doses from release of radioactive material from the proposed LNP Units 1 and 2. The impacts on human health from radiological emissions will be addressed in Chapter 5 of the EIS.*

Comment: Furthermore, I do not know whether the EPA levels protects micro-organisms on which the health of existing ecologic systems depend, and upon which the economic health of local communities exist. (**0015-107** [Hopkins, Norman])

Response: *This comment relates to radiation doses from release of radioactive material from the Levy Nuclear Plant. The impacts to biota other than humans from radiological emissions will be presented in Chapter 5 of the EIS.*

Comment: I am requesting that the EIS examine and clearly explain to the residents of Levy and Citrus counties and the surrounding region, the difference between the conditions now and the conditions if the new nuclear units reach full operation as proposed. I am interested in the conditions specifically due to the two new reactors and associated operations, without regard for the decommissioning of the coal fired unit at Crystal River. Please express the detailed quantitation and any assumptions made for the calculations.

- Airborne radionuclides and other pollutants by chemical species and concentration
- Waterborne radionuclides and other pollutants by chemical species and concentration
- Pollutant levels in soil and graphic depiction of zones of influence.
- Pollutant uptake by vegetation and graphic depiction of zones of influence. (**0030-1** [Roff, Rhonda])

Response: *Radiological impacts from normal operation of proposed LNP Units 1 and 2 will be discussed in Chapter 5 of the EIS, and cumulative impacts will be discussed in Chapter 7 of the EIS.*

Comment: I am requesting that the EIS examine and clearly explain to the residents of Levy and Citrus counties and the surrounding region, the difference between the conditions now and the conditions if the new nuclear units reach full operation as proposed. I am interested in the conditions specifically due to the two new reactors and associated operations, without regard for the decommissioning of the coal fired unit at Crystal River. Please express the detailed quantitation and any assumptions made for the calculation of:

- The increased potential for uptake of Strontium 90 in humans.
- Any potential changes in mammalian milk quality, including dairy cattle and humans.
- Projected increased cancer risk, including but not limited to childhood leukemia as depicted in the epidemiological study recently published by Joseph Mangano and attached hereto. (**0030-6** [Roff, Rhonda])

Response: *Chapter 2 of the EIS will discuss the radiological environment around proposed LNP Units 1 and 2 and Chapter 5 of the EIS will address the release of effluents during operation and the impacts from these releases.*

Comment: And another thing I would like to know is does this United States, what you said, Nuclear Regular Atomic Commission, require specific environmental standards and which have to be complied with? (**0014-128** [Cannon, Renate])

Response: *The NRC, pursuant to the Atomic Energy Act, has established the nuclear power plant regulatory program for radiation protection of individuals and the public. The primary radiological standards are contained in 10 CFR Part 20, 40 CFR Part 190, and 10 CFR Part 50, Appendix I.*

D.15 Comments Concerning Accidents

Comment: A 1982 Congressional report estimated that if a meltdown occurred at just one of Progress Energy's reactors at their nearby Crystal River nuclear plant, it could cause 900 peak early fatalities, 3800 peak early injuries, 2800 peak cancer deaths, and over $53 billion in property damage. The operation of more reactors in this area will only worsen these terrible impacts and put more people's lives and health at risk. (**0008-12** [Musser, Marcie])

Comment: If there is an accident or meltdown the # of fatalities and injuries are absolutely inacceptable for those who live in this state. (**0009-4** [Davis, Suellyn])

Comment: Don't forget, in a facility that stores an average quantity of spent fuel, around 450 metric tons, a meltdown would kill 25,000 people over a distance of 500 miles if evacuation were perfect. (**0019-8** [Heywood, Harriet])

Comment: Accidents happen. It is technically impossible to build a facility that is 100% secure. (**0029-3** [Cox, Lesley])

Comment: Another very important point is the fact that nuclear plants themselves cannot be made 100% safe. Whether through equipment malfunction, operator error, or terrorist attack, nuclear plants pose an unacceptable risk, not just to those of us living in Florida, but to all life on earth. One little incident could literally mean the actual end of all life on earth! If you don't think it can happen, think about that little O ring on the Challenger. We humans are not infallible, and neither is anything we produce. This means that nuclear plants cannot, simply cannot be guaranteed to be safe. And when it comes to accidents or attacks involving nuclear materials, anything less than 100% safety is just not good enough. (**0032-12** [Wilansky, Laura Sue])

Comment: Please assess the sacrifice zone that NRC will be creating by this license action. ...in the event of some type of local accident, fourth would be disclosure of estimates, as were made in the CRAC II report - of a fuel pool accident and a reactor accident. In this day and age, it should also include projections of impact were BOTH containments were to be lost. (**0038-12** [Olson, Mary])

Response: *In Chapter 5 of the EIS, the NRC staff will address risks associated with both design basis and postulated severe accidents. The staff will also address the cumulative risks from operation of the proposed new reactor. Design basis accidents will be evaluated by comparison with regulatory criteria, and the probability-weighted consequences of severe accidents will be compared with risks to which individuals and populations are generally exposed.*

D.16 Comments Concerning the Uranium Fuel Cycle

Comment: High-level radioactive waste created (used nuclear fuel) has no place to be stored or disposed, nor is it likely that a "solution" will be found in our lifetimes. Building a nuclear plant in Levy County will unfairly burden future generations with a legacy of radioactive waste. (**0008-5** [Musser, Marcie])

Comment: The proposed location in Levy County is currently a "green field" site; it is clean and free of contamination or industrial facilities. The long-lived, highly radioactive nuclear waste that will be produced by the proposed new reactors will remain onsite for generations, indefinitely threatening the health of nearby communities and the environment. (**0008-14** [Musser, Marcie])

Comment: Please assess the sacrifice zone that NRC will be creating by this license action. ...the burial of wastes on the site and need for long-term license or institutional controls. (**0038-11** [Olson, Mary])

Comment: Nonetheless, the fact that the Levy County site is the only true "green field" application brings this matter into ever clearer focus. Therefore we offer here a series of issues that we believe MUST be considered in the FEDERAL environmental evaluation of this federal action - to license a site that has never previously been licensed for a new nuclear-waste-generating and radionuclide-leaking site. This proposed sacrifice (and approval of an activity that will likely garner direct public subsidy) must be weighed against current reevaluation of the Waste Confidence Decision by the Commission - to affirm dry cask storage as THE source of federal confidence in continuing to produce high-level radioactive waste in the form of irradiated nuclear fuel. (**0038-3** [Olson, Mary])

Comment: If nuclear power generation is so clean, why do we need to build storage facilities like Yucca Mountain? (**0043-2** [Eppes, Thomas])

Response: *The safety and environmental effects of long-term storage of spent fuel onsite have been evaluated by the NRC and, as set forth in the Waste Confidence Rule at 10 CFR 51.23, the NRC generically determined that "if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation (which may include the term of a revised or renewed license) of that reactor at its spent fuel storage basin or at either onsite or offsite independent spent fuel storage installations." The impact of the uranium fuel cycle, including disposal of low-level radioactive waste and spent fuel, will be addressed in Chapter 6 of the EIS.*

Comment: [W]hat about the disposal of massive amounts of nuclear waste. According to the NY Times (11.29.08), we can't properly handle the amount of waste flowing into the Chesapeake Bay from a chicken farm with 150,000 chickens in Maryland. So who believes we can adequately and safely deal with the piles of nuclear waste which will accrue from permitting these plants? (**0006-9** [Dickinson, Josh] [Dickinson, Sally] [Malwitz-Jipson, Merrillee] [Wapner, Howard])

Comment: Yucca Mountain was supposed to take nuclear waste twenty-seven years ago. (**0014-125** [Cannon, Renate])

Comment: Yucca Mountain never occurred. (**0014-162** [Waldron, Theresa])

Comment: This nation does not need and cannot afford to continue stockpiling nuclear waste. I think that is the biggest environmental issue of this hearing. Nuclear waste remains deadly for longer than any society has ever existed. What makes us think that we're going to be around to take care of it. (**0014-71** [Eppes, Thomas])

Comment: Until the problem of waste storage is successfully resolved -- and by successful I mean, politically, economically, scientifically, and safely -- no new nuclear power plant should be permitted by the NRC. (**0014-72** [Eppes, Thomas])

Comment: [W]e [the Socialist Party] stand against the expansion of this type of power in the country because [of] the inability of the country to dispose of waste products. (**0015-102** [Moore, Brian])

Comment: I have here this article about the EPA ruling that says the waste must now be sequestered for a million years. Tell me who and how you are going to get a million year guarantee. And also it was just recently in the news that Yucca Mountain, which, by the way, is not going to be able to accept the waste, can't hold everything that the power plants now have ready to go, much less what any new power plant might make. Talk about a safety issue, an environmental issue. (**0015-37** [Klutho, Mark])

Comment: First, do no harm. We already have nuclear waste with a half life of thousands of years that will already fill the Yucca Mountain area. As the gentleman said, let's not make more. (**0015-61** [Sullivan, Jennifer])

Comment: The safety concerns are enormous. Currently, most nuclear power plants are reaching the ends of their lives, and will have to be decommissioned and there is still no plan to safely compensate for the nuclear waste which is stored onsite at every one of these accidents waiting to happen. These spent fuel rods will be hot for 10,000 years. (**0019-5** [Heywood, Harriet])

Comment: President-elect Obama has expressed reservations about whether our country's massive new investments in renewable energy should include nuclear power until issues of ... disposal of waste have been resolved. (**0028-3** [Horgan, Wendy])

Comment: We still do not have a solution for radioactive waste. (**0029-2** [Cox, Lesley])

Comment: Nuclear power is not sustainable when you have to secure the waste for 100,000 years. (**0029-4** [Cox, Lesley])

Comment: There is also no place for nuclear waste storage in Florida. Due to our delicate and fragile eco-system, our Floridan Aquifer which underlies our entire state and parts of four others, and the way everything in our Florida environment is interconnected, there is just no site here stable or isolated enough for any kind of nuclear waste storage - low-level or high-level. Levy County is certainly not a good place to turn into a nuclear waste dump, and as I understand it, Progress Energy has no other place to store waste from these plants. ...And we still have no permanent long-term solution for what to do with high-level nuclear waste, which remains radioactive for thousands upon thousands of years - so why create more of it?! (**0032-6** [Wilansky, Laura Sue])

Comment: [Uranium] is mined, radioactive, has hazardous waste that remains for thousands of years. (**0039-4** [Arnason, Deb])

Response: *The safety and environmental effects of long-term storage of spent fuel onsite have been evaluated by the NRC and, as set forth in the Waste Confidence Rule at 10 CFR 51.23, the NRC generically determined that "if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation (which may include the term of a revised or renewed license) of that reactor at its spent fuel storage basin or at either onsite or offsite independent spent fuel storage installations. Further, the Commission believes there is reasonable assurance that at least one mined geologic repository will be available within the first quarter of the twenty-first century and sufficient repository capacity will be available within 30 years beyond the licensed life for operation of any reactor to dispose of the commercial high-level waste and spent fuel originating in any such reactor and generated up to that time." The impact of the uranium fuel cycle, including disposal of low-level radioactive waste and spent fuel, will be addressed in Chapter 6 of the EIS.*

Comment: Nuclear power is NOT a solution to climate change. When the entire fuel chain is examined, including the initial construction and production processes, nuclear power (sold superficially as carbon neutral) becomes a big carbon producer. (**0006-3** [Dickinson, Josh] [Dickinson, Sally] [Malwitz-Jipson, Merrillee] [Wapner, Howard])

Comment: I think several hundred million dollars is a joke when we talk about the total cost over time of storing those materials. We today have no effective, you know, plan, reliable means of dealing with even the small amounts of waste that the professor had discussed. They may be small but they are potent. And I encourage people to look at a movie called Kilowatt Ours, Kilowatt O-U-R-S. It specifically delineates where we are at with regard to, you know, even the mining of uranium, which is a declining resource in exactly the same way as oil. (**0014-67** [Russell, John])

Comment: Nuclear is not a carbon-neutral enterprise. Those who say it is are not taking into account the mining, extraction, purifying, storing, transportation and all other aspects of providing the fuel for nuclear power plants. (**0026-7** [Towles Ezell, Joy])

Comment: Nuclear energy is neither carbon-free nor emission-free throughout its entire life cycle, which includes a variety of wastes produced by mining uranium and making nuclear fuel, in addition to the aforementioned unsolved problem with spent fuel and other nuclear waste. (**0032-8** [Wilansky, Laura Sue])

Comment: Nonetheless, the fact that the Levy County site is the only true “green field” application brings this matter into ever clearer focus. Therefore we offer here a series of issues that we believe MUST be considered in the FEDERAL environmental evaluation of this federal action – to license a site that has never previously been licensed for a new nuclear-waste-generating and radionuclide-leaking site. This proposed sacrifice (and approval of an activity that will likely garner direct public subsidy) must be weighed against:

- Current - and possible future lack - of any facility licensed under 10CFR61 for the permanent disposal of so-called low-level waste. If NRC is planning to license the expanded production of this waste production of this waste for which there is no permanent disposition that is currently licensed - what will the impacts (procreative, health, safety, environment, socio-economic, economic, legal, security) be on Levy County if a so-called “temporary plan” becomes a defacto permanent “solution”?
- The environmental impact statement must include the environmental impact of any possible “short-term” plan that Progress (or NRC) plan to employ to deal with the operational waste that would be generated at this site. These “short-term” options may include:
  - on-site storage - de facto permanent would mean that the waste never actually leaves the site, so the County is effectively becoming both a “low-level” and a “high-level” dump site. Please apply the above climate informed projections to a the so-called “low-level” waste as well.
  - shipping to a radioactive waste processor for decontamination and release - please include a complete assessment in the environmental impact statement of the impacts of Levy-generated waste on the public, workers (including transport), processor community, and eventual “end-users” of any materials released for re-use or recycle, or impact of disposal in municipal land-fills
  - shipping to a processor/waste broker for storage - please analyze all impacts to the public workers (including transport), host community and the potential of this plan reverting to on-site storage since it is likely that such storage would be time-limited
  - incineration - same as above
- combinations of all of these in a “shell game” that still does not resolve the fundamental problem of making this waste with no where for it to end up. (**0038-5** [Olson, Mary])

Response: *The NRC staff will evaluate impacts from the life-cycle of fuel production, construction, operation, and decommissioning of the plant. The results of this analysis will be presented in Chapters 4, 5, and 6 of the EIS. The generic impacts of the fuel cycle are codified in 10 CFR 51.51(b), Table S-3, Table of Uranium Fuel Cycle Environmental Data. In accordance with the guidance in 10 CFR 51.51, the staff will rely on Table S-3 as the basis for evaluating the environmental impacts (including fossil emissions) of uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of* *irradiated fuel, transportation of radioactive materials and management of low-level wastes and high-level wastes related to uranium fuel cycle activities.*

Comment: I would like to know why we cannot recycle the waste and re-use it like it is done in France, if I am not mistaken. (**0014-130** [Cannon, Renate])

Response: *Federal policy no longer prohibits reprocessing. The Energy Policy Act of 2005, P.L. 109-58, Section 953, directed the U.S. Department of Energy (DOE) to conduct an advanced fuel recycling technology research and development program to evaluate proliferation-resistant fuel recycling and transmutation technologies that minimize environmental or public health and safety impacts. Additional research and development is needed before commercial reprocessing and recycling of spent fuel produced under the U.S. commercial nuclear power program occurs. Reprocessing as part of the fuel cycle and waste management will be discussed in Chapter 6 of the EIS.*

Comment: This proposed sacrifice (and approval of an activity that will likely garner pulic subsidy) must be weighed against an examination of the supply of uranium that is cost-effective and energy balance-effective to use for fuel. A disclosure of assumptions made in licensing 2 new reactors that would operate 40 - 60 years while other nations are also expanding their nuclear generating capacity and the impact on both cost to operate and reliability of this form of power generation. (**0038-9** [Olson, Mary])

Response: *The irretrievable and irreversible commitment of resources, such as uranium, will be addressed in the context of the resources availability in Chapter 10 of the EIS.*

D.17 Comments Concerning Transportation

Comment: [T]ransportation of radioactive waste through our state to other sites poses additional environmental dangers. (**0032-7** [Wilansky, Laura Sue])

Comment: In spite of assurances from Progress Energy, residents are concerned about the possible future transportation of hazardous materials and nuclear waste through their neighborhoods. This danger would obviously pose significant pollution and health hazards. (**0040-7** [Medlin, Ted])

Response: *A detailed analysis of the impacts of transporting fuel and waste by truck to and from the proposed LNP site will be conducted and included in Chapter 6 of the EIS.*

D.18 Comments Concerning Decommissioning

Comment: But what are we going to do with those plants? That's why I asked that question before. We have plants that are old right now that need to be decommissioned. (**0014-66** [Russell, John])

Comment: This [nuclear] waste includes the plants themselves, which operate for a few decades, and then take, at a minimum, hundreds of years to be decommissioned. (**0032-9** [Wilansky, Laura Sue])

Response: *10 CFR Section 50.75 requires the applicant to provide reasonable assurance that funding will be available for decommissioning activities at the time they are needed. The environmental impact from decommissioning a permanently shutdown commercial nuclear power reactor will be discussed in Chapter 6 of the EIS. In addition, the staff may consider information from Supplement 1 to NUREG-0586, Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, which was published in 2002, when analyzing the expected impacts from decommissioning.*

D.19 Comments Concerning Site Redress

Comment: The EIS should provide information on what actions will be taken by PEF, if, in fact; the LWA work is accomplished, but all environmental clearances and permits are not obtained or if PEF decides not to continue with the project. How will the site be restored? What types of mitigation measures, if any, will be needed for affected wetlands? The EIS should fully document all actions to be taken by PEF if an LWA is granted, the work accomplished, and the project does not go forward. (0044-4 [Mueller, Heinz J])

Response: *By letter dated May 1, 2009, Progress Energy provided notification to NRC to withdraw their request for an LWA*.

D.20 Comments Concerning Cumulative Impacts

Comment: There appears to be no recognition of cumulative impacts resulting in the discharge of three nuclear power plants in a single location, a discharge flowing into a very shallow coastal estuary region and rich marine resource. It is both a marine nursery and habitat for at least one listed species. I find no reference to, or evaluation of salinity increases and associated impacts resulting from the LNP Blowdown contribution to the CREC discharge flow and think this is pertinent to the CZMA. (**0014-185** [Hilliard, Dan])

Comment: I'm going to be Progress Energy's closest neighbor. I live 7,000 feet or less from where their nuclear reactor is going to be. And I have three questions I've been trying to get answered and I think I got some answers but not all. One of them is, I want to know how many people live within 7,000 feet or less of adjoining properties to two nuclear reactors in the state of Florida, and I want to know if there has been any health studies done on them people within thirty years. (**0014-34** [Smith, Robert])

Comment: Is there another location in the United States or the world where two nuclear power plants will be located within eight statute miles of each other? If so, I would like to know it because with all the research I've done -- and a lot of people will tell you I'm a heck of a researcher -- it doesn't exist. Just one. Could you please tell us, the folks located between the two projected closest locations in the world, why they are so needed so proximate to that which already exists with the grid for distribution that already exists? (**0015-98** [Peters, Michael])

Comment: The proposed site plan is too close to the current Florida Power & Light nuclear plant exposing the people and environment in the entire area to too much of a potential for disaster to occur. Having nuclear power plants within close proximity to each other invites those who wish to do harm to our country to act upon those deadly desires. The proposed site is also next to a state forest - a place that the people of the state of Florida wish to preserve. (**0026-5** [Towles Ezell, Joy])

Comment: Progress Energy operates a nuclear power plant in Citrus County, Florida, where I live and its proposal to locate another nuclear power facility nearby unreasonably exposes the residents of Levy and Citrus County to the increased risks that are well understood to be associated with nuclear power plants. (**0028-2** [Horgan, Wendy])

Response: *The comments address the proximity of proposed LNP Units 1 and 2 to the existing Crystal River Unit 3. The cumulative impacts associated with the construction and operation of the proposed nuclear power facility will be evaluated and the results of this analysis will be presented in Chapter 7 of the EIS.*

Comment: Under the National Environmental Policy Act (NEPA), we are compelled to point out that building a new nuclear power reactor at all, anywhere is a "major federal action" not in and of itself, but also because it has now been almost 34 years since a new nuclear power reactor was ordered that actually went on-line. As such, the 15 some combined operating licensing actions now pending before the NRC constitute together this major federal action. Since NRC is implementing NEPA at each site, there is an overall effect of truncation since the decision to license a nuclear power reactor at all is not being considered. (**0038-2** [Olson, Mary])

Response: *The spatial and temporal effects identified for the proposed action will be reasonably bounded to the appropriate geographical area in Chapter 7 of the EIS.*

Comment: The largest single issue facing our world today is CLIMATE CHANGE. Any decisions we make from now on MUST contain an analysis of that project's impact on climate change. It is a matter of life. The whole world should have a say as to whether or not these proposed power plants are permitted. Think Alaskan villages toppling into the sea, Bangladeshi coastal-dwellers, the low lying portions of our own fair state of Florida, and the melting permafrost that is releasing methane at unprecedented rates. Increased carbon emissions mean accelerated climate change. (**0006-2** [Dickinson, Josh] [Dickinson, Sally] [Malwitz-Jipson, Merrillee] [Wapner, Howard])

Comment: Maybe we could use the wetlands and the trees. They are part of a carbon sequestration banking system. I just think it is an idea since we're talking about all different ways to help our environment and the air and global climate change. (**0015-32** [Casey, Emily])

Comment: It is not acceptable to state that the climate crisis is speculative, nor is it acceptable to contemplate granting a federal license that will result in billions of dollars of taxpayer and electric-power consumer money being spent on something that is not going to address that crisis - but the public funding is being justified under such a banner. This is either delusion or fraud. (**0038-21** [Olson, Mary])

Response: *The airborne emissions from proposed nuclear plants, although normally sufficiently small as to not degrade air quality or be important in climate change, will be considered in the evaluation of potential impacts. The impacts on air quality resulting from construction and operation of proposed LNP Units 1 and 2 will be discussed in Chapters 4 and 5 of the EIS. The impacts of nuclear power generation on climate change will be addressed in Chapter 7 of the EIS.*

Comment: [Progressive Energy] [has] made no decisions about the four coal units that we have operating in Crystal River. Clearly we have decisions that we will be making in the long term but it is quite a few years off before we will have all of the decisions finalized. (**0015-10** [Barnwell, Martha])

Comment: What are the cumulative environmental impacts of this project for the greater Nature Coast region given current and other proposed projects in the region (Tarmac Mine, Cemex Mine, proposed residential developments in Levy County, Gulf Hammock mines currently in operation)? Please fully explore the full cumulative regional impacts from this project and other projects in the region and their connections and relationships in terms of regional water supply, health and structure of the aquifer, regional water quality, health of wetlands systems, habitat, and coastal ecosystems and estuaries, etc. (**0015-114** [Murphy, Joe])

Response: *The cumulative impacts associated with the construction and operation of the proposed nuclear power facility will be evaluated and the results of this analysis will be presented in Chapter 7 of the EIS.*

D.21 Comments Concerning the Need for Power

Comment: We have followed with great interest the steady progression of PEF in pursuit of their proposed electrical generating facility, which when completed will:

- Provide electricity to meet the demands of continued growth in the region, for customers of Progress Energy and other utilities.
- Ensure more flexibility and a backup system for providing critical energy to the area.
- Maintain a robust system for supplying and delivering electricity to ensure the continued economic prosperity of the region. (**0010-2** [Johannesen, Francine])

Comment: We concur with the PEF philosophy that - electricity is far too important to risk service interruptions or problems with power quality due to inadequate equipment. We applaud Progress Energy for its continued efforts to work cooperatively with regulators, community leaders, and other stakeholders in Florida to ensure the company makes the best long-term decisions to meet Florida's future energy needs. (**0010-3** [Johannesen, Francine])

Comment: Life would be nice without the threats associated with nuclear power. However, no one I know wants to give up electricity and what it brings to our lives; therefore, power plants are a necessary evil. With that in mind, I believe, and most people agree, rural areas are the best place for power plants. (**0013-1** [Bullock, Wade])

Comment: Along with the proper transit solutions, energy production/consumption is a critical component and decisions need to be made now so that the state is not faced with an energy shortage. (**0014-103** [Mucci, Matt])

Comment: The U.S. Department of Energy estimates that our electricity demand will increase twenty-five percent by the year 2030. Roughly that means, for every four Americans you can add one more flipping the switch, adjusting the thermostat or opening the refrigerator. As technology advances and our population increases, so too will our need for energy grow. In Florida alone demand is increasing faster than the state's population. Is it any wonder? It used to be the only thing you would carry on your person that ran on electricity was your watch, just a small battery. But today we have cell phones, laptops, Blackberries, iPods, and in the not too distant future we may have cars that are running on electricity that you have to plug into the wall every single night. In fact, it is somewhat ironic that today on Capitol Hill, Congress is talking about to get bailed out the car manufacturers are going to have to make electric vehicles. So how will we handle the enormous increases in electricity that we will need? (**0014-108** [Walther, Robert])

Comment: The Levy County project clearly is intended to address the documented needs for additional electrical service that is going to be required within the State of Florida. (**0014-131** [Maidhof, Gary])

Comment: Despite the current economic downturn that we are seeing not only in this state but across the United States, Florida is, indeed, the fourth largest state in the United States. And we are ranked third nationally in per capita energy consumption. Over the last three decades homes in the state have grown by an average of over fifty percent and usage is up in those homes by over thirty percent. And, quite frankly, over the next decade we anticipate that usage will increase by over twenty-five percent. (**0014-6** [Barnwell, Martha])

Comment: Even with our significant commitment to alternatives, renewables, and to energy efficiency, we will need additional generation to meet the growth of our state. (**0014-8** [Barnwell, Martha])

Comment: The need for electricity within this region, both now and in the future, is clearly documented. (**0015-1** [Maidhof, Gary])

Comment: [L]et me just begin with by saying that despite the fact that this area of the state of Florida, as well as across the United States, that we are seeing an economic downturn, energy usage and growth in the State of Florida has been strong for a number of years. Florida is the fourth largest state and ranks third in the usage per capita of energy consumption. In addition, over the last three decades our home sizes have grown by over fifty percent and our usage has grown by over thirty percent. In the next decade, we project that we will have a twenty-five percent growth in usage here with our customers in the state of Florida. (**0015-11** [Barnwell, Martha])

Comment: At Progress we recognize that there is no one solution to the energy needs that we have here in the state. It must be a balanced solution. And that solution includes energy efficiency, investments in alternatives and renewables, as well as the building of state of the art plants, including state of the art nuclear plants. (**0015-12** [Barnwell, Martha])

Comment: The U.S. Department of Energy predicts that by the year 2030 our demand for electricity will have gone up by twenty-five percent. Roughly that means for every four people in the United States add another who is flipping a switch, opening the refrigerator, or adjusting the thermostat. As technology advances and our population increases, so too does our demand for electricity. In Florida alone demand is increasing faster than the state's population. But is it any real wonder? It used to be the only thing you used to carry on your person that used electricity was a watch than ran off a small battery. But now laptops, iPods, Blackberries, cell phones, and pretty soon we may have cars that are plugging into the outlets. I mentioned earlier that today we had a hearing on the Hill with the automakers. And our congressmen and women suggested that electric hybrid plug-ins have to be part of the solution, have to be part of the future. So how are we handling the enormous increases in electricity that we will need? Conservation and more efficient electrical appliances will help. (**0015-46** [Walther, Robert])

Comment: Our region is one of the fastest growing in Florida. Progress Energy is mindful of that fact and how best to serve Florida's future energy demand. The Levy County project will do just that. (**0015-8** [Pernu, Dorothy])

Comment: Our future energy needs are paramount. (**0035-5** [Craig, Avis])

Response: *The comments support or conclude that more baseload power resources are needed. The NRC staff will evaluate the need for power in Chapter 8 of the EIS.*

Comment: I would like to see Progress Energy present some true alternatives. I mean, a lot of their models are based on Florida just growing, growing, growing. We all know it's not happening right now. Things have slowed down and there is no guarantee that things are going to start taking off and growing in the future again like they used to be. Past performance is no guarantee of future performance. You know, our country is changing. It is time to downsize. If they need power let's build small efficient plants where the power is needed. (**0014-154** [Jones, Art])

Comment: I guess what I really want to say is I have an answer for us dummies. We need to form a coalition, hire an advocate attorney, and nip this thing in the bud from the Governor all the way down. Now, you say: Well, that probably wouldn't work. Well, it did because I donated my $10 in Palm Beach County. We took Florida Power and Light to court and we won. And I got $13.75 back and I got $10 a month lower in the bill. So it is possible. I've written this in the newspapers, both St. Pete Times and the Chronicle. I would be very happy to form this and spend my time. It will take donations. Now, I only gave $10, but my God, you've got to figure that was 1950. So I don't know what it would take. But I think it is the idea, a way for us seniors to fight this. Not so much the plant. You can build a dozen plants but don't ship my energy up north. (**0014-50** [Foreman, Patricia])

Comment: The new plant that could be built in Levy will be able to power 1.4 million homes. The reality is we will need to require more from all of these sources and all others in the years ahead. If the housing crisis in Florida has shown us anything, it is that sound economic policy must recognize the virtue of diversity. So too must a wise energy plan. And in that diverse plan nuclear energy is a critical component. (**0015-48** [Walther, Robert])

Comment: This society has convinced itself that electric power is vital to our survival. NRC in implementing NEPA must remember and evaluate resources based on the truth - living human beings need in this order: air, water, food and then a whole bunch of things - somewhere down that list is electric power. (**0038-15** [Olson, Mary])

Response: *The NRC staff will evaluate the need for power in Chapter 8 of the EIS.*

D.22 Comments Concerning Alternatives – Energy

Comment: We should be putting our emphasis on conservation and efficiency instead of simply generating more power. (**0006-11** [Dickinson, Josh] [Dickinson, Sally] [Malwitz-Jipson, Merrillee] [Wapner, Howard])

Comment: Not only will its construction and use be detrimental in many ways, most significantly, its high dollar cost will directly squander the resources essential for America to implement meaningful climate mitigation through development of alternative/sustainable energies. Florida already has FREE energy coming to us every day, from the sun. We should be pouring our resources into developing solar energy state wide. (**0006-4** [Dickinson, Josh] [Dickinson, Sally] [Malwitz-Jipson, Merrillee] [Wapner, Howard])

Comment: This 17 million dollars could be better spent on renewable, clean, safe energy technologies - we do not want any further investment in coal or nuclear! (**0007-2** [Whiteley, Naomi])

Comment: [W]e must produce electricity needed in Florida through less risky energy supplies such as energy efficiency, solar, wind, water and biopower. (**0008-13** [Musser, Marcie])

Comment: Floridians need and want affordable, clean and safe energy choices such as energy efficiency, wind, water, solar, and biopower. (**0008-2** [Musser, Marcie])

Comment: Were the “Sunshine State” to put 1/4 th that amount into solar we could avoid all the drawbacks of nuclear power. (**0008-4** [Musser, Marcie])

Comment: It would make much more common sense, be more affordable, present less hazard to us and the environment or animals if we developed renewable energy. (**0009-5** [Davis, Suellyn])

Comment: We have taken an interest in alternative energy approaches and it is a priority of our local legislative state delegation. (**0014-105** [Mucci, Matt])

Comment: The Clean and Safe Energy Coalition supports conservation. Let me be clear. We support conservation. Energy conservation and efficient electrical appliances will help and a deeper commitment to renewable sources like wind, solar and geothermal is needed. Again, let me be clear. We support these alternative forms of energy. (**0014-109** [Walther, Robert])

Comment: Wind and solar are also a part of the diverse mix. I want to make that very clear and continue to stress we may be a coalition that does advocate the expansion of nuclear power, but we also support a diverse portfolio. (**0014-135** [Hernandez, Michael])

Comment: And it is an enormous amount of money which is being taken out of financing other forms of alternative energy which are competitive and cleaner. Now those competitive systems could be brought on stream well in advance of the time taken for the Levy plants to be completed and brought on stream. (**0014-57** [Hopkins, Norman])

Comment: Progress Energy has right of way of hundreds of miles of land under existing transmission lines. It uses solar energy in five Sun Smart schools in Florida. It exercises hydrogen fuel economies in Florida. I'm sorry, initiatives in Florida. And its facility in Citrus County has cheap railcar access. One ought to exploit these assets as an alternative to putting something which is essentially a tumor on our society and on our land, possibly by siting solar installations on their own rights of way, which they already have, capturing the electricity generated, back-feeding it to the plant site to supply the national grid, converting excess loads generated into hydrogen fuel to service cars and transportation as a future resource. A balanced complementary generating policy is needed. If this were founded in Citrus County, creating jobs of the type just described for handling all of that solar energy collection, and increasing the County purse because that would not suffer, then go, make progress. (**0014-59** [Hopkins, Norman])

Comment: [W]e can look at vortex-induced vibration for aquatic clean energy, which is a hybrid which works. You know, these are proven technologies. It is wave energy on steroids. Of course, on the campaign trail one of the state senators that I was on the dais with, he had no clue what wave energy was. This is a problem that I spoke about that involves the political industrial hand-in-glove relationship that is in return for those lobbyists' contributions of $2300 we have people that go along and get along. There is great ownership in denying us progress in the future. (**0014-68** [Russell, John])

Comment: This [no new nuclear plant should be permitted by the NRC until the problem of waste storage is successfully resolved] is especially true in Florida which has enormous yet largely untapped sources of safe, clean, renewable energy. The technology to convert that energy into electricity can be installed by the power companies for about half the cost of building a nuclear plant and will create far more permanent jobs to help our economy. (**0014-73** [Eppes, Thomas])

Comment: Please do not permit our utilities to divert tens of billions of dollars, of our dollars, into Twentieth Century nuclear technology when Twenty-First Century solar technology is so much safer, cleaner and cheaper. Companies like Southern California Edison, Sun Edison, Solyndra, and VRB Power are showing everyone how to do it. The NRC can help by not permitting Progress Energy Florida to build a nuclear plant in Levy County. Some things last forever like nuclear waste and solar cells. Which would you rather have in your environment? (**0014-75** [Eppes, Thomas])

Comment: France was mentioned. France has gone big on nuclear. It is an entirely different nuclear process than what Progress Energy is talking about doing here and what we do in the United States. Germany has not been mentioned. Germany is doing a huge amount of solar energy. Which business model do we want to follow? Progress Energy talks about a balanced solution which I support. I think we need to have a balanced solution of alternative energy and energy efficiency in addition to state of the art power plants. (**0014-76** [Eppes, Thomas])

Comment: But where is the balance when Progress Energy is going to limit renewable energy sources to just three percent of the fuel mix with or without this nuclear plant. Where is the balance when Progress Energy has an energy efficiency program that based on current expenditures over the next eight years will amount to less than ten percent of their investment in this nuclear power plant. (**0014-77** [Eppes, Thomas])

Comment: This power plant will cost $7.7 million per megawatt. Southern California Edison is installing solar panels on leased commercial rooftops in high growth areas for $3.5 million dollars per megawatt. Less than half the cost. (**0014-78** [Eppes, Thomas])

Comment: A recent study by Navigant Consulting for the Florida Public Service Commission showed that Florida's solar potential is 175.8 kilowatt hours which amounts to 71.7 percent of all the electricity produced in Florida in 2007. That simply confirms the study done by the American Council for an Energy Efficient Economy last year which showed that solar and other renewables could replace 26 percent of conventionally generated electricity in Florida by the year 2023. California is going to have 20 percent of their electricity generated by renewables by 2010. Certainly we can do just as good a job. (**0014-79** [Eppes, Thomas])

Comment: We can reduce our energy -- now, I'm familiar with this because when we lived in Europe in the eighties they were building buildings over there that had solar energy built into them when they were brand new. The Greeks. We lived in Greece and they had on the tops of roofs, every new house being built had pipes running up to the roof for heating hot water. We haven't done anything like that in this country. We don't have any solar panels here to speak of except in California, which is the leader, the big leader, and God bless them. (**0014-94** [Roberts, Preston])

Comment: We can reduce our energy requirements by, I calculate, a minimum of twenty percent when we build a new home. And the way of doing it is through the design of the house, the positioning of the house for the sun. They do that in many places out west. They design a house so that they either get rid of the sun or attract the sun. Insulation, and there are all kinds of insulation programs available today, different kinds of insulation. Triple glazed glass in your windows. Tremendous heat gain can be stopped by having triple glazed glass or you can keep your cool in or your heat in, whichever you're trying to do. Improved heat pump systems. (**0014-95** [Roberts, Preston])

Comment: [P]utting solar panels on the roofs and having the Federal government, as well as the State, start giving incentive to contractors to put these units in and let us sell the energy back to Progress. Let us make lots of electricity in our homes, which we can do. We can use -- we have batteries there. We pull that energy in, we use it in our homes. We will use what we need to use when we want it, want to do that, and the balance, let's sell it back. Boulder, Colorado has gone all electric now with panels in their homes. This is true. This was out about two weeks ago. And they are conserving energy and they are very interested in solar. And all the homes now have these units in there that control the house electric flow at the prime and peak times. And that's not something new; that's been readily available. But Boulder is on top. And they are going after it and doing it, and God bless them. (**0014-96** [Roberts, Preston])

Comment: I understand this Progress Energy plant is going to service thirty-five counties. That's what was told to me today, thirty-five counties. I wonder if we held a vote, a vote in those thirty-five counties, explained the alternate possibility besides a nuke plant, two nuke plants, three nuke plants, maybe solar panels. Solar farms they call them. They call them solar farms. Putting those solar farms in place. (**0014-97** [Roberts, Preston])

Comment: My fourth concern questions the relevancy of the project at this time. Efficiency first. The project diverts money, attention and effort from such a campaign that could reduce energy consumption in this country by one fifth. (**0015-111** [Hopkins, Norman])

Comment: Our last electric bill, $36.47. Now, you want to talk about the environment? That's because of the solar on the roof for our hot water. I haven't even done the retrofit on the house yet. It will be even less when that's completed and the house will also be able to stand up to a hurricane five. (**0015-44** [Klutho, Mark])

Comment: Where are the options of conservation? You want to hear that. They don't make money off of that. Where are the solar representatives? Not invited, not funded, not considered as an option. Where are the wood power reps? Same thing. Solar is being used worldwide despite the oil, coal, gas and nuclear industry's suppression of it. It is used in the Northwest United States and in Scandinavia. There are huge solar fields that are being built in the western part of this nation. And if you think we don't have wind here in Florida, they say we don't, then these people need to get out in the Gulf of Mexico once in a while. We've got wind. (**0015-58** [Sullivan, Jennifer])

Comment: Progress Energy could do the right thing and take the billions of dollars that are allocated for the planning and implementation of this plant and work on creating truly sustainable energy plans for our state using solar, wind and other natural alternatives. By doing this we would be creating just as many jobs, sustaining our environment, protecting our employment, and leaving green solutions for those who come after us, such as our children. (**0015-79** [Stewart, Anita])

Comment: By the time the Levy County plant comes on line some of its technology will already be outdated. Everybody is talking about change this year. It has become a real key word. Do we want nebulous change or something really life changing. This is something that we all need to think about and this gives us many opportunities. Alternative energy sources could be our real change. (**0015-80** [Stewart, Anita])

Comment: Possibly there is no real need for the nuclear but there is a need for more wind and water. (**0015-94** [Berger, Betty])

Comment: We are at the edge of a new beginning in terms of energy and the environment. New technology is beckoning at our door and we must open that door to the future. Thousands of new jobs, trades and learning opportunities are enveloped in the new solar, wind, thermal and tide energies. We as a world leader must say 'NO' to the old ways of polluting our own world. Just like our bodies, we only get one. Though it is too late for us as a nation to take the lead in this environmental transition, we join the advanced nations on the correct path. (**0016-2** [Waldron, Theresa])

Comment: The environmental negatives of such a project are obvious, and I don't need to elaborate extensively on them. The science does not support nuclear power as a viable alternative to greenhouse gases. Nuclear power distracts us from the real viable alternative fuels that don't pollute and add to the greenhouse effect. Solar, wind, geothermal and other clean fuel technologies are the only answer to our energy future. (**0019-10** [Heywood, Harriet])

Comment: Progress Energy had made little effort in developing our region's energy conservation and energy alternatives. We live in a state where solar energy is about to take hold. Progress and Levy County are in a position to set the trend for the future through the promotion of conservation and solar and wind energy. (**0023-1** [Highsprings, Jojo])

Comment: [T]he loss of this expanded level of state grid capacity would be catastrophic to the state power supply needs, since the utilities in Florida have not brought forward other renewable energy supplies such as solar and solar photovoltaic, river current electricity, tidal energy, ocean current, nor wind where possible. (**0026-2** [Towles Ezell, Joy])

Comment: The NRC should work its way out of existence by concentrating on closing down nuclear power plants and moving into a new, sustainable, safe, renewable power future for the United States. (**0026-8** [Towles Ezell, Joy])

Comment: This is not the time to push ahead with a nuclear power plant that is not supported by the general public and does not advance our country's interests in developing renewable energy sources that are safe for people and the environment. (**0028-5** [Horgan, Wendy])

Comment: Uranium is a scarce resource. The sun, wind, conservation, and energy efficiency are not. (**0029-5** [Cox, Lesley])

Comment: Not only will its construction and use be detrimental in many ways, most significantly, its high dollar cost will directly squander the resources essential for America to implement meaningful climate mitigation through development of alternative/sustainable energies. Florida already has FREE energy coming to us every day, from the sun. We should be pouring our resources into developing solar energy state wide. (**0029-6** [Cox, Lesley])

Comment: Lastly, and most importantly, I would like to see an assessment of the long-term opportunity cost of constructing, maintaining and employing this type of electricity generation as opposed to meeting the projected demand through conservation, efficiency and renewable energy generation. Give the limited financial resource projection and current Florida regulation, we are not confident that conservation, efficiency and renewables will be fundable once the nuclear capacity is funded. (**0030-10** [Roff, Rhonda])

Comment: And building new nuclear plants will directly interfere with the development of better, safer technologies by diverting much-needed resources from their development. There is enormous potential in many already existing sustainable technologies, as well as new ones currently in development. If these promising technologies had a fraction of the resources that have been poured into the giant sinkhole that is the nuclear industry, we would not even be having this discussion. It would be crystal clear to everyone, as it is to me, that there are better, safer energy options, and that there is no need for new nuclear plants in Florida or anywhere else. If we are to save our environment and our planet, now is the time to invest everything we can into truly safe, sustainable technologies. But the huge financial investment required by new nuclear plant construction will mean that the full development of new renewable, sustainable energy technologies could be set back by years, at the time when we need these new technologies the most. Florida in particular has abundant solar energy that is not being used. And through improved energy conservation alone, we could reduce our power consumption in Florida enormously. These are just a few of the many safer and more cost-effective ways to address our Florida energy needs, rather than building new nuclear plants. (**0032-10** [Wilansky, Laura Sue])

Comment: What about turbines & sun uses for electric in our communities? (**0036-3** [Foreman, Patricia])

Comment: Address the climate crisis head-on: compare nuclear energy (including fuel production and waste management) to other forms of electric power generation - besides coal which IS the problem - for contribution to reducing greenhouse gas emissions. Please also include systemic programs that produce “nega-watts” - also called energy efficiency - but in this case NOT the action of individual consumers, but actual institutional programs whether by utility corporations or independent administrators. (**0038-18** [Olson, Mary])

Comment: Given the striking fact that there has not been a new reactor license that was not subsequently canceled in more than 30 years, under NEPA there should be a specific comparison to other alternatives that includes a comparison of the wastes, emissions and routine releases from various forms of energy. Please include carbon footprint in this analysis - and include the mining and production of the fuel and the handling of the wastes in that analysis. We all know that coal has very bad emissions and wastes as well, however it is time that NRC includes a fair and balanced assessment of nuclear compared to the fastest growing electric power generating capacity on the planet: wind. Concentrating solar is growing as well - and while new forms of hydro are still under development, some of these could be included as well. While you are at it, please include the so-called “Gen IV” reactors since they are being invoked by the industry as THE REASON to build the current sorry generation 2 (it is a stretch to call these same-old, same-old PWRs and BWRs Gen 3). We need some good data disclosure on the wastes of Gen II, Gen III and Gen IV - it would a service for NRC to give us these comparisons. (**0038-6** [Olson, Mary])

Comment: My husband and I, 400 signatures I have collected from family and friends, say no coal, no nukes, go solar first. (**0039-2** [Arnason, Deb])

Comment: [Nuclear energy] accident potential far beyond that of solar, wind, wave, geothermal. (**0039-7** [Arnason, Deb])

Comment: Power companies should be public utilities. We need honest plans like www.ieer.org, Carbon-Free and Nuclear-Free, A Roadmap for US Energy Policy and Google Energy’s plan to power the US 2500x over using solar, wind and geothermal. This is being done. Only the political and corporate determination to make a killing instead of a living off of the citizens of Florida and the US and the planet keep us from truly clean, renewable energy. (**0039-9** [Arnason, Deb])

Comment: Please heed the warnings from mere citizens such as myself for me and my young family members. Find the alternatives that promote health and well being. (**0042-2** [Malwitz-Jipson, Merrillee])

Comment: Please clarify whether the EIS process will incorporate a review of reasonable alternative energy sources. To inform the reviewer, applicant’s design alternative evaluations can be incorporated by reference. (**0044-2** [Mueller, Heinz J])

Response: *Decisions regarding which generation sources and alternatives to deploy are made by the applicant and regulatory bodies such as State energy planning agencies. The alternatives must be technically viable, feasible, and competitive. Alternative actions such as the no-action alternative (energy efficiency and demand-side management), new generation alternatives, purchased electrical power, alternative technologies (including renewable energy* *sources such as wind and solar), and the combination of alternatives will be considered in Chapter 9 of the EIS.*

Comment: The territory of the State of Florida is quite unique, being a peninsula, with limited energy resources, limited borders with other states, and therefore limited space for installation of power lines. All this indicate that the State should invest on internal generation of power/electricity. Different sources specially Nuclear Power and Solar Energy should be expanded because both do not have greenhouse gas emissions. (**0005-2** [Haghighat, Alireza])

Comment: It [nuclear power] also provides long-term cost stability as it is the lowest production cost of any major source of electricity, including natural gas and coal. And as we invest in more carbon-free nuclear, we decrease our reliance on fossil fuels and we help to stabilize rates and reduce fuel volatility that we've been experiencing over the past several months. (**0014-10** [Barnwell, Martha])

Comment: The greater conservation and renewable energy don't provide the base load power, the power that gets you to and from work, that gets the economy moving all twenty-four hours of the day. Consider that today all renewal sources produce two percent of our electricity while nuclear power accounts for twenty percent or one out of every five homes and businesses in the United States. (**0014-110** [Walther, Robert])

Comment: With regard to the waste question, the fissioning of a uranium atom releases 200 million electron volts. The burning of one coal atom releases four electron volts. In other words, on an atom-for-atom basis, nuclear creates 50 million times less waste. (**0014-20** [Tulenko, James])

Comment: [T]he true honest concern is yes, I do have a large carbon footprint; yes, I would like to see alternatives to the fuel that we are currently using because it is not in our best interest. (**0014-29** [Welker, Randy])

Comment: [I]n my opinion, fossil fuels need to become a dinosaur and a way of the past. And fossil fuels, obviously there is no doubt that they harm the environment and there is lasting impacts that we would like to see go away. (**0014-38** [Frink, Ken])

Comment: As an aside, a remark has been made about the cost, the comparative cost of electricity. Now, according to Amory B. Lovins, J. Rom (phonetic), Lester Brown who are widely accepted in this field, the cost of the energy in terms of cents per kilowatt hour from the nuclear plants will be at least twice the cost of the same from wind or solar. (**0014-58** [Hopkins, Norman])

Comment: At Progress Energy we have a responsibility to serve the electrical needs of our customers but we also recognize that there is no one single solution to meeting the energy needs of our customers. Our solution is a three-fold solution, a balanced solution. It is a combination of energy efficiency, alternatives and renewables, as well as investing in state of the art plants. (**0014-7** [Barnwell, Martha])

Comment: Even with a significant commitment to energy efficiency and renewables, we will not be able to meet the needs without cost-effective environmentally responsible ways to serve Florida's needs through nuclear. Nuclear also provides long term cost stability and it is the lowest production cost of any source of electricity, including coal and natural gas. (**0015-13** [Barnwell, Martha])

Comment: As we invest in carbon-free nuclear, we decrease our reliance on fossil fuels, and we stabilize our rates and reduce the fuel volatility that we have seen over the past several months. (**0015-14** [Barnwell, Martha])

Comment: A deeper commitment to renewable sources such as wind, solar and geothermal is needed. Let me be clear. We support them. But greater conservation and renewable energy don't provide the base-load power, the round-the-clock power that we need to run our country. We need to be able to turn the switch on any time of day. Consider today that all renewal sources produce two percent of our electricity while nuclear power accounts for twenty percent. That's one out of every five homes or businesses in the United States. (**0015-47** [Walther, Robert])

Comment: Energy Yield - or Energy Balance/Thermal Pollution - please start including in your side-by-sides of the different alternatives an honest disclosure of energy in vs energy out...include the mining and production of the fuel and handling of the wastes. It is high time that the younger generation get to SEE that 2/3 of the radioactive waste generated in this process did NOT make electric power. The latent heat issue needs full disclosure in the context of efficiency of power production. It is not appropriate to assert that wind and solar are intermittent forms of power and operate at a lower capacity without in the same comparison pointing out that power production that depends on steam wastes 2/3 of the fuel by releasing the latent heat of phase transition as thermal pollution, not power. (**0038-7** [Olson, Mary])

Response: *The NRC is not involved in establishing energy policy; rather, it regulates the nuclear industry to protect public health and safety within existing policy. The discussion of alternative energy sources in Chapter 9 of the EIS will describe potential impacts from alternative energy sources, including fossil and renewable energy sources such as wind and solar, in comparison with the proposed action.*

D.23 Comments Concerning Alternatives – Sites

Comment: [W]e have chosen Levy County as our preferred site. It provides a sufficient supply of cooling water which is one of the major requirements and important factors in the sustainability of any plant site. Our preferred site was chosen because it has ample water to meet the needs without adversely affecting other water usage and requirements in the area. Cooling water for the plant will be supplied through an intake from the Gulf of Mexico. This site also works well because it can connect easily to our transmission grid with our transmission plans that we have associated with the plant, allowing the energy generated here to serve in our thirty-five counties. (**0014-12** [Barnwell, Martha])

Comment: I think that the location of this plant is a bad location. I've listened to what people have said here, and particularly Mr. Norm Hopkins. And this is somebody who has really done his homework. It is somebody that is not on anybody's payroll. It is somebody who is doing his homework because they care about Crystal River and all the people that live here. (**0014-147** [Jones, Art])

Comment: [L]et's build it where the need is for the power so you don't, you know, have these transmission lines going 180 miles to bring power over the villages. If the villages are growing, and the villages need power, and these nuclear plants are so safe, well then build it over near the villages. This just looks like a really bad location for the plant. It looks like a bad environmental disaster waiting to happen. (**0014-152** [Jones, Art])

Comment: So, you know, I just want to say I think we should keep it simple. I know the NRC has got tons, and tons, and tons of paperwork to go over and, you know, I hope you really look and listen clearly to people like Mr. Hopkins who has done their homework and that will take the burden off you. Here is someone that did the homework and it is just not a good location for these plants. (**0014-155** [Jones, Art])

Comment: And this is a lovely area, pristine area, and I think that's one of the reasons we've been targeted to put three together in here. And I would like to know where the energy is going aside from locally. (**0014-158** [Tyler, Janice])

Comment: Placing the proposed plants in this area would contribute to the degradation of the ecological banking system which has worked fine for us in the past and will work better in the future if we can restore or at least maintain a lot of what we already have and not lose any more. (**0015-31** [Casey, Emily])

Comment: [T]hey [Progress Energy] are putting this plant so far away from the population that it supposed to be serving. The more populous areas would be a lot more costly to cover should there be a disaster. (**0015-54** [Albert, Pamela])

Comment: [T]here are 4100 acres in Crystal River where there happens to be two coal-fired plants and a nuclear power plant. Well, there are over 3,000 acres there unused. There is an existing distribution network for the power that could be made with the new dual nuclear power plants located where one already is and two back-up coal-fired plants already are. (**0015-96** [Peters, Michael])

Comment: Progress Energy has proposed one of the worst siting situations in history. (**0026-3** [Towles Ezell, Joy])

Comment: The NRC issued a public notice for the 12/4/2008 meeting that stated that it intended to gather the information necessary to prepare the EIS as part of the review of the LWA and COL application for the LNP site. The public notice stated that the EIS would include alternatives to the proposed action (issuance of the LWA and COL), such as no action, reasonable alternative energy sources, and alternate sites. But at the public scoping meeting, NRC Environmental Project Manager Douglas Bruner stated that the EIS would be developed for only one specific site, the 3105 acre site near Inglis, FL specified in the Levy Nuclear Plant Units 1 and 2 COL Application's Environmental Report. Mr. Bruner indicated that no alternative sites are to be assessed. Also, it was stated that the NRC would only consider the one specific design submitted by PEF. Please clarify whether the EIS process will incorporate a review of reasonable alternate sites. To inform the reviewer, applicant's site alternative evaluations can be incorporated by reference. (**0044-1** [Mueller, Heinz J])

Response: *The NRC will address alternatives to the proposed action in Chapter 9 of the EIS such as "no action, reasonable alternative energy sources, and alternate sites" to a level necessary to meet the requirements of NEPA. Additionally, the EIS will provide the information necessary for the U.S. Army Corps of Engineers to address the Least Environmentally Damaging Practicable Alternative (LEDPA) in their Record of Decision required under Section 404(b)(1) of the Clean Water Act.*

D.24 Comments Concerning Benefit-Cost Balance

Comment: I am greatly angered by the audacity of the NRC for allowing the investors to build a double reactor in Levy County. Aside from the nonsensical, and I might add astronomical, cost for such a HUGE time-consuming dinosaur, the environmental and safety concerns are staggering. (**0019-1** [Heywood, Harriet])

Comment: [I]t is clear to me that building new nuclear plants at the proposed Levy County site would be extremely dangerous and very costly in a variety of ways. (**0032-1** [Wilansky, Laura Sue])

Response: *These comments express opposition to the applicant's COL application. The NRC will carefully review the application against its regulations that are intended to protect public health and safety and the environment. An evaluation of the benefit-cost balance of constructing proposed LNP Units 1 and 2 will be discussed in Chapter 10 of the EIS.*

Comment: The insolence of the nuclear industry's request for REDUCED safeguards at the same time they ask for massive Federal funding should be a first signal that something is terribly out of whack. We now have a more refined sense of what an ANNUAL request for

$25 billion or MORE actually represents in terms of the public's ability to pay. (**0006-8** [Dickinson, Josh] [Dickinson, Sally] [Malwitz-Jipson, Merrillee] [Wapner, Howard])

Comment: My third concern is the cost of the project and the unrewarded charges to consumers for capital expense of Progress Energy incurred. (Both costs and time to build are guesses at this stage. Even Progress Energy literature is vague on this in a range of $2.5 billion to $17 billion). The project costs are hard to comprehend. Looked at another way, the latter equals about three times the value of gold reserves held by the International Monetary fund (IMF), or 5% of IMF total reserves. That is a huge sum to apply to a single venture, taking money away from competitive power generation alternatives, which would be expected to mature years before the Levy County system is completed. (**0015-110** [Hopkins, Norman])

Response: *The NRC does not have authority under the law to ensure that the proposed plant is the least costly alternative to provide energy services under any particular set of assumptions concerning future circumstances. This authority and responsibility is most often the role of State regulatory authorities such as public service commissions, or in the case of merchant plants, the competitive marketplace. The EIS will consider the potential for alternative non-nuclear technologies to provide the electricity that could be generated by the proposed plant and their environmental impacts. The potential effect of a particular nuclear power investment on the future development and implementation of alternative technologies is speculative and beyond the scope of the EIS.*

Comment: Progress Energy's proposal to build the Levy County nuclear plant provides a recent example of the high cost of nuclear energy and the difficulty in providing accurate cost estimates. The cost of two Westinghouse AP1000 reactors has nearly tripled since initial estimates, to more than $17 billion. (**0008-3** [Musser, Marcie])

Comment: [W]hen are we going to get a lottle sense and quit spending so much money??? Of there is an affordable way and one that eventually we MAY recoup the expenses then common sense says that going the more affordable way would make financial sense. (**0009-2** [Davis, Suellyn])

Comment: A major advantage of a nuclear power plant is that once built, electricity costs will remain relatively stable for the next 60 to 80 years, because the major costs are the capital cost of building the plant. Once built, the fuel costs are a minor part of the total cost, unlike natural gas. (**0011-6** [Tulenko, James])

Comment: If our plans continue to move forward and are approved by our State and Federal regulators, the two new advanced technology reactors could begin operating in 2016 and 2017 respectively. And once those plants begin operating we will save our customers over $1 billion annually in fuel costs. (**0014-11** [Barnwell, Martha])

Comment: Because of the time and expense required to build nuclear facilities we've got to take the long-term view now, and that is why we are all here today. If plans continue to move forward and we receive state and Federal regulatory approval, the two new advanced technology reactors could begin operating in 2016 and 2017, respectively. Once the plants begin, we anticipate that we will save our customers over $1 billion annually in fuel costs. (**0015-15** [Barnwell, Martha])

Comment: According to figures provided by Progress Energy, total investment in the two new nuclear units and associated infrastructure will be on the order of $17 billion. This is certainly a large investment by any standard, and particularly in a relatively rural area such as this. Perhaps the largest single investment ever made in Levy County. (**0015-69** [Hodges, Alan])

Comment: I ask you to include the true costs of nuclear plants throughout their entire life cycle in your environmental calculations, including among other factors: the guaranteed damage to Florida's environment; the very real potential for enormous risks to health and life; the diversion of resources from the desperately- needed development of truly safe and sustainable energy technologies; the cost of hundreds of years of plant decommissioning; and the cost of nuclear waste storage for thousands of years to come. (**0032-13** [Wilansky, Laura Sue])

Response: *The disclosure of the costs of the proposed action will rely on the best available estimate of financial costs with uncertainties noted. Associated costs that cannot be reliably quantified also will be discussed. The EIS will discuss the estimated overall internal and external benefits, costs, and associated environmental impacts of the proposed project.*

Comment: My third concern is the cost of the project, and also the fact that we are being asked to contribute to the capital base as has already been discussed. It is difficult to comprehend $17 billion, but it's three times the gold reserves of the International Monetary Fund. It is also five percent of the total reserves of the International Monetary Fund. (**0014-56** [Hopkins, Norman])

Comment: Let's look at a cost comparison. Let's do a vote. Let's have a mandate that we take those thirty-five counties and get people to say yes or no. Then there is no question on whether or not it is going to happen. If they say yes, they've got the go-ahead. If they say no, we want more environmental information, and we want to see the dollars and cents figures. (**0014-98** [Roberts, Preston])

Comment: Another issue is that it's apparently $10 billion to erect a power plant of this nature and the economy cannot bear this burden, especially in light of what is happening today. (**0015-104** [Moore, Brian])

Comment: Another problem is that Wall Street does not like the nuclear industry because of the huge risk factors involved. Many folks remember huge cost overruns, ignored safety inspections, and deep pocket corruption. (**0019-3** [Heywood, Harriet])

Response: *While these comments are related to benefit-cost balance, they do not provide specific information related to the environmental effects of the proposed action and will not be evaluated in the EIS.*

Comment: Please take action to stop Progress Energy from making the citizens pay for the construction costs of the planned nuclear power plant. The Progress Energy shareholders, not the public, should bear the cost of building new plants. For the next 8 years Progress Energy plans to charge the average customer each and every month to pay for this plant. That will total of thousands of dollars for each and every one of us. We, the citizens, should not pay thousands of dollars to enrich the Progress Energy Corporation. (**0017-1** [Miller, Joan] [Miller, Ron])

Comment: In a time when money is so tight, and clean, and relatively cheap energy sources are begging to be developed, why is the NRC so hot to allow the nuclear industry to push such a risky a venture on us? Who will be paying for this project? Public subsidies (us) rate increases (us). (**0019-4** [Heywood, Harriet])

Comment: I do not believe it should be the responsibility of present Progress Energy Customers to pay for two buildings in Levy County for Nuclear Power. If the CEOs, Governor, Legislature and Energy Commission want these two plants let them pay for them. (**0036-1** [Foreman, Patricia])

Response: *The NRC regulates the nuclear industry to protect public health and safety within existing policy. Issues relate to sale adjustments are outside of the NRC's mission and authority and will not be addressed in the EIS. This authority and responsibility is most often the role of state regulatory authorities such as public service commissions.*

Comment: If nuclear power generation is so safe, why do we still need the Price-Anderson Act? (**0043-1** [Eppes, Thomas])

Comment: If nuclear power generation is so cost-effective, why does it continue to require billions of taxpayer dollars in Federal subsidies? (**0043-3** [Eppes, Thomas])

Comment: What is the dollar value (per megawatt of capacity) of all Federal subsidies to the nuclear power industry, including Price-Anderson and the projected costs of securely storing deadly waste for the requisite thousands of years? (**0043-4** [Eppes, Thomas])

Comment: I suggest that future NRC public meetings specifically address these [Federal subsidies and long term waste storage costs] questions. If you have the answers to any of these questions, please send them to me. Thank you for your public service. (**0043-5** [Eppes, Thomas])

Response: *The NRC is not involved in establishing energy policy; rather, it regulates the nuclear industry to protect public health and safety within existing policy. Thus, matters related to the Price-Anderson Act of 1957 are outside the scope of this review and will not be included in the EIS. However, the EIS will include an evaluation of potential health impacts of operating a nuclear plant on the LNP site in Chapter 5. In addition, the safety assessment for the proposed licensing action was provided as part of the application. The NRC is in the process of developing a Safety Evaluation Report that analyzes all aspects of construction and operational safety. The NRC will only issue a license if it can conclude that there is reasonable assurance that: (1) the activities authorized by the license can be conducted without endangering public health and safety, and (2) such activities will be conducted in compliance with the rules and regulations of the NRC. Issues related to the evaluation of the benefit-cost balance for proposed LNP Units 1 and 2 will be addressed in Chapter 10 of the EIS.*

Comment: If nuclear energy was truly cost-effective and truly a profitable business, the companies trying to build new nuclear plants would not have to keep coming back to Congress for loan guarantees, liability insurance and tax breaks. The fact that this industry cannot obtain operating insurance by any means other than Congressional action is extremely telling! Nuclear plants are uninsurable!!!! Does that sound like an environmentally safe, economically sound business to you?! It surely doesn't to me! And haven't we had enough Congressional bailouts of failing private industries? The investments we have already made in the nuclear industry over many past decades have not paid off for the American people, and no further such investments should be made, based on their extensive existing track record. (**0032-11** [Wilansky, Laura Sue])

Comment: The people who decided to promote new reactor licenses (Dick Cheney, George Bush for two) liked to claim that nuclear energy will solve the climate crisis" - is this true? Is it the most cost effective way? This is particularly important, since NRC's licensing decision would trigger the use of massive public subsidy in the form of tax dollars and also public loan guarantees. It is NRC's fiduciary responsibility to address the climate issue head-on and disclose real facts about the comparative value of the public's investment in fighting this imminent threat. (**0038-19** [Olson, Mary])

Response: *The NRC is not involved in establishing energy policy. Rather, it regulates the nuclear industry to protect the public health and safety within existing policy. Issues related to the subsidization of nuclear power are outside of the NRC's mission and authority and are not addressed in the EIS. These comments will not be considered further in the EIS.*

Appendix E

Draft Environmental Impact Statement Comments and Responses

Appendix E

Draft Environmental Impact Statement Comments and Responses

This appendix is intentionally left blank in the draft environmental impact statement (EIS). In the final EIS, this appendix will include comments and responses received on the draft EIS.

Appendix F

Key Consultation Correspondence

Appendix F

Key Consultation Correspondence

Table F-1 identifies correspondence received during the evaluation process for the combined construction permit and operating license (COL) application for the siting of two new nuclear units, Levy Nuclear Plant (LNP) Units 1 and 2, in Levy County, Florida. In addition, full copies of the Biological Assessments and Essential Fish Habitat documents are included in this appendix.

Table F-1. Key Consultation Correspondence

Source	Recipient	Date of Letter
U.S. Nuclear Regulatory Commission (Mr. Gregory Hatchett))	Florida Division of Historical Resources (Mr. Frederick Gaske)	November 5, 2008 (ML082740519)
U.S. Nuclear Regulatory Commission (Mr. Gregory Hatchett)	Miccosukee Tribe (Honorable Chairman Billy Cypress)	November 5, 2008 (ML082740531)
U.S. Nuclear Regulatory Commission (Mr. Gregory Hatchett)	Seminole Tribe of Florida (Honorable Chairman Mitchell Cypress)	November 5, 2008 (ML082740536)
U.S. Nuclear Regulatory Commission (Mr. Gregory Hatchett)	U.S. National Marine Fisheries Service (Mr. David Bernhart)	November 5, 2008 (ML082750414)
U.S. Nuclear Regulatory Commission (Mr. Gregory Hatchett)	U.S. Fish and Wildlife Service (Mr. Jay Herrington)	November 5, 2008 (ML082750418)
U.S. Nuclear Regulatory Commission (Mr. Gregory Hatchett)	Advisory Council on Historic Preservation (Mr. Don Klima)	November 6, 2008 (ML082740502)
U.S. Nuclear Regulatory Commission (Mr. Gregory Hatchett)	Florida Fish and Wildlife Conservation Commission (Mr. Rolando Garcia)	November 6, 2008 (ML082750434)
U.S. National Oceanic and Atmospheric Administration (Mr. Mark Sramek)	U.S. Nuclear Regulatory Commission (Mr. Michael Masnik)	November 24, 2008 (ML091180043 and ML091180051)
The Miccosukee Tribe of Indians of Florida (Mr. Steve Terry)	U.S. Nuclear Regulatory Commission (Ms. Jessie Muir)	December 10, 2008 (ML090120781)
U.S. National Marine Fisheries Service (Mr. Robert Hoffman)	U.S. Nuclear Regulatory Commission	December 11, 2008 (ML083510905)

Table F-1. (contd)

Source	Recipient	Date of Letter
Florida Division of Historical Resources (Mr. Frederick Gaske)	U.S. Nuclear Regulatory Commission (Mr. Gregory Hatchett)	December 11, 2008 (ML090650566)
Advisory Council on Historic Preservation (Ms. Charlene Dwin Vaughn)	U.S. Nuclear Regulatory Commission (Mr. Gregory Hatchett)	February 9, 2009 (ML090620074)
Florida Fish and Wildlife Conservation Commission (Ms. Tara Alford)	U.S. Army Corps of Engineers (Mr. Gordon Hambrick)	March 17, 2009 (ML091230012)
National Oceanic and Atmospheric Administration (Mr. Miles Croom)	U.S. Army Corps of Engineers (Colonel Paul Grosskruger)	March 23, 2009 (ML091230014)
Florida Fish and Wildlife Conservation Commission (Ms. Mary Ann Poole)	U.S. Army Corps of Engineers (Colonel Paul Grosskruger)	April 9, 2009 (ML091230013)
U.S. Environmental Protection Agency (Ms. Jennifer Derby)	U.S. Army Corps of Engineers (Colonel Paul Grosskruger)	April 13, 2009 (ML912300011)
U.S. Environmental Protection Agency (Mr. Stanley Meiburg)	U.S. Army Corps of Engineers (Colonel Paul L. Grosskruger)	June 5, 2009 (ML091660080)
U.S. Nuclear Regulatory Commission (Mr. Robert Schaaf)	Miccosukee Tribe (Mr. Steve Terry)	August 25, 2009 (ML092120229)
U.S. Nuclear Regulatory Commission (Mr. Robert Schaaf)	Perdido Bay Tribe (Chief Micco Bobby Johns Bearheart)	August 31, 2009 (ML092120271)
U.S. Nuclear Regulatory Commission (Mr. Robert Schaaf)	Seminole Nation of Oklahoma (Chief Leonard Haro)	May 27, 2010 (ML1013106220)
U.S. Nuclear Regulatory Commission (Mr. Robert Schaaf)	Muscogee Nation of Florida (Chairwoman Anne Tucker)	May 27, 2010 (ML100960539)

Essential Fish Habitat Assessment

National Marine Fisheries Service

Levy Nuclear Plant Units 1 and 2
Combined License Application

U.S. Nuclear Regulatory Commission
Docket Nos. 52-029 and 52-030

U.S. Army Corps of Engineers
Permit Application

Levy County, Florida

August 2010

U.S. Nuclear Regulatory Commission
Rockville, Maryland

U.S. Army Corps of Engineers
Jacksonville District

1.0 Introduction

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (16 USC 1801 et seq.) identified the importance of habitat protection to healthy fisheries. The amendments, known as the Sustainable Fisheries Act of 1996 (Public Law 104-297), strengthened the governing agencies' authority to protect and conserve the habitat of marine, estuarine, and anadromous animals (Gulf of Mexico Fishery Management Council [GMFMC] 2004). Essential fish habitat (EFH) is defined as the waters and substrate necessary for spawning, breeding, feeding, or growth to maturity. Identifying EFH is an essential component in the development of fishery management plans (FMPs) to evaluate the effects of habitat loss or degradation on fishery stocks and take actions to mitigate such damage. This responsibility was expanded by the National Marine Fisheries Service (NMFS) to ensure additional habitat protection (NMFS 1999). The consultation requirements of Section 305(b) of the MSFCMA provide that Federal agencies consult with the Secretary of Commerce on all actions or proposed actions authorized, funded, or undertaken by the agency that may adversely affect EFH.

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application from Progress Energy Florida, Inc. (PEF) for NRC-authorized combined construction permits and operating licenses (COLs) to construct and operate two new nuclear power reactors on a greenfield site in Levy County, Florida. The U.S. Army Corps of Engineers (USACE) is reviewing an application from PEF for a Department of the Army (DA) permit pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Federal Water Pollution Control Act (Clean Water Act) to perform site-preparation activities and supporting facilities at the site for a proposed nuclear power-generation station with two Westinghouse Electric Company, LLC (Westinghouse) AP1000 pressurized water reactors (Units 1 and 2). The USACE is cooperating with the NRC to ensure to the maximum extent practicable that the information presented in a single environmental impact statement (EIS), prepared under the National Environmental Policy Act of 1969, as amended (NEPA) document, is adequate to fulfill the requirements of USACE regulations; the Clean Water Act Section 404(b)(1) guidelines, which contain the substantive environmental criteria used by the USACE in evaluating discharges of dredged or fill material into waters of the United States; and the USACE public-interest review process. Decisions by the NRC to issue the COLs and the USACE to issue a DA permit will be made following issuance of the final EIS.

The proposed Levy Nuclear Plant (LNP) Units 1 and 2 would be located on a greenfield site (Figure 1-1). The LNP site is in Levy County, Florida, approximately 10 mi northeast of the Crystal River Energy Complex (CREC), an energy facility also owned by PEF, and 30 mi due west of Ocala, Florida. This EFH assessment examines the potential impacts of the proposed actions on species listed in Table 1-1. These species are described further in Section 4.0, and the impacts to them are discussed in Section 5.0.

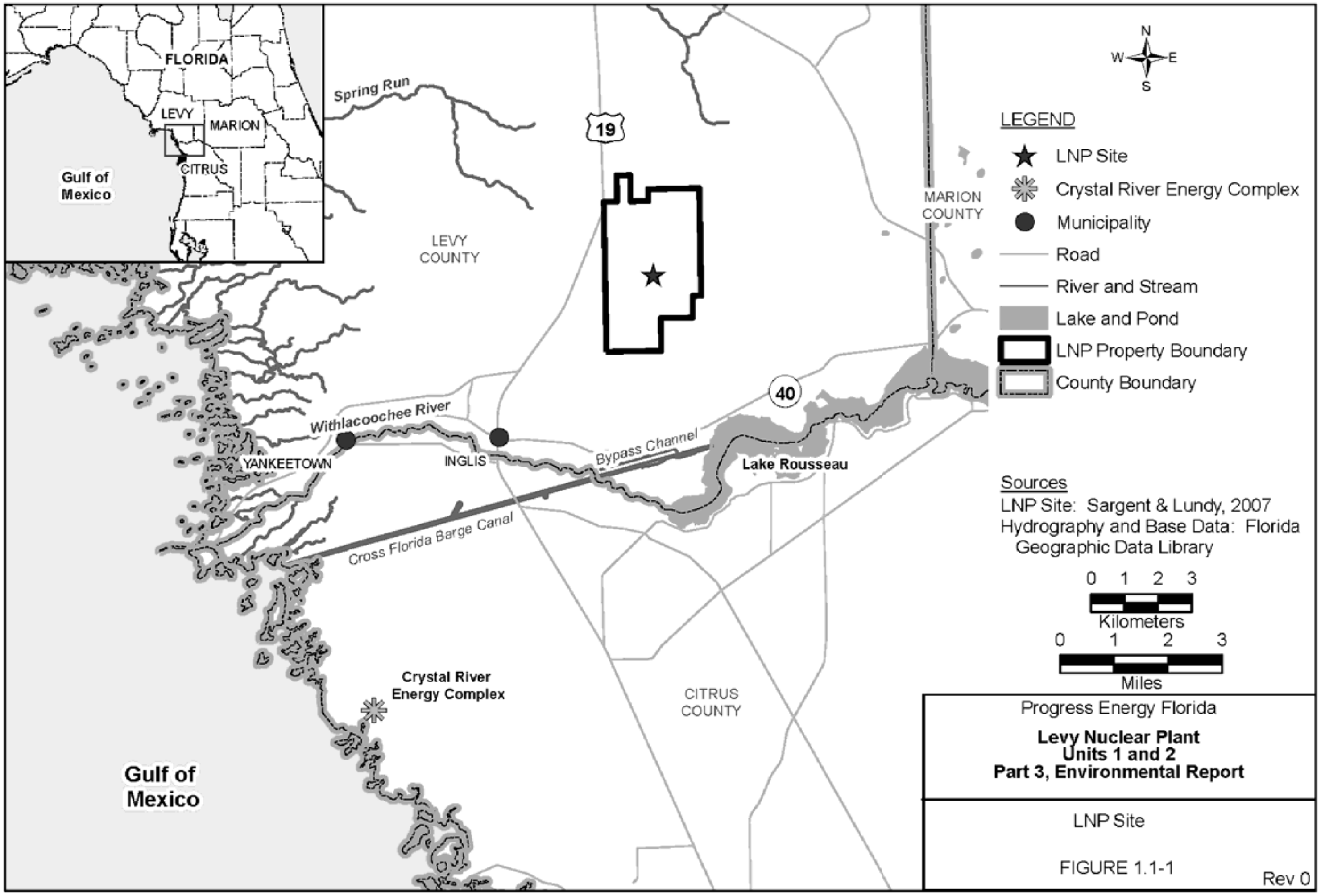

Figure 1-1. Location of the LNP Site (PEF 2009a)

The review team is aware of recent events in the Gulf of Mexico associated with the Deepwater Horizon oil spill. To date, information associated with aquatic and terrestrial resources are preliminary and inconclusive. Although not included in this EFH, the review team will consider information associated with the oil spill for the LNP project as it becomes available.

Table 1-1. Ecoregion 2 Designated EFH for Gulf of Mexico Fishery Management Council Managed Species

Common Name	Species	System	Life Stage
Spanish mackerel	*Scombermorus maculatus*	Estuarine/marine marine	Adults Eggs, larvae, juveniles
Gray triggerfish	*Balistes capriscus*	Marine	Eggs, larvae, juveniles
Golden tilefish	*Lopholatilus chamaeleonticeps*	Marine	Eggs, larvae, juveniles
Goldface tilefish	*Caulolatilus chrysops*	Marine	Eggs, larvae
Blueline tilefish	*Caulolatilus microps*	Marine	Eggs, larvae
Banded rudderfish	*Seriola zonata*	Marine	Larvae, juveniles
Almaco jack	*Seriola rivoliana*	Marine	Eggs, juveniles
Hogfish	*Lachnolaimus maximus*	Estuarine/marine	Juveniles
Lesser amberjack	*Seriola fasciata*	Marine	Eggs, larvae, juveniles
Greater amberjack	*Seriola dumerili*	Marine	Eggs, larvae, juveniles
Dwarf sand perch	*Diplectrum bivittatum*	Marine	Juveniles
Schoolmaster	*Lutjanus apodus*	Marine estuarine/marine	Eggs, larvae Juveniles
Gray (mangrove) snapper	*Lutjanus griseus*	Marine marine/estuarine estuarine/marine	Eggs larvae, juveniles, adults
Vermillion snapper	*Rhomboplites aurorubens*	Marine	Eggs, juveniles, adults
Red snapper	*Lutjanus campechanus*	Marine	Eggs, larvae, juveniles, adults
Dog snapper	*Lutjanus jocu*	Marine estuarine/marine	Eggs, larvae juveniles
Blackfin snapper	*Lutjanus buccanella*	Marine	Eggs, juveniles
Lane snapper	*Lutjanus synagris*	Marine estuarine/marine	Eggs larvae, juveniles
Yellowtail snapper	*Ocyurus chrysurus*	Marine marine/estuarine	Eggs, adults juveniles
Scamp	*Mycteroperca phenax*	Marine	Eggs, larvae, juveniles

Table 1-1. (contd)

Common Name	Species	System	Life Stage
Speckled hind	*Epinephelus drummondhayi*		
Rock hind	*Epinephelus adscensionis*	Marine	Eggs, larvae, juveniles
Red hind	*Epinephelus guttatus*	Marine	Eggs, larvae, juveniles
Yellowedge grouper	*Epinephelus flavolimbatus*	Marine	Eggs, larvae, juveniles, adults
Warsaw grouper	*Epinephelus nigritus*	Marine	Eggs, larvae, juveniles
Nassau grouper	*Epinephelus striatus*	Marine	Eggs, larvae, juveniles
Red grouper	*Epinephelus morio*	Marine marine/estuarine	Eggs, larvae, adults juveniles
Black grouper	*Mycteroperca bonaci*	Marine estuarine/marine marine/estuarine	Eggs, larvae juveniles adults
Gag grouper	*Mycteroperca microlepis*	Marine marine/estuarine	Eggs, larvae, adults juveniles
Red drum	*Sciaenops ocellatus*	Marine estuarine marine/estuarine	Eggs larvae, postlarvae, juveniles, adults
White shrimp	*Litopenaeus setiferus*	Marine estuarine/marine estuarine	Eggs larvae juveniles
Pink shrimp	*Farfantepenaeus duorarum*	Marine Estuarine	Eggs, larvae, adults Juveniles
Florida stone crab	*Menippe mercenaria*	Estuarine/marine	Eggs, larvae, juveniles
Gulf stone crab	*Menippe adina*	Estuarine/marine estuarine	Eggs, larvae juveniles
Coral	classes Hydrozoa and Anthozoa	Marine	All stages

Source: NMFS 2008

2.0 Environmental Setting

The proposed LNP site is located in a primarily rural area in Levy County, approximately 4 mi northeast of the town of Inglis and approximately 8 mi east of the Gulf of Mexico (Figure 1-1). The LNP site is currently a greenfield site approximately 3105 ac in size. The LNP footprint would occupy 300 ac for two reactors and the associated power production infrastructure near the center of the site (Figure 2-1). Two AP1000 reactors are proposed with an electrical output of 1000 MW(e) and 3415 MW(t) each. The waterbodies associated with, or potentially affected by, the action are the Cross Florida Barge Canal (CFBC), the Old Withlacoochee River (OWR)(a remnant arm of the Withlacoochee River) downstream of the Inglis Dam, and the Crystal Bay area of the Gulf of Mexico associated with the CREC. The CFBC and OWR waters are estuarine due to the lower salinities attributed to the freshwater resources from Lake Rousseau.

2.1 Cross Florida Barge Canal

In an effort to provide maritime navigation between the Atlantic Ocean and the Gulf of Mexico, construction of a 12-ft-deep by 150-ft-wide Florida cross-peninsular waterway began in the mid-1930s (Noll and Tegeder 2003). Originally intended to be a 171-nautical-mi canal, only 4 percent was complete by 1965 due to lack of funding and congressional support for several decades. Continued local opposition and lack of government funding eventually prompted an injunction that halted the construction in 1971, leaving a western portion from the newly constructed Inglis Lock to the Gulf of Mexico and an eastern stretch forming Lake Ocklawaha between the St. Johns Lock and Rodman Dam. Official deauthorization for the barge canal came in 1991, and the Cross Florida Greenway State Recreation and Conservation Area took over the former barge canal properties. In 1998, the canal and lands associated were renamed the Marjorie Harris Carr Cross Florida Greenway and Conservation Area (Noll and Tegeder 2003). The section of western CFBC affiliated with the proposed action is the 7.4-mi stretch from Inglis Lock west to the Gulf of Mexico. It ranges in depth from 8.6 to 18.2 ft and in width from 207 to 262 ft. The Inglis Lock is currently no longer functional, and allows some leakage of freshwater from Lake Rousseau into the CFBC (FDEP 2005). The Inglis Dam was built in 1909 to impound the Withlacoochee River to form 3700-ac Lake Rousseau. An approximately 1.5-mi portion of the historical downstream segment of the OWR runs into the western CFBC below the Inglis Lock. A 1.7-mi channel was constructed upstream of the Inglis Lock to reconnect Lake Rousseau waters with the downstream 11-mi portion of the Withlacoochee River, serving as a bypass around the CFBC. The CFBC lies 8 mi to the south of the proposed LNP site and is the preferred source for cooling water (Figure 2-1).

The CFBC discharges into the Withlacoochee Bay estuary in the Gulf of Mexico and is influenced by tidal changes. The CFBC is not designated as an Outstanding Florida Water as defined by Florida Administrative Code (FAC) 62-302.700. The CFBC is influenced by tidal salt water from the Gulf of Mexico, freshwater contributions from subsurface springs, leakage of Lake Rousseau waters through the Inglis Lock, and periodic releases of freshwater from Lake Rousseau over the Inglis Dam downstream to the OWR (CH2M Hill 2009a).

Water-quality characteristics show a wedge of salt water extending from the surface waters where the CFBC meets the Gulf of Mexico up toward the Inglis Lock, where persistent salinities

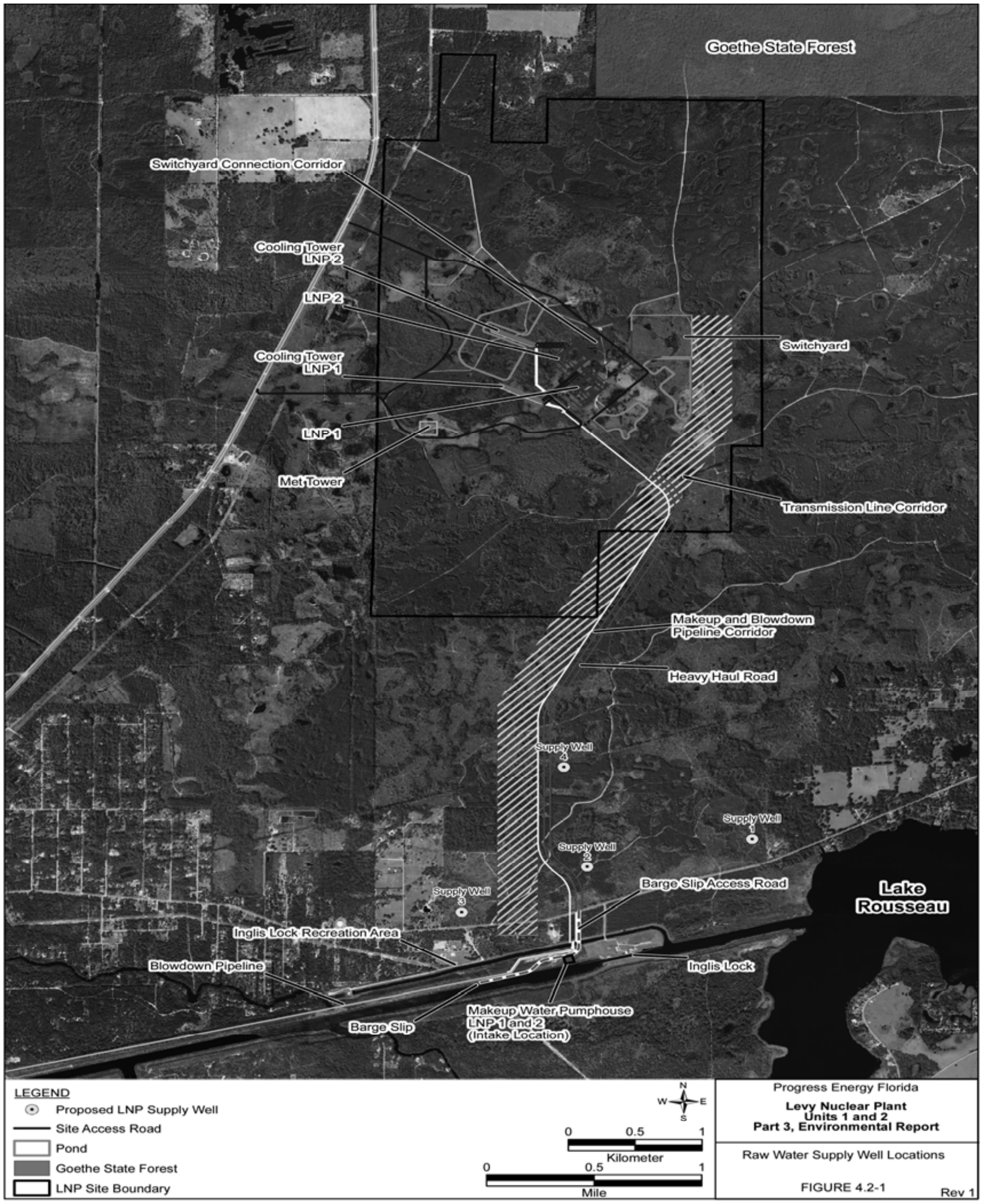

Figure 2-1. LNP Site Map (PEF 2009a)

range from an average of 5.75 practical salinity scale (pss) units at the surface to 16.87 pss at a depth of 4 m, and salinities just outside the mouth of the CFBC average 17.83 pss at the surface and 25.91 pss at 4 m (CH2M Hill 2009b). Sediment profiles for the CFBC within the 7.4-mi stretch from the Inglis Lock to the Gulf of Mexico are predominated by 49.2 to 60.7 percent silt, 17.1 percent sand, and 28.6 percent clay. Just 0.5 mi outside the mouth of the CFBC, the sediment profile shifts dramatically to primarily sand (average 83 percent) as is common with nearshore estuarine habitat (CHM2 Hill 2009b).

Analytical chemistry analyses of water samples taken along the length of the CFBC show a general trend of decreasing total organic carbon and increasing dissolved oxygen from the Inglis Lock to the nearshore Gulf of Mexico. Over 30 samples were taken at four stations along the length of the CFBC over the course of a year (October 2007 – November 2008) (CH2M Hill 2009b). Ammonia, nitrate, total nitrogen, organophosphate, total phosphate, and chlorophyll a concentrations were slightly elevated near the location of the proposed intake compared to the further downstream CFBC and nearshore sampling locations, with the exception of higher levels of chlorophyll a at Station 2 compared to Station 1 (Figure 2-2). Total suspended solids tended to be more concentrated moving from Station 1 to the nearshore sampling stations. Surface water quality is discussed in EIS Section 2.3.3.1.

Species sampling results in the CFBC from October 2007 to September 2008 are presented in EIS Section 2.4.2.1 and provided below in Table 2-1 and Table 2-2. Species abundance and diversity are greatest at the mouth and offshore of the CFBC compared to the upper end of the canal near the Inglis Lock.

2.2 Old Withlacoochee River

The OWR that flows from below the Inglis Dam into the CFBC is approximately 1.5 mi long; it originates from the Lake Rousseau's Inglis Dam and varies in width from 20- to 30-ft (Figure 2-3). The flow within the OWR is variable primarily due to weather patterns and the need to control Lake Rousseau water levels during rain events by spill over the Inglis Dam into the OWR. The periodic higher flows have led to scouring of the bottom habitat down to bedrock in the center of the OWR, and the sediments along the sides are primarily sand mixed with organic materials (CH2M Hill 2009a).

Salinity profiles at 1-m depth in this remnant arm range from 0.14 pps below the Inglis Dam to 4.38 pps where the OWR joins with the CFBC. In June and August 2008, sampling was conducted at three locations: the junction of the OWR with the CFBC, halfway between the junction and the Inglis Dam, and just downstream of the Inglis Dam within this portion of the OWR. Analytical chemistry analysis of water samples show no significant differences in ammonia, nitrate, nitrite, total nitrogen, organophosphate, total phosphate, chlorophyll a, or total suspended solids between the three sampling stations for the June sampling event. Dissolved

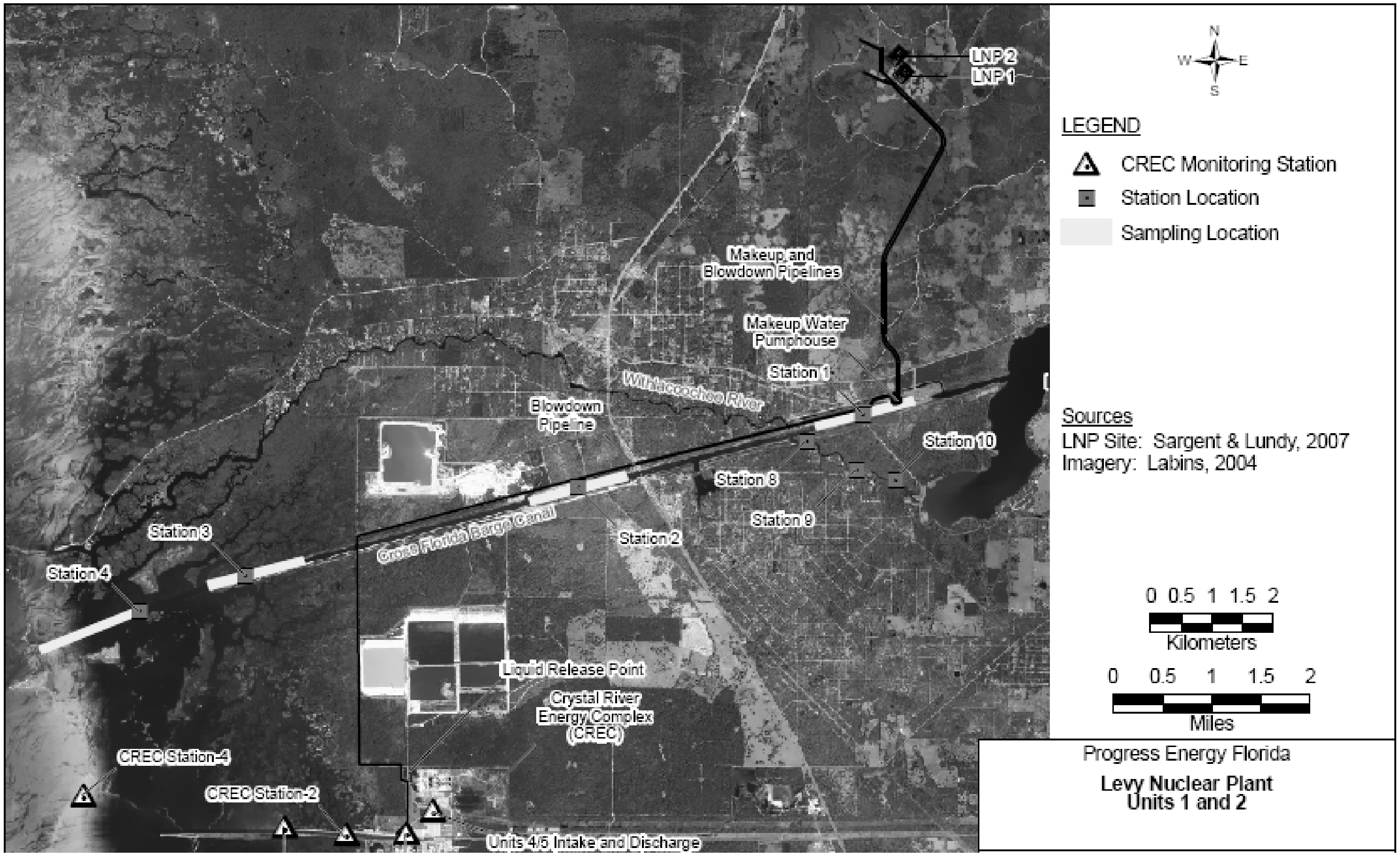

Figure 2-2. The Locations for Aquatic Species Sampling in the CFBC and OWR (CH2M Hill 2009a)

Table 2-1. Motile Macroinvertebrates Sampled in the CFBC and CREC with Catch per Unit Effort (CPUE) >1.0 from October 2007 through November 2008 by Trawl and Crab Trap

		Total Catch Per Unit Effort Across Trawl and (Crab Trap) for All Sampling Events					
Common Name	**Scientific Name**	**CFBC 1**	**CFBC 2**	**CFBC 3**	**CFBC 4**	**CREC 3**	**CREC 4**
Jellyfish	Cyaneidae	-	1.5	-	-	-	-
Common eastern nassa	*Nassarius vibex*	-	-	-	-	-	1.5
Atlantic brief squid	*Lolliguncula brevis*	-	-	5	-	-	2
Palaemonid shrimp	Palaemonidae	-	-	-	-	-	1.5
Pink shrimp	*Farfantepenaeus duorarum*	-	1.5	2.5	-	-	5.5
Hippolyte shrimp	*Hippolyte*.	-	-	-	-	-	1.5
Decorator crab	*Stenocionops furcata*	-	-	-	-	-	2
Yellowline arrow crab	*Stenorhynchus seticornus*	-	-	-	-	-	7
Hermit crab spp.	*Pagurus* spp.	-	-	-	3	-	-
Mud crab	Xanthidae	-	-	-	3.5	3	-
Florida stone crab	*Menippe mercenaria*	-	-	-	-	(3.6)	2 (1.6)
Portunid crab	*Portunus* sp.	-	-	-	-	-	1.5
Blue crab	*Callinectes sapidus*	-	4.5 (2.5)	4 (4.3)	-	-	-
Source: CH2M Hill 2009b							

Table 2-2. Fish Species Sampled in the CFBC, OWR, and CREC with CPUE >1.0 from October 2007 through November 2008 by Beach Seine, Trawl, Cast Net, Gill Net, and Minnow Trap

		Total Number Collected Across All Sampling Gear and Events								
Common Name	**Scientific Name**	**CFBC 1**	**CFBC 2**	**CFBC 3**	**CFBC 4**	**OWR 8**	**OWR 9**	**OWR 10**	**CREC 3**	**CREC 4**
Spinner shark	*Carcharhinus brevipinna*	-	-	-	-	-	-	-	4	1
Blacktip shark	*Carcharhinus limbatus*	-	-	-	-	-	-	-	-	7
Bull shark	*Carcharhinus leucas*	-	8	-	-	-	-	-	1	-
Bonnethead shark	*Sphyma tiburo*	-	-	-	2	-	-	-	-	1
Cownose ray	*Rhinoptera bonasus*	-	-	1	-	-	-	-	-	3
Spotted eagle ray	*Aetobatus narinari*	-	-	-	-	-	-	-	2	1
Atlantic stingray	*Dasyatis sabina*	-	1	-	2	-	-	-	1	1
Southern stingray	*Dasyatis americana*	-	-	-	2	-	-	-	-	1
Longnose gar	*Lepisosteus osseus*	2	-	1	3	-	-	-	-	1
Tidewater silverside	*Menidia peninsulae*	-	-	-	-	-	-	-	113	-

Table 2-2. (contd)

Common Name	Scientific Name	Total Number Collected Across All Sampling Gear and Events								
		CFBC 1	**CFBC 2**	**CFBC 3**	**CFBC 4**	**OWR 8**	**OWR 9**	**OWR 10**	**CREC 3**	**CREC 4**
Inland silverside	*Menidia beryllina*	-	-	-	-	7	-	4	-	-
Halfbeaks	Hemiramphidae	-	-	-	-	-	-	-	10	-
Atlantic needlefish	*Strongylura marina*	7	2	9	3	-	-	-	2	1
Redfin needlefish	*Strongylura notata*	2	-	4	-	-	-	-	3	-
Killifishes	*Fundulus* spp.	-	-	-	-	-	-	-	60	-
Seminole killifish	*Fundulus seminolis*	-	-	-	-	-	-	22	-	-
Bluefin killifish	*Lucania goodei*	-	-	-	-	-	-	97	-	-
Goldspotted killifish	*Floridichthys carpio*	7	-	-	-	-	-	-	285	-
Mullets	Mugilidae	-	9	30	-	-	-	-	-	-
Striped (black) mullet	*Mugil cephalus*	8	6	24	35	-	-	-	21	9
White mullet	*Mugil curema*	8	27	14	51	-	-	-	36	1
Atlantic spadefish	*Chaetodipterus faber*	-	-	2	-	-	-	-	2	3
Gobys	Gobiidae	4	20	13	7	-	-	-	1	2
Skilletfish	*Gobiesox strumosus*	-	4	2	-	-	-	-	-	-
Sunfishes	Centrarchidae	4	-	-	1	-	1	4	-	-
Largemouth bass	*Micropterus salmoides*	1	-	-	-	1	5	17	-	-
Silver perch	*Bairdiella chrysoura*	-	95	398	246	-	-	-	1	149
Common snook	*Centropomus undecimalis*	-	4	-	-	-	-	-	1	-
Whitefin shark sucker	*Echeneis neucratoides*	-	-	1	1	-	-	-	-	-
Mojarras	Gerreidae.	-	-	8	-	3	-	-	38	1
Spotfin mojarra	*Eucinostomus argenteus*	198	290	125	37	4	-	-	84	100
Polka-dot batfish	*Ogcocephalus cubifrons*	-	-	-	4	-	-	-	-	2
Grunts	Haemulidae	-	-	2	1	-	-	-	-	-
Pigfish	*Orthopristis chrysoptera*	-	2	6	11	-	-	-	3	28
Snappers	Lutjanidae	8	20	14	-	-	-	-	5	2
Atlantic croaker	*Micropogonias undulatus*	-	8	2	1	-	-	-	-	2
Black drum	*Pogonias cromis*	4	13	-	1	-	-	-	11	1

Table 2-2. (contd)

Common Name	Scientific Name	Total Number Collected Across All Sampling Gear and Events CFBC 1	CFBC 2	CFBC 3	CFBC 4	OWR 8	OWR 9	OWR 10	CREC 3	CREC 4
Red drum	*Sciaenops ocellatus*	2	1	-	-	-	-	-	1	1
Spot	*Leiostomus xanthurus*	-	17	-	17	-	-	-	-	3
Sand seatrout	*Cynoscion arenarius*	-	23	16	12	-	-	-	-	4
Spotted seatrout	*Cynoscion nebulosus*	-	-	-	-	-	-	-	-	5
Spanish mackerel	*Scomberomorus maculatus*	-	-	2	4	-	-	-		5
Atlantic bumper	*Chloroscombrus chrysurus*	-	6	4	24	-	-	-	-	29
Leatherjacket	*Oligoplites saurus*	-	-	1	1	-	-	-	4	-
Bay anchovy	*Anchoa mitchilli*	100	706	704	125	1	2	-	-	1
Striped anchovy	*Anchoa hepsetus*	2	4	3	-	-	-	-	-	-
Atlantic thread herring	*Opisthonema oglinum*	-	-	2	2	-	-	-	-	10
Herrings	Clupeidae	4	-	-	-	-	-	-	-	-
Ladyfish	*Elops saurus*	9	15	24	6	-	-	-	-	1
Gulf menhaden	*Brevoortia patronus*	591	73	9	226	-	-	-	-	-
Yellowfin menhaden	*Brevoortia smithi*	-	1	3	-	-	-	-	-	17
Scaled sardine	*Harengula jaguana*	24	41	47	21	1	-	-	-	-
Pinfish	*Lagodon rhomboides*	13	54	61	26	2	-	-	2	91
Sheepshead	*Archosargus probatocephalus*	9	6	-	-	1	1	-	63	2
Southern kingfish	*Menticirrhus americanus*	-	-	1	6	-	-	-	-	-
Crevalle jack	*Caranx hippos*	-	2	-	-	-	-	-	1	1
Blue runner	*Caranx crysos*	-	-	-	-	-	-	-	-	4
Hardhead catfish	*Ariopsis felis*	-	5	18	33	-	-	-	6	11
Gafftopsail catfish	*Bagre marinus*	2	2	2	-	-	-	-	-	5
Flounders	*Paralichthyidae*	-	1	2	6	-	-	-	-	1
Pufferfish	*Spheroides* sp.	-	1	1	-	-	-	-	-	1

Source: CH2M Hill 2009b

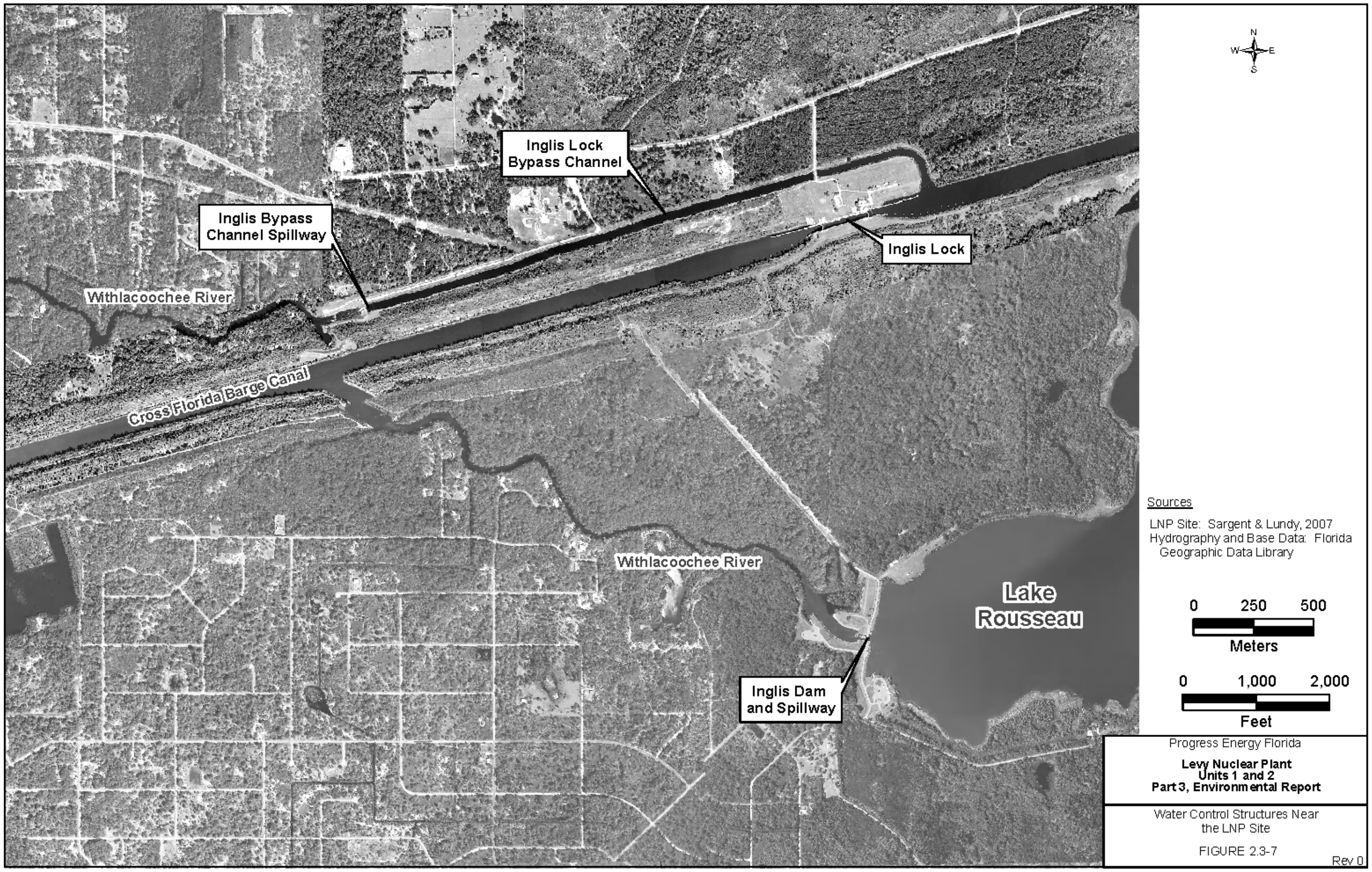

Figure 2-3. Water Control Structures Near the Proposed LNP Site (PEF 2009a)

oxygen was highest near Inglis Dam following a high-volume water release during the August sampling, which also significantly lowered the nitrate/nitrite concentration (CH2M Hill 2009b).

Biological sampling in the OWR was performed using beach seine, cast net, minnow trap, and crab traps. Gill nets and trawling were not used because manatees were present in the river. Crab traps yielded only two crustaceans and were not considered further in biological analyses. Fish caught near the Inglis Dam were representative of fish species that prefer euryhaline or freshwater conditions, with killifish species (*Fundulus* spp.) and largemouth bass (*Micropterus salmoides*) representing the abundant species at that location. In a similar fashion, fish caught near the junction of the OWR and the CFBC were represented by silverside species (*Menidia* spp.) and mojarra species (*Eucinostomus* spp.), which were also caught in the CFBC and prefer more saline environments. The midway location for sampling did not yield as many species as either of the other locations, which may be due to the variable salinity or water quality conditions for that region. Benthic macroinvertebrate sampling mirrored the fish sampling results with euryhaline dipteran species predominant at the CFBC-OWR junction, freshwater oligochaetes and amphipods near the Inglis Dam, and a paucity of organisms and limited diversity at the midpoint (CH2M Hill 2009a).

2.2.1 Crystal Bay

Aquatic species and habitats associated with the discharge from CREC into Crystal Bay have been characterized historically from CREC operations (Stone and Webster 1985) and were recently sampled from April through November 2008. Following installation of helper cooling towers in the early 1990s, the applicant has quantified the extent of seagrass beds in the Gulf of Mexico in the vicinity of the CREC discharge (Estevez and Marshall 1993, 1994, 1995). Previously affected seagrass areas were observed to recover with colonization by shoal grass (*Halodule wrightii*) a dominant, quick-growing seagrass. However, between 1995 and 2001, overall seagrass abundance declined, likely from a number of environmental influences (Marshall 2002). No seagrass habitat is present at the point of discharge or at the 1.4-mi nearshore sampling location. A few seagrass beds just to the north of the point of discharge were identified in 1993, and greater coverage of this same area by *Halodule wrightii* (increase of 19.5 percent beyond previously noted seagrass perimeter) was noted for this same area in 2001 (Marshall 2002).

Sediments at the CREC point of discharge and in nearshore waters (1.4 mi from point of discharge) are dominated by sand and silt. Surface salinities at the discharge mouth and nearshore waters ranged between 28.2 and 31.5 pss, with salinities increasing slightly at increasing depths (CH2M Hill 2009b). Average dissolved oxygen generally decreases along the CREC discharge canal from the discharge origin at 6.28 mg/L to 5.05 mg/L at the point of discharge into Crystal Bay. Average dissolved oxygen then increases to 5.61 mg/L in nearshore waters surrounding the point of discharge. Average temperatures at the point of discharge (31.9°C) were 6°C higher than average temperatures recorded 1.4 mi away in nearshore waters during the 2008 sampling events (CH2M Hill 2009b).

Analytical chemistry analyses of water samples taken in September and November 2008 show no significant differences in total organic carbon, dissolved oxygen, ammonia, nitrate, nitrite, total nitrogen, organophosphate, total phosphate, chlorophyll a, or total suspended solids between the point of discharge and 1.4 mi away in nearshore waters (Figure 2-4).

Fish, plankton, and macroinvertebrate sampling in the CREC discharge area of Crystal Bay are indicative of coastal salt marsh and nearshore species and show biodiversity commensurate with similar habitat sampling at CFBC stations 3 and 4 (EIS Section 2.4.2). However, several of the top forage fish species are notably absent (bay anchovy, scaled sardine, and silver perch) from the CREC point of discharge and nearshore water habitats.

3.0 Proposed Federal Action

The proposed Federal actions are the issuance of a COL for the construction and operation of two new nuclear reactors at the proposed LNP site pursuant to Title 10 of the Code of Federal Regulations (CFR) Part 52, and a DA permit pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act.

The NRC, in a final rule dated October 9, 2007 (72 FR 57416), limited the definition of “construction” to those activities that fall within its regulatory authority in 10 CFR 51.4. Many of the activities required to build a nuclear power plant are not part of the NRC action to license the plant. Activities associated with building the plant that are not within the purview of the NRC action are grouped under the term “preconstruction.” Preconstruction activities include clearing and grading, excavating, erecting support buildings and transmission lines, and other associated activities. These preconstruction activities may take place before the application for a COL is submitted, during the staff’s review of a COL application, or after a COL is granted. Although preconstruction activities are outside of the NRC’s regulatory authority, many of them are within the regulatory authority of local, State, or other Federal agencies. The distinction between construction and preconstruction is not carried forward in this EFH assessment, and both are being discussed together as construction for the purposes of the NRC/USACE joint EFH consultation.

Prerequisites to construction activities include, but are not limited to, documentation of existing site conditions within the Levy County site and acquisition of the necessary permits (e.g., COLs, local building permits, Clean Water Act Section 402(p) National Pollutant Discharge Elimination System (NPDES) construction and industrial stormwater permits, a DA permit, and a Clean Water Act Section 401 Certification). After these prerequisites are met, planned construction

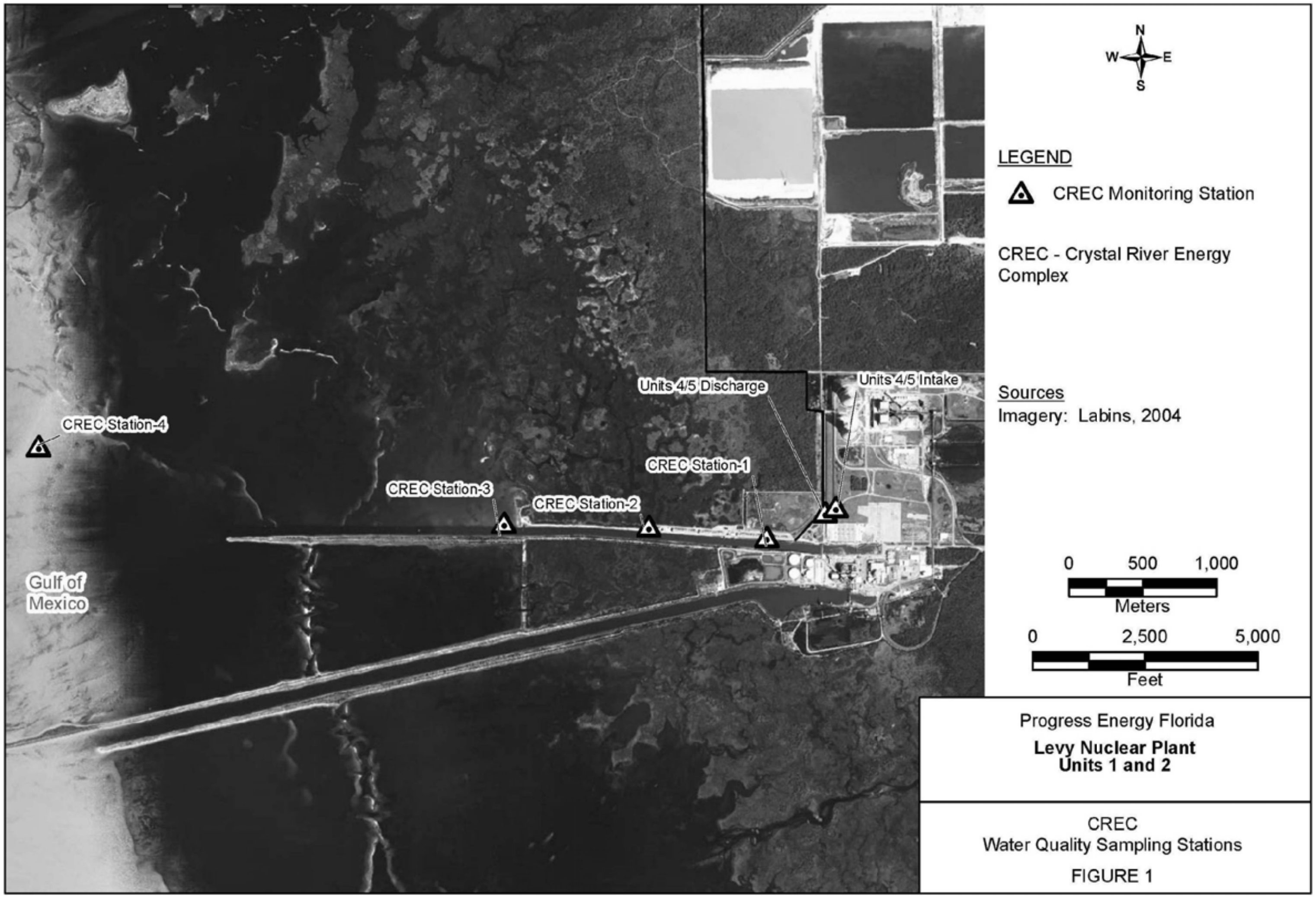

Figure 2-4. Aquatic Sampling Locations for CREC (CH2M Hill 2009b)

activities could proceed pursuant to 10 CFR 50.10(c), which may include the activities described in 10 CFR 50.10(a). Following construction, the planned operation of the new reactors would be authorized if the Commission finds, under 10 CFR 52.103(g), that all acceptance criteria in the COLs are met.

Construction and operation activities could potentially affect the species and/or habitats listed in Table 1-1**Error! Reference source not found.**. These following construction and operation activities were determined to potentially affect these species and habitats based on habitat affinities and life-history considerations and the nature, spatial, and temporal considerations of the activity:

- Construction
  - new dredging and construction of a barge slip and boat ramp on the shoreline of the CFBC
  - installation of the cooling-water intake structure (CWIS) on the CFBC shoreline
  - installation of the cooling-water discharge system, including dredging and placement of discharge piping in the CFBC
  - connection of discharge piping with the existing CREC discharge canal
  - vessel movements associated with in-water work; vessel transportation of large components via barge for LNP site
  - new transmission-line corridors and towers
- Operation
  - impingement, entrainment, and maintenance activities associated with the CWIS
  - salinity changes in the CFBC and OWR
  - discharge plume from the cooling-water system (thermal, chemical, and physical effects)
  - maintenance of transmission-line corridor rights-of-way.

3.1 Cooling-Water Intake System

The proposed closed-cycle cooling system and cooling-water intake and discharge systems for the LNP site are described in the following sections. The LNP would use a closed-cycle cooling system that would draw in water from a new intake structure on the north shore of the CFBC, 0.5 mi downstream of the Inglis Lock, and heat removal would be accomplished via mechanical draft cooling towers. The blowdown water would discharge via pipeline to the existing CREC discharge canal (Figure 3-1).

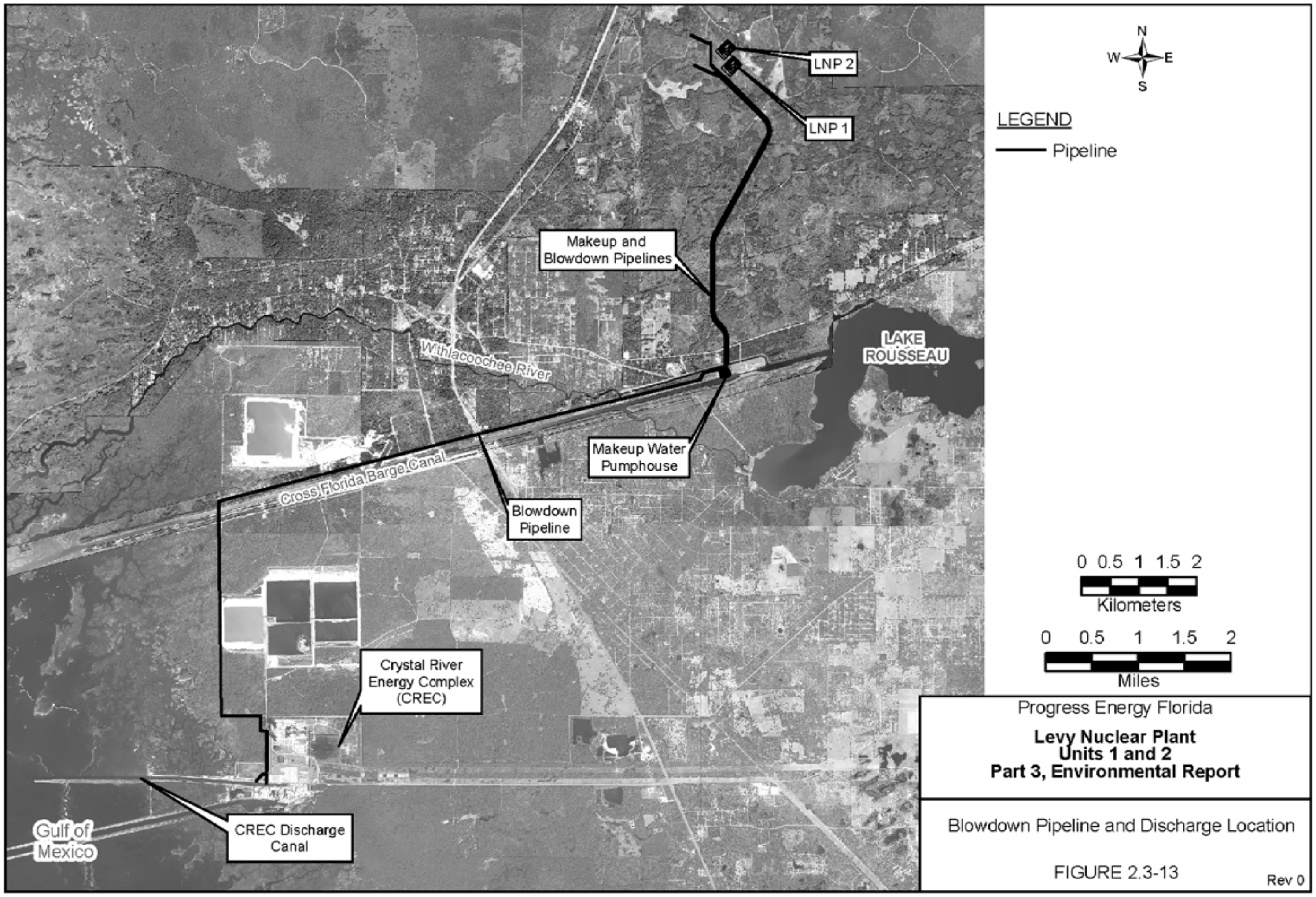

Figure 3-1. Location of Blowdown Pipeline and Discharge (PEF 2009a)

In its Environmental Report (ER), PEF stated that a closed-cycle, mechanical draft system would be used for proposed LNP Units 1 and 2. Depending on the quality of the makeup water, closed-cycle, recirculating cooling-water systems can reduce water use by 96 to 98 percent of the amount that the facility would use if it employed a once-through cooling system (66 FR 65256). This significant reduction in water withdrawal rate results in a corresponding reduction in impingement and entrainment. PEF has stated that the proposed LNP Units 1 and 2 intake structure would comply with U.S. Environmental Protection Agency (EPA) Phase I 316(b) (66 FR 65256) and have a design through-screen velocity of less than 0.5 fps (PEF 2009a). However, the CFBC near the proposed intake essentially is a dead end with tidal exchange the only appreciable flow not including the freshwater flows from the lock and intermittent flows over the Inglis Dam following rain events. For the LNP Units 1 and 2 CWIS, PEF assessed 316(b) impacts of withdrawal of cooling water from the CFBC. The approach velocity for the intake bays would be 0.25 fps at the bar screens and 0.5 fps for through-screen flow. To achieve these low velocities, the inlet area would be larger than 106.1 ft^2 (CH2MHill 2009c). The zone of hydraulic influence would extend 5 mi from the CWIS in the CFBC towards the mouth. The CFBC is tidally influenced, and, beyond the 5-mi zone of influence, the average current velocity in the remaining 2 mi of CFBC towards the mouth is greater than the CWIS-induced velocity 90 percent of the time.

3.2 Cooling-Water Discharge System

The effluent discharge from proposed LNP Units 1 and 2 would be directed into the CREC discharge. Discharge pipelines from the LNP would run alongside the northern bank of the CFBC before crossing the canal and continuing on to the CREC. The LNP discharge pipeline (two 54-in. high-density polyethylene [HDPE] pipes, per the conceptual design) will discharge directly into the CREC discharge canal just downstream of the discharge culverts for CREC Units 4 and 5. CREC Units 4 and 5 discharge into a concrete-lined, open channel. This 0.7-mi open channel drains directly into the CREC discharge canal approximately 1.1 mi from the Gulf of Mexico (PEF 2009b). The discharge volume of the LNP Units 1 and 2 blowdown water would be 81.34 Mgd and would be combined with the CREC Units 1 through 5 discharge of 1651.8 Mgd in the CREC discharge canal, which opens into the Gulf of Mexico. The LNP discharge would account for only 4.9 percent of the total discharge flow and would have little physical scouring impact at the terminus of the discharge canal (PEF 2009a). In EIS Section 5.2.3.1, the review team describes its independent assessment of the incremental impacts of proposed LNP Units 1 and 2 on the water temperatures within the CREC discharge and the Gulf of Mexico. The addition of LNP Units 1 and 2 discharge would result in increase discharge volume of 87.93 Mgd, but with no significant increase in thermal plume temperature or salinity over current conditions, as discussed in EIS Section 5.3.2.1.

In addition, Florida Department of Environmental Protection (FDEP) (FDEP 2010) Conditions of Certification states that PEF would retire its two oldest, once-through coal-fired units at the

CREC by December 31, 2020 if LNP Units 1 and 2 are licensed, built, and begin commercial operation. CREC Units 1 and 2 cessation of operations would significantly reduce the discharge flow from the CREC discharge canal even with the additional discharge flow from LNP Units 1 and 2 (Table 3-1).

Table 3-1. Comparison of NPDES Discharge Volumes Under Different Operation Scenarios.

Operating Unit	CREC Current Combined Discharge (Mgd)	Percent of Total Discharge	Addition of LNP Units 1 & 2 to current CREC (Mgd)	Percent of Total Discharge	Addition of LNP Units 1 & 2 to current CREC (Mgd) with Decomissioning of CREC Units 1 & 2	Percent of Total Discharge
CREC 1	446	23.5	446	22.5	-	-
CREC 2	472	24.8	472	23.8	-	-
CREC 3	979.9	51.6	979.9	49.5	979.9	92.3
LNP 1 & 2	-	-	81.3	4.4	81.3	7.6

Source: PEF 2009d
Note: CREC discharge rates are given as current maximum NPDES-permitted volumes.
CREC Units 4 and 5 are not listed in table because they withdraw cooling water from the discharge of CREC Units 1 through 3, and through evaporative cooling during operation actually reduce station discharge flow.

3.3 Chemical Discharges

Other discharge-related impacts include the chemical treatment of the cooling water. The ER indicates that chemicals would be added to the circulating, service, and blowdown water systems (PEF 2009a). Intake structures such as the pump suction housings and sensor tubes will be coated with a copper-based anti-fouling substance to minimize fouling of these structures. In addition, ClamTrol (CT1300) will be injected every 21 days at a concentration not to exceed 4.5 ml per liters, into the CWISs to prevent biofouling of marine invertebrates (PEF 2009b). Chemical treatment of cooling water at LNP would likely be similar to that occurring at CREC. The use of chemicals in the existing CREC discharge is regulated by an NPDES permit, which is issued by the FDEP. The chemical concentrations at the outfall for the existing units meet the NPDES limits (FDEP 2008). Table 3-2 (ER Table 5.3.2-1) lists the water-treatment chemicals, their use, and the concentration that is anticipated to be discharged from proposed LNP Units 1 and 2 blowdown. The concentrations in the discharge are significantly lower than the LC50 (the concentration that is lethal to 50 percent of the sample population) obtained from the Material Safety Data Sheets (PEF 2009a). The CREC effluent discharge and water flow from the Gulf of Mexico would further dilute the concentration of these chemicals.

Table 3-2. Chemical Discharges to the Gulf of Mexico from Proposed LNP Units 1 and 2

Chemical	Use	Concentration at Discharge Point
Sodium hypochlorite	Biocide	0.2 ppm residual chlorine or 0.36 sodium hypochlorite
Ammonium chloride	Algaecide	0.2 ppm residual chlorine or 0.303 ppm ammonium chloride
Sulfuric acid	pH adjuster	2.237 ppm sulfuric acid
Orthopolyphosphate	Corrosion inhibitor	30 ppm orthopolyphosphate
Polyacrylate	Silt dispersant	150 ppm polyacrylate
Phosphonate	Antiscalant	20 ppm phosphonate
Source: PEF 2009a		

3.4 Transmission-Line Corridors

Connection from the proposed LNP to the Citrus substation corridor would cross the Withlacoochee River bypass channel, CFBC, and the OWR. Existing and new corridors extending to the proposed Central Florida South substation would cross the Withlacoochee River at the border of Citrus and Marion Counties and Two Mile Prairie Lake (PEF 2009a). Connection of the CREC switchyard to the new Citrus substation would use existing corridors bordering estuarine habitat within Crystal Bay, which is considered EFH.

Beyond the first substation, existing corridors are proposed for the transmission lines extending 50 mi from the Kathleen substation to the Griffin substation and extending west to the Lake Tarpon substation. This corridor crosses the following Outstanding Florida Waters: Blackwater Creek, Trout Creek, the Hillsborough River, and Cypress Creek (PEF 2008). Other waterbodies include Flint Creek, tributaries of Hollomans Branch, Brushy Creek, Rocky Creek, and numerous unnamed intermittent and perennial tributaries of the previously named waterbodies. None of these waterbodies are considered EFH and are not designated aquatic critical habitats.

4.0 Potential Impact of Plant Construction and Operation on Biota and Habitat

This section describes the potential impacts from the construction and operation of the proposed LNP Units 1 and 2 on Federally managed estuarine and marine species and their habitats in the CFBC, OWR, and Crystal Bay area of the Gulf of Mexico. The construction and operation activities that could affect Federally managed estuarine and marine species based on habitat affinities and life-history characteristics and the nature and spatial and temporal considerations of the activities are briefly discussed below.

4.1 General Construction

Impacts on the EFH in the CFBC from construction of proposed LNP Units 1 and 2 would be associated mainly with the construction of new water intake structure, discharge piping systems, and a barge slip. These activities would result in temporary water quality changes and temporary and permanent loss or conversion of aquatic habitat in the CFBC, but they are not anticipated to impact aquatic habitat or water quality in the OWR.

The major construction events associated with building proposed LNP Units 1 and 2 that would affect EFH in the Crystal Bay area of the Gulf of Mexico include connection of the discharge outfall with the existing CREC discharge canal. No construction is planned at the point of discharge for the CREC or in nearshore waters. All work would be conducted in accordance with Federal, State, and local permits that would be obtained by PEF. Because the facilities would be built inland or use existing transmission-line corridors, EFH in the CFBC, OWR, and Gulf of Mexico likely would not be adversely affected by the installation of new transmission facilities for the proposed LNP Units 1 and 2.

4.1.1 Dredging and Pipeline Trenching

Construction for both the barge slip and the intake structure would occur in primarily upland areas behind an earth bank separating construction activities from the CFBC until excavation is complete. Steel sheet piling would be installed at the barge slip and in a cofferdam for intake structure construction. Piles would be installed from land using a pile hammer. Turbidity barriers and erosion control measures would be installed in the canal during activities associated with sheet-pile installation to control impacts on water quality. Construction activities are expected to commence with installation of permanent piling over 60 weeks for the barge slip and over 13 weeks for temporary piling at the intake structure. Removal of temporary piling at the intake structure is expected to occur following 6 months of construction activities. Turbidity barriers and erosion control measures are expected to be installed commensurate with piling installation activities and will remain in place before operations (PEF 2008). Use of water quality control measures should prevent impacts on the few species that inhabit the portion of the CFBC near the proposed intake.

Dredging would be necessary for construction of a trench in the CFBC for placement of discharge piping. Using EPA Method 1311, sediments would be tested before construction for toxicity characteristics to determine final disposition of dredged spoil materials. Non-hazardous sediments would be used to backfill pipeline trench, as fill material onsite, or disposed of in upland areas. Sediments deemed unsuitable for use would be appropriately disposed of in landfills approved for hazardous disposal (PEF 2009c). Residual water from dredging activities would be tested for compliance with NPDES and Florida surface-water-quality standards (FDEP 2008). Discharge piping from the LNP site to the CREC discharge would run parallel along the northern CFBC berm, enter and exit CFBC water supported by anchor piers along both CFBC berms, and run south to CREC along an existing transmission-line corridor (PEF 2009a). Initially proposed routing of the discharge pipeline south of the CFBC crosses several tidal creeks and would adversely impact approximately 4.5 acres of salt marsh habitat. The review team is aware that PEF has proposed to the FDEP an alternate route to avoid this important habitat. FDEP has not made a decision on the proposal. Impacts to habitat related to the discharge pipeline, irrespective of the final routing, would be primarily due to its excavation, placement, and burial associated with construction.

4.1.2 Discharge Pipeline Connection

The LNP discharge pipeline (two 54-in. HDPE pipes, per the conceptual design) will discharge directly into the CREC discharge canal just downstream of the discharge culverts for CREC Units 4 and 5. The discharge canal is a concrete-lined, open channel. This 0.7-mi open channel drains directly into the CREC discharge canal approximately 1.1 mi from the Gulf of Mexico. A headwall structure will be necessary to join the LNP discharge piping to the CREC discharge canal (PEF 2009b). No construction will be conducted beyond the point of discharge into the concrete discharge canal for CREC.

4.1.3 Vessel Movements

Vessel use during the dredging or the installation of the in-water structures, and transportation of large components for proposed LNP Units 1 and 2 may affect the aquatic resources of the CFBC, particularly the benthos. The main effects from using vessels would include turbulence from propellers (prop wash), anchor cable scraping across the canal bottom, and accidental spills of materials overboard. Vessels would be used during the installation of the cooling-water discharge pipeline and during the offloading of materials from barges. Vessel operation during construction would cause short-term, localized impacts on EFH in the CFBC, but impacts on water quality and habitat in the OWR are not anticipated. These impacts should not affect the general resources in the area of the site or the region along this coast of the Gulf of Mexico.

4.1.4 Transmission-Line Corridors

PEF would site the new 500-, 230-, and 65-kV transmission lines in accordance with the Florida Electrical Power Plant Siting Act (PPSA), Chapter 403 of the Florida Statutes (FS), and Chapter 62-17 of the FAC. In addition, PEF would comply with all applicable laws, regulations, and permit requirements and would use good engineering and construction practices (FDEP 2008), which includes leaving a 25-ft buffer of existing vegetation along the banks, with mature heights not exceeding 12 ft at locations where the right-of-way crosses a navigable waterway (PEF 2008).

4.2 Operation

For EFH in the CFBC and OWR, the primary concerns related to water intake withdrawals are those related to the amount of water drawn from the CFBC, and the potential for organisms to be impinged on the intake screens or entrained into the cooling-water system. PEF stated that a closed-cycle, mechanical draft cooling system would be used for proposed LNP Units 1 and 2 (PEF 2009b). The intake system for proposed LNP Units 1 and 2 would incorporate fish and invertebrate protection measures to reduce entrainment and impingement. The intake flow design rate for proposed LNP Units 1 and 2 would not exceed a through-screen flow velocity of 0.5 fps.

4.2.1 Impingement and Entrainment

Impingement and entrainment studies have been conducted for the nearby CREC intake structures. The study was performed in 1983 and 1984 to examine impingement and entrainment for three intakes providing cooling water for CREC fossil-fueled Units 1 and 2 and nuclear Unit 3 (Stone and Webster 1985). Although the operation of these three units has more than 13 times higher withdrawal rates (1897–1613 Mgd) and twice the through-screen velocity (1.0 fps) than those proposed for LNP (122 Mgd with less than 0.5 fps through-screen velocity), the impingement and entrainment studies provide contextual information regarding impacts on relevant species that are present in the Gulf of Mexico and may be affected by LNP operations.

Impingement and entrainment studies were conducted to assess impacts as required under NPDES Permit FL0000159 for CREC (Stone and Webster 1985). Sampling for impingement rates occurred four times over a 24-hour period once every 2 weeks for 1 year by examination of collection baskets attached to screen wash effluents. The three units were assessed by individual intake, but results are combined for discussion purposes here. The highest abundances of organisms were collected in the spring, with bay anchovy (*Anchoa mitchilli*) collected in the greatest numbers with estimates of more than 87,000 impinged annually. Polka-dot batfish (*Ogcocephalus cubifrons*) and spot (*Leiostomus xanthurus*) were two other species also collected in significant numbers. These three species represented more than 72 percent of the selected indicator fish impinged. In 1997, the State of Florida set an annual commercial harvest limit of 85,000 lb of bay anchovy for the counties of Wakulla, Franklin, Gulf, Bay, Okaloosa, and Walton (FFWCC 1997). Eighty-seven thousand anchovies represents approximately 350 lb (average 0.004 lb per fish), indicating the number of impinged anchovy only represent a small fraction of the annual commercial harvest limit of 85,000 lb. The numbers of invertebrates impinged were much higher for inverterbrates than for fish, with pink shrimp (*Farfantepenaeus duorarum*) and blue crab (*Callinectes sapidus*), the predominant species. Like fish, invertebrate impingement was highest in the spring. More than 640,000 pink shrimp and 383,000 blue crab were impinged over a year. These impingement numbers represent 0.6 percent and 0.7 percent, respectively, of the annual commercial fisheries for

Citrus County in 1982 (Stone and Webster 1985), and reflect impingement rates for a through-screen velocity of 1.0 fps. By comparison, LNP Units 1 and 2 potential impingement impacts should be notably less with a through-screen velocity of no more than 0.5 fps and a significantly reduced intake flow rate.

Plankton samples were collected from 15 stations offshore in the vicinity of the CREC intake canal every 2 weeks for 15 months using 505-μm mesh with a 1-m mouth towed for 3 minutes from bottom to surface at a constant flow rate. These samples were analyzed for estimation of entrainment of eggs and larvae for CREC intakes 1 through 3. April and May were peak collection times for eggs, while invertebrate meroplankton were collected in the highest numbers in July and August. Bay anchovy eggs, larvae, and juveniles were most abundant and, using conservative assumptions regarding life history and mortality, represent approximately 21.7 million adults lost per year (Stone and Webster 1985). Recreationally important fish entrained included larvae and/or juveniles of silver perch (6602 adult equivalents as assessed for bay anchovy), spotted sea trout (*Cynoscion nebulosus* , 900 adult equivalents), red drum (*Sciaenops ocellatus* ,18 adult equivalents), spot (*Leiostomus xanthurus* 690,000 adult equivalents), and striped mullet (*Mugil cephalus,* 5985 adult equivalents). With the exception of spot, the entrainment impact on these fish represents less than 0.2 percent of the estimated annual harvest for each species. The 1982 commercial harvest of spot for Citrus and Levy Counties was equivalent to the estimated numbers (based on weight) of entrained spot (Stone and Webster 1985).

Invertebrate sampling indicated that shrimp, stone crab (*Menippe mercenaria*), and brief squid (*Lolliguncula brevis*) could be entrained. Although no pink shrimp were collected, other shrimp post-larvae and juveniles were assessed without distinguishing species and represent more than 29,000 adult equivalents. Florida stone crab zoeal through megalops stages and brief squid were collected and estimated to represent 3652 and 3600 (194 lb) adult equivalents, respectively. With a commercial harvest of shrimp exceeding 1 million pounds, the number of entrained shrimp is minimal. Likewise, the number of entrained brief squid is small with commercial landings of squid in Pasco and Pinellas Counties in 1986 exceeding 2900 lb (FFWCC 1986). Impact on entrained stone crabs is difficult to estimate because the commercial fishery is renewable and only the claws are harvested. However, more than 950,000 lb of claws were harvested in Citrus and Levy Counties in 1982, and, assuming that claws make up half the weight (Lindberg and Marshall 1984), the loss of commercial harvest due to entrainment would be less than 0.01 percent. By comparison, the CREC withdrawal of water from the Gulf of Mexico is between 1897 and 1613 Mgd, which is 13 times greater than the proposed water withdrawal of 122 Mgd from the CFBC for proposed LNP Units 1 and 2. Entrainment impacts for LNP are expected to be significantly less than for CREC.

For the LNP Units 1 and 2 CWIS, PEF estimated potential impacts from withdrawal of cooling water from the CFBC based on design and construction technology, baseline biological characterization, and zone of influence. The through screen velocity for the intake would be 0.5

fps or less. To achieve the low velocity, the inlet area would need to be larger than 106.1 ft^2 (CH2M Hill 2009c). The zone of hydraulic influence would extend 5 mi from the CWIS in the CFBC. The CFBC is tidally influenced, and, beyond the 5-mi zone of influence, the average current velocity is greater than the CWIS-induced through-screen velocity 90 percent of the time. Sampling in the area of the proposed CWIS indicated a biologically depauperate environment with relatively poor water quality (PEF 2009a). However, operation of the CWIS would modify the temperature, salinity, and dissolved oxygen conditions in the vicinity of the CWIS and may attract aquatic biota, enhancing the area. Using conservative assumptions that the water quality may approach similar attributes as those observed in the CFBC near sampling Station 3 at the mouth, the number and diversity of species is likely to increase for the life stages of organisms that are mobile and actively feeding. However, the portion of the CFBC sampled near Station 3 is not a known spawning area, and zooplankton likely drift in and out of this area under tidal influence. Therefore, the potential for impingement and entrainment of aquatic organisms during operation of the CWIS would likely increase only due to zone of hydraulic influence and not from colonization or use of habitat near the CWIS. However, the overall impingement and entrainment of aquatic organisms for LNP are still expected to be significantly less than the impingement and entrainment that occur at the CWIS for the CREC.

4.2.3 Aquatic Thermal Impacts

In EIS Section 5.2.3.1, the review team describes its independent assessment of the incremental impacts of proposed LNP Units 1 and 2 on the water temperatures using the current CREC discharge flow plus the power uprate for CREC Unit 3 on the Gulf of Mexico. A three-dimensional coastal ocean model was used in the assessment of the impact on the Gulf of Mexico. In addition, the review team modeled the discharge with the two LNP units operating, CREC Unit 3 power uprate, and CREC Units 1 and 2 shut down. During summer conditions at ebb tide the surface-water temperatures near the CREC point of discharge channel would be slightly less under the proposed conditions when compared to current conditions that include operation of CREC Units 1 through 5. The discharge volume of the plume would be increased with the addition of LNP Units 1 and 2, but only slightly. The increase in surface-water temperature at the entrance of CFBC channel immediately to the north, would be between 0.05°C and ~0.1°C during the summer months at ebb tide (Figure 4-1). Similar trends in thermal plume temperatures would be observed during winter conditions with the addition of LNP discharge resulting in a slight temperature drop immediately at the CREC discharge canal, and a slight increase in surface-water temperature beyond the immediate discharge area. Surface-water temperatures at the mouth of the CFBC are expected to increase by less than 0.5°C over the current conditions (Figure 4-2). The increased plume size attributable to the operation of two units at the LNP site would likely have minimal impact on aquatic biota that

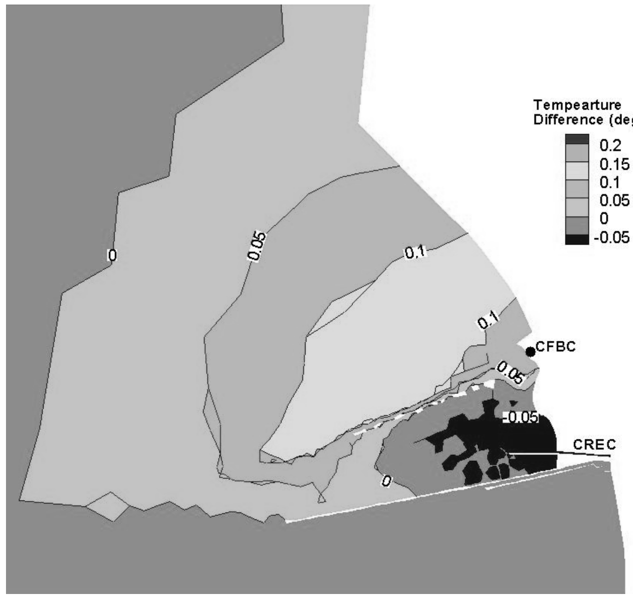

Figure 4-1. Thermal Plume Analysis Using the FVCOM (Finite Volume Community Ocean Model) Showing the Temperature Difference Between the Current and Proposed Thermal Discharge Under Summer Conditions at Ebb Tide

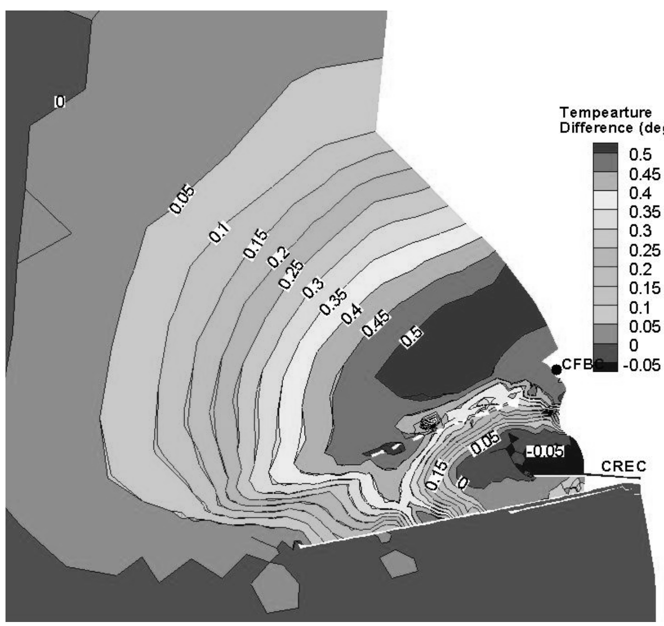

Figure 4-2. Thermal Plume Analysis Using the FVCOM Showing the Temperature Difference Between Current and Proposed Thermal Discharge Under Winter Conditions at Ebb Tide

forage near the CFBC under both extreme conditions primarily because of the small contribution LNP would have on the extent of the plume. Habitat usage is not expected to be detectably affected by operation of LNP at the point of discharge given the minimal addition of discharge volume and temperature change.

4.2.3.1 Chemical Impacts

The use of chemicals in the existing CREC discharge is regulated by an NPDES permit, which is granted by the FDEP. The chemical concentrations at the outfall for the existing units meet the NPDES limits (FDEP 2008) and would be required to be under compliance with the addition of the LNP discharge. The minimal increase in discharge contribution from LNP would not significantly increase the total chemical concentrations and is expected to be compliant with NPDES limits (FDEP 2010). Table 3-2 lists the water-treatment chemicals, their use, and the concentrations that are anticipated to be discharged from the proposed LNP Units 1 and 2 blowdown. The concentrations in the discharge are significantly lower than the LC50. The CREC effluent discharge and the Gulf of Mexico would further dilute the concentration of these chemicals.

In addition, the review team evaluated the potential for impact due to the increased salinity associated with the LNP Units 1 and 2 blowdown, which would have a total dissolved solids concentration up to 1.5 times greater than seawater (PEF 2009b). This increase in total dissolved solids is due to evaporative loss of water through the cooling towers. Because the LNP discharge would be combined with CREC discharge prior to the point of discharge into Crystal Bay and the CREC discharge accounts for the vast majority of the discharge volume (>95 percent), the increase in salinity would be slight (0 pps and ~0.5 pps) in the coastal region near the CREC discharge channel and between 0.4 pps and ~0.45 pps at the mouth of the CFBC (Figure 4-3).

Thus, the incremental impacts from the chemical discharges related to the operation of LNP Units 1 and 2 to the Gulf of Mexico are considered to be minimal.

4.2.3.2 Physical Impacts from Discharge

The discharge volume of proposed LNP Units 1 and 2 blowdown water would be 81.34 Mgd and would be combined with the CREC Units 1 through 5 discharge of 1651.8 Mgd in the CREC discharge canal, which opens into the Gulf of Mexico. The LNP discharge would account for only 4.9 percent of the total discharge flow, would have little physical scouring impact at the terminus of the discharge canal (PEF 2009a), and is not likely to affect water quality or habitat in the nearshore environment.

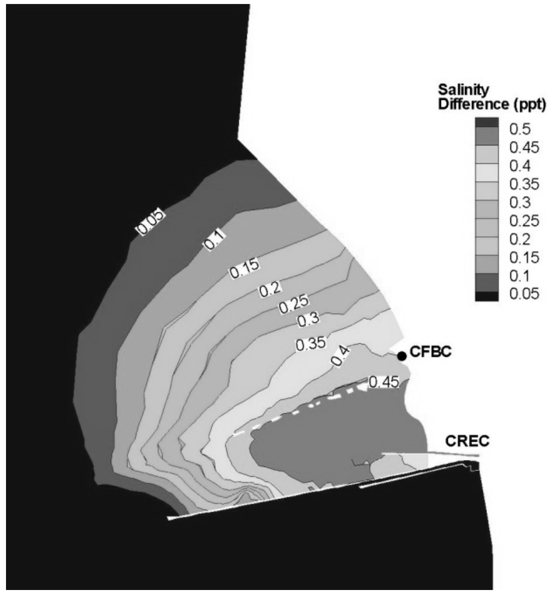

Figure 4-3. Salinity Difference Between the Current and Proposed Discharge Plume at Ebb Tide

4.2.4 Transmission-Line Corridors

Maintenance activities along the four 500-kV, five 230-kV, and two 69-kV transmission lines could lead to periodic temporary impacts on the waterways being crossed. However, it is assumed that the same vegetation management practices currently used by PEF for the existing CREC facility transmission-line rights-of-way would be applied to the existing and proposed new transmission-line right-of-ways. PEF practices and procedures were developed to prevent impacts on surface waters and wetlands; therefore, impacts on aquatic ecosystems from operation and maintenance of transmission lines are expected to be minimal (PEF 2009a). No impacts on aquatic habitats are anticipated from maintenance of the transmission lines.

5.0 Potential Effects of Proposed Federal Actions on EFH Species

During the development of the EFH assessment, NMFS provided a list of species managed by the Gulf of Mexico Fishery Management Council for Ecoregion 2) (NMFS 2008). With the exception of a few species that do not occur in the region of interest or occupy EFHs that would not be affected by the proposed action, these species and life stages that rely on habitats essential for species propagation are detailed below with regard to abundance patterns in Crystal Bay and the CFBC, common depth distributions, relevant migratory and spawning habits, tolerance and preference ranges for temperature and salinity, habitat needs, information on food preferences, and the impact of the proposed Federal actions on EFH. The affected waterbodies associated with LNP are the nearshore Crystal Bay (marine), CFBC (estuarine), and the OWR (estuarine/freshwater). During the initial review of life history and EFH requirements for each candidate species, some species or life stages were eliminated from further consideration based on salinity or depth requirements or life history information that suggested the presence of some species or life stage is unlikely in Crystal Bay, the CFBC, or the OWR (Table 5-1). To indicate those species and life history stages included in EFH consultation, amended lists of species taken from Table 1-1 are given by waterbody (Tables 5-2 and 5-3). Construction impacts are possible for species and EFH in estuarine habitats associated with the CFBC and OWR. Operation impacts are possible for species and EFH in both estuarine (CFBC and OWR) and marine habitats associated with Crystal Bay up to two miles offshore.

5.1 Species Descriptions and Impact Determination

For each species and life stage, LNP construction and operation were evaluated to determine whether they resulted in (1) no adverse impact, (2) minimal adverse impact, or (3) substantial adverse impact on EFH. To determine impact level, LNP monitoring data, scientific journal articles, NMFS publications, CREC data, technical reports, and other relevant information were reviewed.

5.1.1 Spanish Mackerel

Adult Spanish mackerel (*Scombermorus maculatus*) forage in estuarine and marine nearshore pelagic waters, and eggs and juveniles also occur nearshore marine surface (eggs) and pelagic (juveniles) waters (GMFMC 2004). This species is often found in large schools near the water surface. Juvenile and adult Spanish mackerel are fast moving, voracious predators and feed on other smaller schooling fish. Spawning takes place from May to late August. In the eastern Gulf of Mexico, Spanish mackerel migrate northward during late winter and spring, and migrate southward to wintering grounds in south Florida waters in the fall (FFWCC 2008a). Spanish mackerel were collected at the CFBC mouth and CFBC nearshore areas. However, no adult Spanish mackerel were collected in the OWR, and no identifiable Spanish mackerel eggs or juveniles were collected during sampling activities between October 2007 and November 2008 in the CFBC, OWR, or CREC nearshore region of Crystal Bay.

Table 5-1. Species and Life Stages Excluded from EFH Assessment

Common Name	Life Stages Excluded	Rationale for Exclusion
Spanish mackerel	Larvae (eggs, juveniles, and adults retained)	Depth requirements not present in Crystal Bay[a]
Gray triggerfish	All life stages	Depth and substrate requirements not present in Crystal Bay[a]
Golden tilefish	All life stages	Depth requirements not present in Crystal Bay[a]
Goldface tilefish	All life stages	Depth and substrate requirements not present in Crystal Bay[a]
Blueline tilefish	All life stages	Depth requirements not present in Crystal Bay[a]
Banded rudderfish	All life stages	Depth requirements not present in Crystal Bay[a]
Almaco jack	All life stages	Depth requirements not present in Crystal Bay[a]
Lesser amberjack	Juveniles(eggs and larvae retained)	Depth requirements not present in Crystal Bay[a]
Vermillion snapper	Eggs, juveniles, adults	Depth and substrate requirements not present in Crystal Bay[a]
Red snapper	Eggs, larvae, juveniles (adults retained)	Depth requirements not present in Crystal Bay[a]
Blackfin snapper	All life stages	Depth requirements not present in Crystal Bay[a]
Scamp	All life stages	Depth and substrate requirements not present in Crystal Bay[a]
Speckled hind	All life stages	Depth requirements not present in Crystal Bay[a]
Rock hind	Juveniles (eggs and larvae retained)	Substrate requirements not present in Crystal Bay[a]
Red hind	All life stages	Depth and substrate requirements not present in Crystal Bay[a]
Yellowedge grouper	All life stages	Depth and substrate requirements not present in Crystal Bay[a]
Warsaw grouper	All life stages	Depth and substrate requirements not present in Crystal Bay[a]
Red grouper	Eggs, larvae (juveniles and adults retained)	Depth requirements not present in Crystal Bay[a]

Table 5-1. (contd)

Common Name	Life Stages Excluded	Rationale for Exclusion
Black grouper	Eggs, larvae (juveniles and adults retained)	Depth requirements not present in Crystal Bay[(a)]
Gag grouper	Eggs, larvae, adults (juveniles retained)	Depth requirements not present in Crystal Bay[(a)]
White shrimp	Eggs (larvae and juveniles retained)	Depth requirements not present in Crystal Bay[(a)]
Gulf stone crab	All life stages	Species not present in geographical area
Coral	All life stages	Depth and substrate requirements not present in Crystal Bay[(a)]

(a) Crystal Bay area defined by affected nearshore environment up to 2 mi offshore.
Modified from Table 1-1.

Table 5-2. Designated EFH for Species and Life Stages for the Estuarine Cross Florida Barge Canal and Old Withlacoochee River

Common Name	Species Name	Life Stage
Spanish mackerel	*Scombermorus maculatus*	Adults
Hogfish	*Lachnolaimus maximus*	Juveniles
Schoolmaster	*Lutjanus apodus*	Juveniles
Gray (mangrove) snapper	*Lutjanus griseus*	Larvae, juveniles, adults
Dog snapper	*Lutjanus jocu*	Juveniles
Lane snapper	*Lutjanus synagris*	Larvae, juveniles
Yellowtail snapper	*Ocyurus chrysurus*	Juveniles
Red grouper	*Epinephelus morio*	Juveniles
Black grouper	*Mycteroperca bonaci*	Juveniles, adults
Gag grouper	*Mycteroperca microlepis*	Juveniles
Red drum	*Sciaenops ocellatus*	Larvae, juveniles, adults
White shrimp	*Litopenaeus setiferus*	Larvae, juveniles
Pink shrimp	*Farfantepenaeus duorarum*	Juveniles
Florida stone crab	*Menippe mercenaria*	Eggs, larvae, juveniles

Modified from Table 1-1.

Table 5-3. Designated EFH for the Marine Crystal Bay Up to 2 mi Offshore

Common Name	Species	Life Stage
Spanish mackerel	*Scombermorus maculatus*	Eggs, juveniles, adults
Hogfish	*Lachnolaimus maximus*	Juveniles
Schoolmaster	*Lutjanus apodus*	Eggs, larvae, juveniles
Lesser amberjack	*Seriola fasciata*	Eggs, larvae
Greater amberjack	*Seriola dumerili*	Eggs, larvae, juveniles
Dwarf sand perch	*Diplectrum bivittatum*	Juveniles
Gray (mangrove) snapper	*Lutjanus griseus*	Eggs, larvae, juveniles, adults
Dog snapper	*Lutjanus jocu*	Eggs, larvae, juveniles
Lane snapper	*Lutjanus synagris*	Eggs, larvae, juveniles
Yellowtail snapper	*Ocyurus chrysurus*	Eggs, juveniles, adults
Red snapper	*Lutjanus campechanus*	Adults
Red grouper	*Epinephelus morio*	Juveniles, adults
Black grouper	*Mycteroperca bonaci*	Juveniles, adults
Gag grouper	*Mycteroperca microlepis*	Juveniles
Nassau grouper	*Epinephelus striatus*	Eggs, larvae, juveniles
Rock hind	*Epinephelus adscensionis*	Eggs, larvae
Red drum	*Sciaenops ocellatus*	Eggs, juveniles, adults
White shrimp	*Litopenaeus setiferus*	Larvae
Pink shrimp	*Farfantepenaeus duorarum*	Eggs, larvae, adults
Florida stone crab	*Menippe mercenaria*	Eggs, larvae, juveniles

Modified from Table 1-1.

Construction activities would not occur in nearshore areas, but would occur in a small proportion of available potential foraging habitat within the CFBC at the site of discharge piping entrenchment, barge-unloading facility, and intake structure placement. Disruption of habitat for foraging in these areas of the CFBC is expected to be minor and temporary. Spanish mackerel were also collected in the nearshore area of the CREC discharge. No construction activities are planned for the nearshore areas around the CREC discharge. The thermal, chemical, and physical changes in the nearshore Crystal Bay environment should be easily avoided by adult and juvenile Spanish mackerel, as well as by their prey. Eggs may drift into the region of the discharge plume, but the water-quality parameters from discharge operations (chemical and thermal) are not expected to significantly alter the pelagic Crystal Bay environment. Barges moving heavy equipment and bulk commodities are likely to be slow-moving and prop wash and wave action from the vessel movement is not likely to affect any life stages of Spanish mackerel in the vicinity. Vegetation management practices in transmission corridors and transmission line maintenance is not expected to affect EFH species. Therefore, LNP construction activities would likely have a minimal adverse effect on adult Spanish mackerel EFH in the CFBC, and LNP operations would likely have minimal adverse impact on Spanish mackerel eggs, and juvenile EFH.

5.1.2 Hogfish

Juvenile hogfish (*Lachnolaimus maximus*) are found in shallow estuarine and marine areas and near submerged aquatic vegetation (SAV) habitats, where they forage on benthic crustaceans, mollusks, and echinoderms (GMFMC 2004). Hogfish juveniles are all female and transform to males following spawning as females around 3 years of age (FFWCC 2008b). No hogfish were collected during sampling activities in the Crystal Bay area, nearshore of the CFBC, or within the CFBC (CH2M Hill 2009b).

Construction activities would not occur in nearshore areas, but would occur in a small proportion of available potential foraging habitat within the CFBC at the site of discharge piping entrenchment, barge-unloading facility, and intake structure placement. Disruption of habitat for foraging in these areas of the CFBC is expected to be minor and temporary. Juvenile hogfish that may be present should be able to use adjacent unaffected SAV habitats. No construction activities are planned for the nearshore areas around the CREC discharge. The thermal, chemical, and physical changes in the nearshore Crystal Bay environment should be easily avoided by juvenile hogfish, as well as by their prey. Water-quality parameters from discharge operations (chemical and thermal) are not expected to significantly alter the pelagic Crystal Bay environment. Barges moving heavy equipment and bulk commodities are likely to be slow-moving and prop wash and wave action from the vessel movement is not likely to affect juvenile hogfish in the vicinity. Vegetation management practices in transmission corridors and transmission line maintenance is not expected to affect EFH species. Therefore, LNP construction and operations would likely have minimal adverse impact on hogfish juvenile EFH.

5.1.3 Amberjack Species

The greater amberjack (*Seriola dumerili*) and lesser amberjack (*Seriola fasciata*) primarily are found in offshore deepwater marine habitats. Spawning occurs offshore in the spring, and eggs, larvae, and greater amberjack juveniles may drift into shallower marine habitats. Juvenile greater amberjack feed on plankton and small invertebrates (GMFMC 2004). No eggs, larvae, or juveniles were collected during sampling activities in the Crystal Bay area or nearshore of the CFBC (CH2M Hill 2009b).

No construction activities are planned for the nearshore areas around the CREC discharge, and construction activities within the CFBC would not impact marine EFH for both lesser and greater amberjack eggs, larvae, and juveniles. The thermal, chemical, and physical changes in the nearshore Crystal Bay environment should be easily avoided by juvenile greater amberjack, as well as by their prey. Eggs and larvae may drift into the region of the discharge plume, but the water-quality parameters from discharge operations (chemical and thermal) are not expected to significantly alter the pelagic Crystal Bay environment. Barges moving heavy equipment and bulk commodities are likely to be slow-moving and prop wash and wave action from the vessel movement is not likely to affect any life stages of greater or lesser amberjack species in the vicinity. Vegetation management practices in transmission corridors and transmission line maintenance is not expected to affect EFH species. Therefore, LNP construction would likely have no adverse impact on amberjack EFH, and LNP operations would likely have minimal adverse impact on amberjack egg and larvae EFH.

5.1.4 Dwarf Sand Perch

Juvenile dwarf sand perch (*Diplectrum bivittatum*) are demersal and occur in hard-bottom marine habitats that may be present in nearshore areas of Crystal Bay. It is unknown what specific habitat needs juveniles require in these areas. Dwarf sand perch feed on benthic crustaceans and small fish. Juveniles move from shallow marine habitats and move offshore during winter months (GMFMC 2004). No juveniles were collected during sampling activities in the Crystal Bay area or nearshore of the CFBC (CH2M Hill 2009b).

No construction activities are planned for the nearshore areas around the CREC discharge, and construction activities within the CFBC would not impact marine EFH for juvenile dwarf sand perch. The thermal, chemical, and physical changes in the nearshore Crystal Bay environment should be easily avoided by juvenile dwarf sand perch, as well as by their prey. Barges moving heavy equipment and bulk commodities are likely to be slow-moving and prop wash and wave action from the vessel movement is not likely to affect juvenile dwarf sand perch in the vicinity. Vegetation management practices in transmission corridors and transmission line maintenance is not expected to affect dwarf sand perch juveniles. Therefore, LNP construction and operation would likely have no adverse impact on dwarf sand perch juvenile EFH.

5.1.5 Gray Snapper

For estuarine habitats associated with the CFBC, larval, juvenile, and adult life stages of gray snapper (*Lutjanus griseus*) are considered because this species occupies primarily inshore habitats. Eggs are found primarily in marine waters as part of the plankton community. Larvae are marine, neritic, and planktonic, and are known to be in the Gulf of Mexico from April through November. As they mature, gray snapper move into estuarine habitats and occupy inshore grassy areas. Juveniles and adults are found near SAV in inshore marine and estuarine habitats or near mangroves (GMFMC 2004). Adults move offshore to spawn between June and September. Juvenile and adult gray snapper forage on small fish and crustaceans (FFWCC 2008c). Gray snapper were observed in the CFBC at all three stations from the Inglis Lock to the mouth and in the nearshore area of the CREC discharge (CH2MHill 2009b).

For estuarine habitats associated with the CFBC, larval, juvenile, and adult life stages of gray snapper are considered because this species occupies primarily inshore habitats (GMFMC 2004). Eggs are found primarily in marine waters as part of the plankton community. Adults and juveniles occur in potential foraging habitat within the CFBC at the site of discharge piping entrenchment, barge-unloading facility, and possibly the intake installation. Disruption of habitat for foraging in these areas of the CFBC is expected to be minor, temporary, and largely mitigable. Larvae may move into estuarine habitats, like the CFBC, and become entrained in the cooling-water intake system. However, it is unlikely that appreciable numbers of larvae would be entrained because no larval snapper species were collected over a year of sampling near the mouth or within the CFBC. Juvenile gray snapper that may be present should be able to use adjacent unaffected SAV habitats. The thermal, chemical, and physical changes in the nearshore Crystal Bay environment should be easily avoided by adult and juvenile gray snapper, as well as by their prey. Eggs and larvae may drift into the region of the discharge plume, but the water-quality parameters from discharge operations (chemical and thermal) are not expected to significantly alter the pelagic Crystal Bay environment. Barges moving heavy equipment and bulk commodities are likely to be slow-moving and prop wash and wave action from the vessel movement is not likely to affect gray snapper in the vicinity. Vegetation management practices in transmission corridors and transmission line maintenance is not expected to affect gray snapper EFH. Therefore, LNP construction would likely have minimal adverse impact on gray snapper juvenile and adult EFH. LNP operations would likely have minimal adverse impact on gray snapper eggs, larvae and juvenile EFH.

5.1.6 Lane Snapper

Larvae and juvenile lane snapper (*Lutjanus synagris*) may occupy estuarine to marine habitats with SAV or sand, shell, or soft substrate (GMFMC 2004). Mature adults spawn offshore from March through September, and eggs are found primarily in marine waters as part of the planktonic water column. Juveniles feed on small crustaceans and fish and mature to reproductive adults within a year (FFWCC 2008d). Lane snapper were observed in the CFBC at all three stations from the Inglis Lock to the mouth and in the nearshore area of the CREC discharge (CH2MHill 2009b).

Juvenile lane snapper may forage within the CFBC at the site of discharge piping entrenchment, barge-unloading facility, and possibly the intake installation. Disruption of habitat for foraging in these areas of the CFBC is expected to be minor, temporary, and largely mitigable. Larvae may move into estuarine habitats, like the CFBC, and become entrained in the cooling-water intake system. However, it is unlikely that appreciable numbers of larvae would be entrained as no larval snapper species were collected over a year of sampling near the mouth or within the CFBC. Larval and juvenile lane snapper that may be present should be able to use adjacent unaffected SAV habitats. The thermal, chemical, and physical changes in the nearshore Crystal Bay environment should be easily avoided by juvenile lane snapper, as well as by their prey.

Eggs and larvae may drift near the region of the discharge plume, but EFH for these life stages is defined at a depth range of 4 to 132 m, which would not occur in the discharge plume region. Barges moving heavy equipment and bulk commodities are likely to be slow-moving and prop wash and wave action from the vessel movement is not likely to affect lane snapper in the vicinity. Vegetation management practices in transmission corridors and transmission line maintenance is not expected to affect lane snapper EFH. Therefore, LNP construction would likely have minimal adverse impact on lane snapper juvenile EFH. LNP operations would likely have minimal adverse impact on lane snapper egg, larvae and juvenile EFH.

5.1.7 Schoolmaster

Both larval schoolmaster and schoolmaster eggs are found in marine waters associated with the planktonic water column. Juveniles move into shallow, estuarine waters (GMFMC 2004) However, no life stages of these species were collected during sampling activities in the Crystal Bay area or the CFBC (CH2M Hill 2009b).

Schoolmaster juveniles may forage within the CFBC at the site of discharge piping entrenchment and possibly the intake installation. Disruption of habitat for foraging in these areas of the CFBC is expected to be minor, temporary, and largely mitigable. During operation, impingement losses of juveniles are unlikely due to the low through-screen velocity and limited withdrawal rates for closed-cycle cooling. Eggs and larvae may drift into the region of the discharge plume, but the water-quality parameters from discharge operations (chemical and thermal) are not expected to significantly alter the pelagic Crystal Bay environment. Barges moving heavy equipment and bulk commodities are likely to be slow-moving and prop wash and wave action from the vessel movement is not likely to affect schoolmaster in the vicinity. Vegetation management practices in transmission corridors and transmission line maintenance is not expected to affect schoolmaster. Therefore, LNP construction would likely have minimal adverse impact on schoolmaster juvenile EFH. LNP operations would likely have minimal adverse impact on schoolmaster egg and larvae EFH.

5.1.8 Dog Snapper

Dog snapper use estuarine, grassy nearshore habitat for juvenile development. Both dog snapper larvae and eggs are found in marine waters associated with the planktonic water column (GMFMC 2004), which occur outside the CFBC. Juveniles may also use sand, shell, or soft bottom estuarine habitat, such as found in the CFBC, for foraging. However, no life stages of these species were collected during sampling activities in the Crystal Bay area or the CFBC (CH2M Hill 2009b).

Disruption of habitat for foraging in the areas of the CFBC near the discharge piping entrenchment, barge-unloading facility, and intake installation is expected to be minor, temporary, and largely mitigable. During operation, impingement losses of juveniles are unlikely due to the low through-screen velocity and limited withdrawal rates for closed-cycle cooling. Eggs and larvae may drift into the region of the discharge plume, but the water-quality parameters from discharge operations (chemical and thermal) are not expected to significantly alter the pelagic Crystal Bay environment. Barges moving heavy equipment and bulk commodities are likely to be slow-moving and prop wash and wave action from the vessel movement is not likely to affect dog snapper in the vicinity. Vegetation management practices in transmission corridors and transmission line maintenance is not expected to affect dog snapper. Therefore, LNP construction would likely have minimal adverse impact on dog snapper juvenile EFH. LNP operations would likely have minimal adverse impact on dog snapper egg, larvae, and juvenile EFH.

5.1.9 Yellowtail Snapper

Juvenile yellowtail snapper move into nearshore nursery areas characterized as marine or estuarine with SAV or soft-bottom substrate. Eggs are planktonic and primarily are found in offshore marine waters. Adult yellowtail snapper are found primarily in marine waters, over shallow-to-50-m depth habitats with hard bottom or reef substrates (GMFMC 2004). However, no life stages of these species were collected during sampling activities in the Crystal Bay area or the CFBC (CH2M Hill 2009b).

Juveniles may use potential foraging habitat within the CFBC at the site of discharge piping entrenchment, barge-unloading facility, and possibly the intake installation. Disruption of habitat for foraging in these areas of the CFBC is expected to be minor, temporary, and largely mitigable. Juvenile yellowtail snapper that may be present should be able to use adjacent unaffected SAV habitats. During operation, impingement losses of juveniles are unlikely due to the low through-screen velocity and limited withdrawal rates for closed-cycle cooling. The thermal, chemical, and physical changes in the nearshore Crystal Bay environment should be easily avoided by juvenile yellowtail snapper, as well as by their prey. Eggs may drift into the region of the discharge plume, but the water-quality parameters from discharge operations (chemical and thermal) are not expected to significantly alter the pelagic Crystal Bay environment. It is likely that adults in the Crystal Bay area would swim away or forage in nearby unaffected areas. Barges moving heavy equipment and bulk commodities are likely to be slow-moving and prop wash and wave action from the vessel movement is not likely to affect red snapper in the vicinity. Vegetation management practices in transmission corridors and transmission line maintenance is not expected to affect adult red snapper. Therefore, LNP construction would likely have minimal adverse impact on yellowtail snapper juvenile EFH. LNP operations would likely have minimal adverse impact on yellow snapper egg and juvenile EFH.

5.1.10 Red Snapper

Adult red snapper prefer sandy and rocky-bottom habitats in marine waters up to 200 m (GMFMC 2004). No life stages of these species were collected during sampling activities in the Crystal Bay area or the CFBC (CH2M Hill 2009b).

No construction activities are planned for the nearshore areas around the CREC discharge, and construction activities within the CFBC would not impact marine EFH for adult red snapper. The thermal, chemical, and physical changes in the nearshore Crystal Bay environment should be easily avoided by adult red snapper, as well as by their prey. Barges moving heavy equipment and bulk commodities are likely to be slow-moving and prop wash and wave action from the vessel movement is not likely to affect red snapper in the vicinity. Vegetation management practices in transmission corridors and transmission line maintenance is not expected to affect adult red snapper. Therefore, LNP construction and operations would likely have no adverse impact on adult red snapper EFH.

5.1.11 Grouper Species

Juvenile red grouper (*Epinephelus morio*), gag grouper (*Mycteroperca microlepis*), and juvenile black grouper (*Mycteroperca bonaci*) occupy estuarine hard-bottom and SAV habitats, which occur primarily outside of the CFBC, for growth and feeding (GMFMC 2004). Eggs and larvae for the Nassau grouper (*Epinephelus striatus*) and rock hind (*Epinephelus adscensionis*) are planktonic in marine waters (GMFMC 2004). Juvenile Nassau grouper associate with nearshore SAV in marine waters. No life stages of any grouper species were collected during sampling in the CFBC (CH2M Hill 2009b).

Juveniles and adult black grouper may use potential foraging habitat within the CFBC at the site of discharge piping entrenchment, barge-unloading facility, and possibly the intake installation. Disruption of habitat for foraging in these areas of the CFBC is expected to be minor, temporary, and largely mitigable. Juvenile red, black, and gag grouper that may be present should be able to use adjacent unaffected SAV habitats. No construction activities are planned for the nearshore areas around the CREC discharge. The thermal, chemical, and physical changes in the nearshore Crystal Bay environment should be easily avoided by adult and juvenile grouper species, as well as by their prey. Nassau grouper and rock hind eggs and larvae may drift into the region of the discharge plume, but the water-quality parameters from discharge operations (chemical and thermal) are not expected to significantly alter the pelagic Crystal Bay environment. Barges moving heavy equipment and bulk commodities are likely to be slow-moving and prop wash and wave action from the vessel movement is not likely to affect grouper species in the vicinity. Vegetation management practices in transmission corridors and transmission line maintenance is not expected to affect grouper species in the vicinity. Therefore, LNP construction would likely have minimal adverse impact on juvenile red grouper, juvenile gag grouper, and juvenile and adult black grouper EFH. LNP operations would likely have minimal adverse impact on rock hind and Nassau grouper eggs and larvae, and red grouper, gag grouper, Nassau grouper, and black grouper juvenile EFH.

5.1.12 Red Drum

Red drum (*Sciaenops ocellatus*) larvae and juveniles spend most of their time in estuarine soft-bottom, sand/shell, and SAV habitats actively feeding on mysids, crustaceans, and fish. Adults spend some time near inshore SAV, sandy or hard-bottom foraging habitats, but are predominantly found offshore where spawning activities occur (GMFMC 2004). Red drum move to deep offshore water in the fall to spawn then return to nearshore coastal and estuarine habitats (FFWCC 2007). Red drum larvae, juveniles, and adults were observed at the proposed intake area within the CFBC. However, no red drum eggs were collected during the year-long sampling activities in the CFBC or nearshore waters, Crystal Bay, or OWC (CH2M Hill 2009b).

Construction activities would not occur in nearshore areas, but would occur in a small proportion of available potential foraging habitat within the CFBC at the site of discharge piping entrenchment and intake structure placement. Disruption of habitat for foraging in these areas of the CFBC is expected to be minor and temporary. Larvae may become entrained in the cooling-water intake system in the CFBC as they were collected in the vicinity of the proposed intake. However, it is unlikely that appreciable numbers of larvae will be entrained as, over the year-long sampling events in the CFBC, 23.01 larvae per cubic m were collected near the proposed intake, and 43.31 larvae per cubic m were collected during the same sampling period at the mouth and nearshore waters of the CFBC (CH2M Hill 2009b). When adjusted for potential entrainment using LNP intake flow of 122 Mgd and foregone production assumptions regarding life history and survival (Boreman et al. 1981), this represents approximately 4 adult equivalents entrained in a year, which should not adversely impact red drum populations (CH2M Hill 2009c). The thermal, chemical, and physical changes in the nearshore Crystal Bay environment should be easily avoided by adult and juvenile red drum, as well as by their prey. Red drum eggs may drift into the region of the discharge plume, but the water-quality parameters from discharge operations (chemical and thermal) are not expected to significantly alter the pelagic Crystal Bay environment. Barges moving heavy equipment and bulk commodities are likely to be slow-moving and prop wash and wave action from the vessel movement is not likely to affect red drum in the vicinity. Vegetation management practices in transmission corridors and transmission line maintenance is not expected to affect red drum EFH. Therefore, LNP construction would likely have minimal adverse impact on red drum juvenile and adult EFH. LNP operations would likely have minimal adverse impact on red drum egg, larvae, juvenile, and adult EFH.

5.1.13 Shrimp

Pink shrimp (*Farfantepenaeus duorarum*) and white shrimp (*Litopenaeus setiferus*) migrate from offshore pelagic environment (larvae) to inhabit grassy, estuarine habitats (juveniles) such as those found outside the mouth of the CFBC (GMFMC 2004). Larval pink shrimp may also occupy marine SAV and sand/shell habitats (GMFMC 2004), which are found in Crystal Bay near the point of discharge for CREC and were collected during sampling activities (CH2M Hill 2009b). Although eggs and adult pink shrimp are also found in nearshore environments, they typically are not found in marine waters less than 1 m deep. White shrimp larvae may also be found in the nearshore marine water column, but prefer estuarine habitats (GMFMC 2004) and were not observed during sampling activities in Crystal Bay (CH2M Hill 2009b).

No construction activities are planned for the nearshore areas around the CREC discharge, and the thermal, chemical, and physical changes in the nearshore Crystal Bay environment due to discharge operations are not expected to detectably alter the water column or sediment environments. Juvenile white and pink shrimp may forage within the CFBC at the site of the discharge piping entrenchment, barge-unloading facility, and possibly the intake installation. Disruption of habitat for foraging in these areas of the CFBC is expected to be minor, temporary, and largely mitigable. Pink shrimp larvae EFH is limited to marine habitats, and are not assessed for the estuarine CFBC. White shrimp larvae and pink shrimp juveniles may move into estuarine habitats, such as the CFBC, and become entrained in the cooling-water intake system. However, it is unlikely that appreciable numbers of larvae will be entrained as relatively few juvenile pink shrimp and no larval white shrimp were collected over a year of sampling near the mouth or within the CFBC (CH2MHill 2009b). Barges moving heavy equipment and bulk commodities are likely to be slow-moving and prop wash and wave action from the vessel movement is not likely to affect shrimp species in the vicinity. Vegetation management practices in transmission corridors and transmission line maintenance is not expected to affect pink or white shrimp EFH. Therefore, LNP construction would likely have minimal adverse impact on white and pink shrimp juvenile EFH. LNP operations would likely have minimal adverse impact on white shrimp egg, larvae, juvenile, and pink shrimp larvae and juvenile EFH.

5.1.14 Stone Crab

The Florida stone crab (*Menippe mercenaria*) occupy estuarine and marine SAV, sand/shell, and hard-bottom habitats as eggs, larvae, and juveniles (GMFMC 2004). Stone crab larvae require high salinity (>30 pps) for effective growth (GMFMC 2004). No significant numbers of Florida stone crab eggs, larvae, or juveniles were observed within the CFBC, which does not contain preferred habitat types, but they were collected at the CFBC mouth and nearshore areas and in the Crystal Bay area of the CREC discharge.

It is possible that construction activities in the CFBC associated with discharge pipeline trenching and placement may disrupt foraging in these areas of the CFBC, but any disruption is expected to be minor, temporary, and largely mitigable. Stone crab eggs and larvae may drift into the upper portion of the CFBC, and become entrained in the cooling-water intake system. However, it is unlikely that appreciable numbers of eggs or larvae would be entrained as no stone crab eggs or larvae were collected over a year of sampling within the CFBC (CH2M Hill 2009b). Juvenile stone crab should be able to use adjacent unaffected SAV habitats. No construction activities are planned for the nearshore areas around the CREC discharge, and the thermal, chemical, and physical changes in the nearshore Crystal Bay environment due to discharge operations are not expected to detectably alter the water column or sediment environments. Barges moving heavy equipment and bulk commodities are likely to be slow-moving and prop wash and wave action from the vessel movement is not likely to affect stone crab in the vicinity. Vegetation management practices in transmission corridors and transmission line maintenance is not expected to affect stone crab EFH. Therefore, LNP construction would likely have minimal adverse impact on stone crab juvenile EFH. LNP operations would likely have minimal adverse impact on stone crab egg, larvae, and juvenile EFH.

6.0 Mitigation Measures

Four categories of impacts related to LNP construction and operation that could influence EFH are (1) siltation or turbidity during construction; (2) impingement of juveniles or adults; (3) entrainment of eggs, larvae, and zooplankton in the water column; and (4) release of heated cooling water containing biocides or other chemicals. These operations would be regulated under a FDEP permit currently under consideration (PEF 2008).

Construction activities in the CFBC would involve dredging and trenching activities for installation of the intake structure, blowdown pipelines, and connection of the barge slip to the CFBC. To mitigate construction impacts, turbidity barriers and erosion control measures would be installed in the canal during activities associated with sheet-pile installation to control impacts on water quality and would remain in place until the structures are operational (PEF 2008).

Mitigation of operational impacts include the planned use of closed-cycle cooling, the location of the intake structure in the upper reaches of the CFBC in an area of low biological productivity, the design of the intake structure to limit through screen velocities to 0.5 fps, and the use of bar racks on 3.5 in centers to exclude larger organisms from the vertical traveling screens. Such mitigation is consistent with the Phase I requirements of the Clean Water Act Section 316(b) (66 FR 65256). These mitigation measures should significantly reduce impingement and entrainment mortality of fish and shellfish to levels substantially below those resulting from a similar sized facility utilizing once-through cooling.

Discharged cooling water would be combined with existing CREC discharge effluents, which are currently under FDEP regulations for both maximum thermal limits and discharge of chemicals in the effluent (FDEP 2008). The addition of LNP cooling water discharge would not result in appreciable additional thermal impact, and the applicant has applied for a new discharge permit to comply with regulations involving addition of chemical effluent in the total discharge (PEF 2008).

Although the NRC lacks the statutory authority to require any of the above potential mitigation measures, the review team recognizes that such potential mitigation could further reduce adverse impacts on designated EFH and on Federally managed fish and shellfish species in the Gulf of Mexico. The Corps permit, if issued, could include special conditions such as time-of-year restrictions or specific methods of work to ameliorate potential impacts to EFH for the authorized construction activities. EFH Conservation Recommendations necessary to protect EFH may also be included. Mitigation may only be employed after all appropriate and practical steps to avoid and minimize adverse impacts to aquatic resources have been taken. All remaining unavoidable impacts must be compensated to the extent appropriate and practicable.

7.0 Cumulative Impacts

In addition to the impacts from construction, preconstruction, and operations, the cumulative analysis also considers other past, present, and future actions that could affect aquatic ecology. For this analysis, the geographic area of interest is the waterbodies connected to the proposed LNP site and offsite facilities, the entire CFBC, Lake Rousseau, the Inglis Lock bypass channel, the OWR, the CREC intake and discharge, and the Levy and Citrus Counties offshore areas of the Gulf of Mexico. The proposed transmission-line corridors are also included in the geographic area of interest. Other watersheds such as the Wacassassa River basin, do not affect water quality or biota in the waterbodies associated with LNP activities and are therefore not considered in the cumulative impacts analysis.

Other actions in the vicinity that have present and reasonably foreseeable future potential impacts on the CFBC and Gulf of Mexico offshore of the CREC include operation of the existing CREC, the proposed uprate of CREC Unit 3, current operation of the Inglis Quarry, widening of the US-19 bridge across the CFBC, a proposed hydropower project on the Inglis Lock bypass channel spillway, proposed Tarmac King Road Limestone Mine, decommissioning of CREC Units 1 and 2, development of a Port District along the CFBC, and natural environmental stressors (e.g., short- or long-term changes in precipitation or temperature and the resulting response of the aquatic community). The review team considered these potential sources of impacts in its evaluation of the cumulative aquatic ecology impacts presented in PEF's ER and Requests for Additional Information.

Historically, the construction and operation of CREC Units 1 through 5 have had some impact on fisheries in the Gulf of Mexico, which PEF mitigates by hatchery supplementation. The Crystal River Mariculture Center began operation October 1991, with red drum, spotted seatrout and pink shrimp among the primary species cultured. Other species such as pinfish (*Lagodon rhomboides*), pigfish (*Orthopristis chrysoptera*), stone crab and blue crab are also cultured and released in the Gulf of Mexico (PEF 2009e). The current CFBC was constructed starting in 1964, but it was never completed as a cross-Florida canal and was officially deauthorized in 1991 (Noll and Tegeder 2003). The western portion of the completed CFBC extends from the Gulf of Mexico to the Inglis Lock at Lake Rousseau and is typical of a tidal canal with marine and estuarine characteristics.

Cumulative impacts on aquatic resources within the CFBC may also include activities or events that are distinct from the LNP site. Activities related to construction of the hydropower system on the Inglis Lock bypass channel could affect the downstream migration of fish from Lake Rousseau to the Withlacoochee River, but would not affect the CFBC or OWR. The US-19 bridge expansion would not include in-water construction, and impacts on the CFBC would likely be mitigated through best management practices to control erosion and stormwater runoff. The Inglis Quarry is located on the north side of the CFBC, and drainage ditches are separated from the CFBC by a containment berm (SDI 2008). Barge traffic within the CFBC is likely to be limited to LNP module transportation and should have minimal impacts on aquatic resources as discussed in EIS Section 4.3.2. The proposed Tarmac King Road Limestone Mine expansion may affect groundwater discharge to the lower Withlachoochee River (see EIS Section 7.2.2). As described in EIS Section 4.2.1, the probable impact on overall reduction in groundwater flux through the region is expected to be small. The CREC Unit 3 power uprate is not expected to have any construction-related impacts except for the construction of additional mechanical draft cooling towers on a portion of the CREC site that has been previously disturbed. Any potential onsite construction-related impacts would be mitigated through the use of BMPs. The contribution of LNP construction-related impacts on impacts related to other nearby construction activities would be minor. Impacts from construction of LNP would be temporary, largely mitigated, and mainly confined to the site.

Once the units begin operation, the review team considered the potential cumulative impacts on the Gulf of Mexico and CFBC related to impingement and entrainment of aquatic organisms and also thermal and chemical releases from both CREC and LNP. Water withdrawn for operation of proposed LNP Units 1 and 2 would require a net intake of 190 cfs (122 Mgd). The source of the 190 cfs, under low-flow conditions, would be 50 cfs from leakage of Lake Rousseau water through the Inglis Lock and freshwater springs, emanating in the CFBC in the vicinity of the intake structure; 70 cfs from the discharge of Lake Rousseau water at the Inglis Dam that would enter the CFBC via the OWR; and an inflow of 70 cfs that would come from the Gulf of Mexico.

Currently, CREC Units 1 through 5 withdraw over 15 times more water from the Gulf of Mexico for operations than the required 190 cfs for LNP Units 1 and 2. The proposed CREC Unit 3 uprate would not increase station water intake flow for CREC Units 1, 2, and 3 (PEF 2007). The additional waste heat generated as a result of the CREC Unit 3 power uprate would be dissipated to the atmosphere by the additional mechanical draft cooling tower planned for construction at the CREC site.

The review team considered the potential incremental cumulative impacts of impingement and entrainment of aquatic organisms related to operation of LNP 1 and 2 along with continued operation of CREC Units 1 through 5. As discussed in EIS Section 5.3.2, the proposed closed-cycle cooling system with mechanical draft cooling towers for proposed LNP Units 1 and 2 would not be expected to result in a discernable impact on populations of aquatic organisms inhabiting Crystal Bay and Withlacoochee Bay areas of the Gulf of Mexico as a result of impingement or entrainment.

The review team is aware that the possibility exists that CREC Units 1 and 2 (fossil-fuel plants), which contribute significantly to the overall impingement and entrainment of aquatic organisms at CREC, would be decommissioned once LNP Units 1 and 2 begin operation. This significant reduction in intake withdrawal volume (greater than 48 percent) at CREC would reduce the cumulative impact of impingement and entrainment related to operation of CREC on aquatic organisms in the Gulf of Mexico, and may result in a net positive impact on local fisheries (see Table 3-1).

The operation of the proposed Inglis hydropower project would involve the use of bar racks to prevent debris and organisms larger than 2 in. from traveling through the turbine (Inglis 2008). Any potential impacts from the Inglis hydropower project are isolated from the impacts on the CFBC because the Inglis Lock bypass channel and Withlacoochee River are not hydraulically connected to the CFBC. The construction and operation of the hydroelectric facility would have no effect on populations of aquatic organisms inhabiting the CFBC. Therefore, the Inglis hydroelectric project will have no detectable incremental cumulative impact on aquatic resources affected by the building and operation of LNP.

The review team also considered the potential cumulative impacts of thermal discharges. The operation of all five units at CREC with the uprate of CREC Unit 3 and without the LNP Units 1 and 2 discharge would result in no thermal increase with the operation of a new helper cooling tower to augment the current modular helper cooling towers (PEF 2007). The review team is aware that the possibility exists that CREC Units 1 and 2 (fossil-fuel plants), which contribute to of the discharge flow, would be decommissioned once LNP Units 1 and 2 begin operation. The review team conducted a thermal analysis of two cases involving the discharge from CREC.

The first case evaluated the thermal discharge from all five units at CREC, the power uprate from CREC unit 3 and the blowdown from LNP 1 and 2. A second analysis involved CREC

Units 3 through 5, the Unit 3 power uprate, and blowdown from LNP 1 and 2 and CREC Units 1 and 2 permanently shutdown. The thermal analyses for these two cases are presented in EIS Section 5.2.3.1. The first scenario concludes that resulting changes in discharges at CREC would be minimal for thermal and chemical impacts with a slight increase in discharge plume size. The addition of LNP Units 1 and 2 discharge would result in an increased discharge volume of 87.93 Mgd, but no significant increase in thermal plume temperature or salinity over current conditions, as discussed in EIS Section 5.3.2.1.

The second scenario, with the absence of CREC Units 1 and 2 not operating, CREC Units 3 through 5 operating, CREC Unit 3 with the power uprate, and LNP Units 1 and 2 operating, would result in a discharge plume much decreased in size when compared to the first scenario. CREC Units 1 and 2 currently contribute 918 Mgd total discharge to the Gulf of Mexico during summer operations. This accounts for greater than 45 percent of the total discharge (PEF 2009d). The predicted thermal plume would decrease during both summer and winter conditions as a result from the decreased discharge plume. Salinity increases would occur under both summer and winter conditions due to increased cycles of concentration with CREC Units 1 and 2 non-operational, but are less than 1.0 psu (see EIS Section 7.2.2). The overall impact on aquatic resources is expected to be minimal.

Both scenarios represent a noticeable temperature and salinity change in the immediate Gulf of Mexico waters compared to the same region prior to CREC operations from a cumulative point of view (as discussed in EIS Section 7.2.2.1). However, habitats and aquatic organisms in this area have adapted to the salinity and temperature changes so that the incremental impacts of LNP 1 and 2 discharge, CREC uprate of Unit 3, and decommissioning of CREC Units 1 and 2 would likely not be noticeable.

The review team considered the potential cumulative impacts from chemical releases, including increases in total dissolved solids in the combined CREC and LNP discharge. CREC Units 1 through 5 are in compliance with the Clean Water Act Section 316(a) (thermal discharges) impacts from cooling-water systems. Chemical releases from the existing unit(s) currently comply with the FDEP NPDES permit requirements, and compliance with the Unit 3 uprate, and decommissioning of CREC Units 1 and 2 are expected to continue and would be monitored in the future. The FDEP will take cumulative chemical releases from the existing and proposed unit, as well as from other industrial sites discharging to the Gulf of Mexico, into consideration before approving a NPDES permit for the proposed unit. Given the lack of other discharges into the immediate area of the CREC discharge, it is likely that the cumulative impacts from LNP discharge combined with the discharge from CREC units 1 through 5 with and without operation of CREC Units 1 and 2 would be minimal.

Anthropogenic activities, such as residential or industrial development near the vicinity of the nuclear facility, can present additional constraints on aquatic resources. Future activities may include shoreline development, such as the proposed Port District, for commercial, industrial, and residential waterfront development along the CFBC to the west of US-19 (Citrus County 2009); increased water needs; and increased discharge of effluents into the Gulf of Mexico or the CFBC. In addition to direct anthropogenic activities, physical disturbance and climatic events may impose external stressors on aquatic communities. Aquatic ecosystem responses to these events are difficult to predict. The level of impact resulting from these activities or events would depend on the intensity of the perturbation and the resiliency of the aquatic communities. Aquatic ecosystem responses to these events are difficult to predict. Although trends and conditions, such as urbanization, industrialization, and global climate change, could affect aquatic species habitats, none of the identified present or future projects is expected to adversely affect aquatic species in the region of interest.

Cumulative impacts on aquatic ecology resources are estimated based on the information provided by PEF and the review team's independent review. The review team concludes that cumulative impacts on aquatic biota from the construction, preconstruction, and operation of LNP Units 1 and 2 and other past, present, and reasonably foreseeable projects would be noticeable, but not destabilizing for EFH. The incremental impacts from NRC-authorized activities for proposed Units 1 and 2 would be minor because impacts on aquatic resources, while noticeable in the CFBC and in Crystal Bay, would not noticeably alter the EFH of affected and hydrologically connected waterbodies.

8.0 Conclusion

The potential impacts of the construction and operation of proposed LNP Units 1 and 2 on Federally managed species and their EFH near the site have been evaluated. The known distributions and records of the species, the potential ecological impacts of the construction and operation on them, their habitat, and their prey have been considered in this EFH assessment and are summarized in Table 8-1. Based on the project design, the minimal short-term impacts associated with the dredging and intake installation, and the mitigation measures planned for LNP, the review team concludes that construction and operation of LNP would result in a minimal adverse effect on EFH.

1 **Table 8-1**. Impacts of LNP Construction and Operations on EFH

Common Name	Life Stage	EFH Description[(a)]	Expected Impact
Spanish mackerel	Eggs	M, less than 50 m, planktonic	Minimal Adverse Effect. Increase in discharge plume may affect small portion of Crystal Bay
	Juveniles	M, less than 50 m, pelagic	Minimal Adverse Effect, Increase in discharge plume may affect small portion of Crystal Bay
	Adults	E/M, less than 75 m, pelagic	Minimal Adverse Effect. Construction in CFBC may temporarily disrupt foraging activities.
Hogfish	Juveniles	E/M, between 3 and 30 m, SAV	Minimal Adverse Effect. Construction in CFBC may temporarily disrupt foraging activities. Increase in discharge plume may affect portion of Crystal Bay SAV.
Lesser amberjack	Eggs	M, planktonic	Minimal Adverse Effect. Increase in discharge plume may affect small portion of Crystal Bay
	Larvae	M, pelagic	Minimal Adverse Effect, Increase in discharge plume may affect small portion of Crystal Bay

2

Table 8-1. (contd)

Common Name	Life Stage	EFH Description[(a)]	Expected Impact
Greater amberjack	Eggs	M, 1-183 m, planktonic	Minimal Adverse Effect. Increase in discharge plume may affect small portion of Crystal Bay
	Larvae	M, 1-183 m, pelagic	Minimal Adverse Effect. Increase in discharge plume may affect small portion of Crystal Bay
	Juveniles	M, 1-183 m, drift algae	No Adverse Effect
Dwarf sand perch	Juveniles	M, hard bottom	No Adverse Effect
Gray (mangrove) snapper	Eggs	M, less than 180 m, planktonic	Minimal Adverse Effect. Increase in discharge plume may affect small portion of Crystal Bay
	Larvae	M/E, less than 180 m, planktonic	Minimal Adverse Effect. Operation of intake in CFBC may entrain small percentage of population, increase in discharge plume may affect small portion of Crystal Bay.
	Juveniles	M/E, less than 180 m, SAV	Minimal Adverse Effect. Construction in CFBC may temporarily disrupt foraging activities. Increase in thermal plume may affect small portion of Crystal Bay SAV.
	Adults	E/M, less than 180 m, sand/shell/soft/hard bottom	Minimal Adverse Effect. Construction in CFBC may temporarily disrupt foraging activities.

Table 8-1. (contd)

Common Name	Life Stage	EFH Description[(a)]	Expected Impact
Schoolmaster	Eggs	M, less than 90 m, planktonic	Minimal Adverse Effect, Increase in discharge plume may affect small portion of Crystal Bay
	Larvae	M, less than 90 m, planktonic	Minimal Adverse Effect, Increase in discharge plume may affect small portion of Crystal Bay
	Juveniles	E/M, less than 90 m, hard bottom	Minimal Adverse Effect. Construction in CFBC may temporarily disrupt foraging activities.
Dog snapper	Eggs	M, planktonic	Minimal Adverse Effect, Increase in discharge plume may affect small portion of Crystal Bay
	Larvae	M, planktonic	Minimal Adverse Effect, Increase in discharge plume may affect small portion of Crystal Bay
	Juveniles	E/M, SAV	Minimal Adverse Effect. Construction in CFBC may temporarily disrupt foraging activities. Increase in discharge plume may affect small portion of Crystal Bay SAV.

1 **Table 8-1**. (contd)

Common Name	Life Stage	EFH Description[(a)]	Expected Impact
Lane snapper	Eggs	M, between 4 – 132 m, planktonic	Minimal Adverse Effect. Increase in discharge plume may affect small portion of Crystal Bay..
	Larvae	E/M, between 4 – 132 m, SAV	Minimal Adverse Effect. Operation of intake in CFBC may entrain small percentage of population. Increase in discharge plume may affect small portion of Crystal Bay SAV
	Juveniles	E/M, less than 20 m, SAV, sand/shell/soft bottom	Minimal Adverse Effect. Construction in CFBC may temporarily disrupt foraging activities. Increase in discharge plume may affect small portion of Crystal Bay SAV.
Yellowtail snapper	Eggs	M, between 1 – 183 m, planktonic	Minimal Adverse Effect, Increase in discharge plume may affect small portion of Crystal Bay
	Juveniles	M/E, between 1 – 183 m, SAV, soft bottom	Minimal Adverse Effect. Construction in CFBC may temporarily disrupt foraging activities. Increase in discharge plume may affect small portion of Crystal Bay SAV.
	Adults	M, between 1 – 183 m, hard bottom, shoals/banks	No Adverse Effect

2

Table 8-1. (contd)

Common Name	Life Stage	EFH Description[(a)]	Expected Impact
Red snapper	Adults	M, hard/sand/shell bottom	No Adverse Effect
Red grouper	Juveniles	M/E, less than 50 m, hard bottom, SAV	Minimal Adverse Effect. Construction in CFBC may temporarily disrupt foraging activities. Increase in thermal plume may affect small portion of Crystal Bay SAV.
	Adults	M, between 3 – 183 m, hard bottom	No Adverse Effect
Black grouper	Juveniles	E/M, SAV, hard bottom	Minimal Adverse Effect. Construction in CFBC may temporarily disrupt foraging activities. Increase in thermal plume may affect small portion of Crystal Bay SAV.
	Adults	M/E, hard bottom	Minimal Adverse Effect. Construction in CFBC may temporarily disrupt foraging activities.
Gag grouper	Juveniles	M/E, less than 50 m, SAV, hard bottom	Minimal Adverse Effect. Construction in CFBC may temporarily disrupt foraging activities. Increase in thermal plume may affect small portion of Crystal Bay SAV.

Table 8-1. (contd)

Common Name	Life Stage	EFH Description[a]	Expected Impact
Nassau grouper	Eggs	M, planktonic	Minimal Adverse Effect, Increase in discharge plume may affect small portion of Crystal Bay
	Larvae	M, between 2 – 50 m, planktonic	Minimal Adverse Effect, Increase in discharge plume may affect small portion of Crystal Bay
	Juveniles	M, SAV	Minimal Adverse Effect. Increase in discharge plume may affect small portion of Crystal Bay SAV.
Rock hind	Eggs	M, between 2 – 100 m, planktonic	Minimal Adverse Effect, Increase in discharge plume may affect small portion of Crystal Bay
	Larvae	M, between 2 – 100 m, planktonic	Minimal Adverse Effect, Increase in discharge plume may affect small portion of Crystal Bay

Table 8-1. (contd)

Common Name	Life Stage	EFH Description[a]	Expected Impact
Red drum	Eggs	M, planktonic	Minimal Adverse Effect, Increase in discharge plume may affect small portion of Crystal Bay
	Larvae	E, planktonic, SAV, sand/shell/soft bottom	Minimal Adverse Effect. Operation of intake in CFBC may entrain small percentage of population.
	Juveniles	M/E, less than 5 m, SAV, sand/shell/soft/hard bottom	Minimal Adverse Effect. Construction in CFBC may temporarily disrupt foraging activities. Increase in discharge plume may affect small portion of Crystal Bay SAV.
	Adults	M/E, between 1 – 46 m, SAV, pelagic, sand/shell/soft/hard bottom	Minimal Adverse Effect. Construction in CFBC may temporarily disrupt foraging activities. Increase in discharge plume may affect small portion of Crystal Bay SAV.
White shrimp	Larvae	E/M, less than 64 m, plankton, soft bottom	Minimal Adverse Effect. Operation of intake in CFBC may entrain small percentage of population, Increase in discharge plume may affect small portion of Crystal Bay.
	Juveniles	E, soft bottom	Minimal Adverse Effect. Construction in CFBC may temporarily disrupt foraging activities.

1 **Table 8-1**. (contd)

Common Name	Life Stage	EFH Description[a]	Expected Impact
Pink shrimp	Eggs	M, less than 50 m, sand/shell bottom	Minimal Adverse Effect, Increase in discharge plume may affect small portion of Crystal Bay
	Larvae	M, less than 50 m, planktonic, sand/shell bottom	Minimal Adverse Effect, Increase in discharge plume may affect small portion of Crystal Bay
	Juveniles	E, less than 64 m, sand/shell bottom, SAV	Minimal Adverse Effect. Construction in CFBC may temporarily disrupt foraging activities.
	Adults	M, less than 64 m, sand/shell bottom	No Adverse Effect
Florida stone crab	Eggs	E/M, less than 62 m, sand/shell/hard bottom, SAV	Minimal Adverse Effect. Operation of intake in CFBC may entrain small percentage of population. Increase in discharge plume may affect small portion of Crystal Bay SAV.
	Larvae	E/M, less than 62 m, planktonic	Minimal Adverse Effect. Operation of intake in CFBC may entrain small percentage of population. Increase in discharge plume may affect small portion of Crystal Bay
	Juveniles	E/M, less than 62 m, sand/shell/hard bottom, SAV	Minimal Adverse Effect. Construction in CFBC may temporarily disrupt foraging activities. Increase in discharge plume may affect small portion of Crystal Bay SAV.

(a) M = marine; E = Estuarine; SAV = submerged aquatic vegetation substrate.

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Biological Assessment

National Marine Fisheries Service

Levy Nuclear Plant Units 1 and 2 Combined License Application

U.S. Nuclear Regulatory Commission
Docket Nos. 52-029 and 52-030

Levy County, Florida

August 2010

U.S. Nuclear Regulatory Commission
Rockville, Maryland

U.S. Army Corps of Engineers
Jacksonville District

1.0 Introduction

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application from Progress Energy Florida, Inc. (PEF) for NRC-authorized combined construction permits and operating licenses (COLs) to build and operate two new nuclear power reactors in Levy County, Florida. The U.S. Army Corps of Engineers (USACE) is reviewing an application from PEF for a Department of the Army (DA) permit pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Federal Water Pollution Control Act (Clean Water Act) to perform site-preparation activities and construct supporting facilities. The USACE is cooperating with the NRC to ensure that the information presented in a single environmental impact statement (EIS) prepared under the National Environmental Policy Act of 1969, as amended (NEPA), is adequate to fulfill the requirements of USACE regulations; the Clean Water Act Section 404(b)(1) guidelines, which contain the substantive environmental criteria used by the USACE in evaluating discharges of dredged or fill material into waters of the United States; and the USACE public-interest review process. The NRC and the USACE have prepared this biological assessment (BA) to support their joint consultation with the National Marine Fisheries Service (NMFS) in accordance with Section 7(c) of the Endangered Species Act of 1973, as amended (ESA). Decisions by the NRC to issue the COLs and the USACE to issue a DA permit will be made following issuance of the final EIS.

The proposed Levy Nuclear Plant (LNP) Units 1 and 2 would be located on a greenfield site. The proposed LNP site in Levy County, Florida, is approximately 10 mi northeast of the PEF-owned Crystal River Energy Complex (CREC) and 30 mi due west of Ocala, Florida. Both power generation units would consisste of Westinghouse Electric Company, LLC (Westinghouse) AP1000 pressurized water reactors.

The USACE and the NRC are conducting a joint consultation and have prepared this BA, which examines the potential impacts of building and operating the proposed LNP Units 1 and 2, including proposed transmission lines, on threatened or endangered species pursuant to the ESA. NMFS provided a list of Federally protected species under the jurisdiction of NMFS for the State of Florida (NMFS 2008). This BA examines the effects of the proposed action on seven Federally threatened or endangered species under the jurisdiction of the NMFS (presented in Table 1-1) that could occur in the vicinity of the LNP site, associated offsite facilities, or along proposed transmission-line corridors.

The review team is aware of recent events in the Gulf of Mexico associated with the Deepwater Horizon oil spill. To date, information associated with aquatic and terrestrial resources are preliminary and inconclusive. Although not included in this BA, the review team will consider information associated with the oil spill for the LNP project as it becomes available.

Table 1-1. Federally Listed Aquatic Species Occurring in the Vicinity of the LNP Site and Transmission-Line Corridors

Scientific Name	Common Name	Federal Status[(a)]	Nearest Aquatic Habitat
Mammals			
Balaenoptera musculus	Blue whale	E	Gulf of Mexico
Balaenoptera physalus	Finback whale	E	Gulf of Mexico
Megaptera novaeangliae	Humpback whale	E	Gulf of Mexico
Balaenoptera borealis	Sei whale	E	Gulf of Mexico
Physeter macrocephalus	Sperm whale	E	Gulf of Mexico
Reptiles			
Caretta caretta	Loggerhead sea turtle	T	Gulf of Mexico
Chelonia mydas	Green sea turtle	E	Gulf of Mexico
Eretmochelys imbricata	Hawksbill sea turtle	E	Gulf of Mexico
Dermochelys coriacea	Leatherback sea turtle	E	Gulf of Mexico
Lepidochelys kempii	Kemp's ridley sea turtle	E	Gulf of Mexico
Fishes			
Pristis pectinata	Smalltooth sawfish	E	Gulf of Mexico
Acipenser oxyrinchus desotoi	Gulf sturgeon	T	Gulf of Mexico Suwannee River
Invertebrates			
Acropora palmata	Elkhorn coral	T	Gulf of Mexico
Acropora cervicornis	Staghorn coral	T	Gulf of Mexico

Source: NMFS 2008

(a) Federal status rankings determined by the NMFS under the ESA: E = Federally endangered and T = Federally threatened.

2.0 Proposed Action

The proposed Federal actions are the issuance of COLs for construction and operation of two new nuclear reactors at the proposed LNP site pursuant to Title 10 of the Code of Federal Regulations (CFR) Part 52 and a DA permit pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act.

The NRC, in a Final Rule dated October 9, 2007 (72 FR 57416), limited the definition of "construction" to those activities that fall within its regulatory authority in 10 CFR 51.4. Many of the activities required to build a nuclear power plant are not part of the NRC action to license the plant. Activities associated with building the plant that are not within the purview of the NRC action are grouped under the term “preconstruction.” Preconstruction activities include clearing and grading, excavating, erecting of support buildings and transmission lines, and other associated activities. These preconstruction activities may take place before the application for an NRC COL is submitted, during the staff’s review of a COL application, or after a COL is granted. Although preconstruction activities are outside of the NRC’s regulatory authority, many of them are within the regulatory authority of local, State, or other Federal agencies including the USACE. The distinction between construction and preconstruction is not carried forward in this BA, and both are being discussed together as construction for the purposes of the NRC/USACE joint ESA consultation.

Prerequisites to construction activities include, but are not limited to, documentation of existing site conditions within the LNP site and acquisition of the necessary permits (e.g., local building permits, a National Pollutant Discharge Elimination System (NPDES) permit [40 CFR Part 122], a DA permit, and a General Stormwater permit). After these prerequisites are completed, planned construction activities could commence and would include all or some of the activities identified in 10 CFR 50.10(a). Following construction, the planned operation of the new reactors would be authorized if the Commission finds, under 10 CFR 52.103(g), that all of the acceptance criteria in the COLs are met.

The following construction and operation activities could potentially affect the species (Table 1-1) and/or habitats based on habitat affinities and life-history considerations and the nature, spatial, and temporal considerations of the activity:

- Construction
  - new dredging and construction of a barge slip and boat ramp on the shoreline of the Cross Florida Barge Canal (CFBC)
  - installation of the cooling-water intake structure (CWIS) on the CFBC shoreline
  - installation of the cooling-water discharge system to CREC, including dredging and placement of discharge piping in the CFBC
  - connection of discharge piping with the existing CREC discharge canal
  - vessel movements associated with in-water work; vessel transportation of large components via barge for the LNP site
  - new transmission-line corridors and towers
- Operation
  - impingement, entrainment, and maintenance activities associated with the CWIS

- salinity changes in the CFBC and the lower portion of the Old Withlacoochee River (OWR)(a remnant arm of the Withlacoochee River)
- discharge plume from the cooling-water system (thermal, chemical, and physical effects)
- maintenance of transmission-line corridors.

3.0 LNP Site Description

The proposed facilities and existing aquatic ecology resources onsite and along existing and proposed transmission-line corridors are described in the following sections.

3.1 Proposed Facilities

The proposed LNP site is located on a primarily rural area in Levy County approximately 4 mi from the town of Inglis and 8 mi east of the Gulf of Mexico (Figure 3-1). The LNP site is currently a greenfield site approximately 3105 ac in size.

The LNP footprint would occupy 300 ac for two reactors and the associated power-production infrastructure near the center of the site (Figure 3-2). Two AP1000 reactors are proposed with an electrical output of 1000 MW(e) and 3415 MW(t) each. A closed-cycle cooling system would draw makeup water from the CFBC through a CWIS located on the north side of the canal. A portion of the makeup water would be returned to the environment via the discharge to the existing CREC discharge canal (Figure 3-3). The remaining portion of the water would be released into the atmosphere for evaporative cooling through mechanical draft cooling towers.

Four 500-kV transmission lines are proposed to run adjacent to or within the CREC's existing maintained transmission-line corridors that run to the proposed Citrus substation, Central Florida South substation, and the CREC 500-kV switchyard (PEF 2009a). New corridor segments would be necessary to connect the Levy County site to the existing corridors. Connection to the Citrus substation corridor would require clearing a corridor extending south from the southern boundary of the proposed LNP site. Existing and new corridors would extend to the proposed Central Florida South substation, and connection of the CREC switchyard to the new Citrus substation would use existing corridors. Two additional 69-kV lines would be required to support construction at the LNP site and would connect to existing 69-kV lines from the western and the southern boundaries of the LNP site (PEF 2008a).

Additional transmission lines extending beyond these first substations to the electrical grid would also be required. Two 230-kV lines would extend from the Citrus substation to the existing Crystal River East substation; a 230-kV line would extend from the CREC switchyard to the Brookridge substation; another 230-kV line would extend from the Brookridge substation to

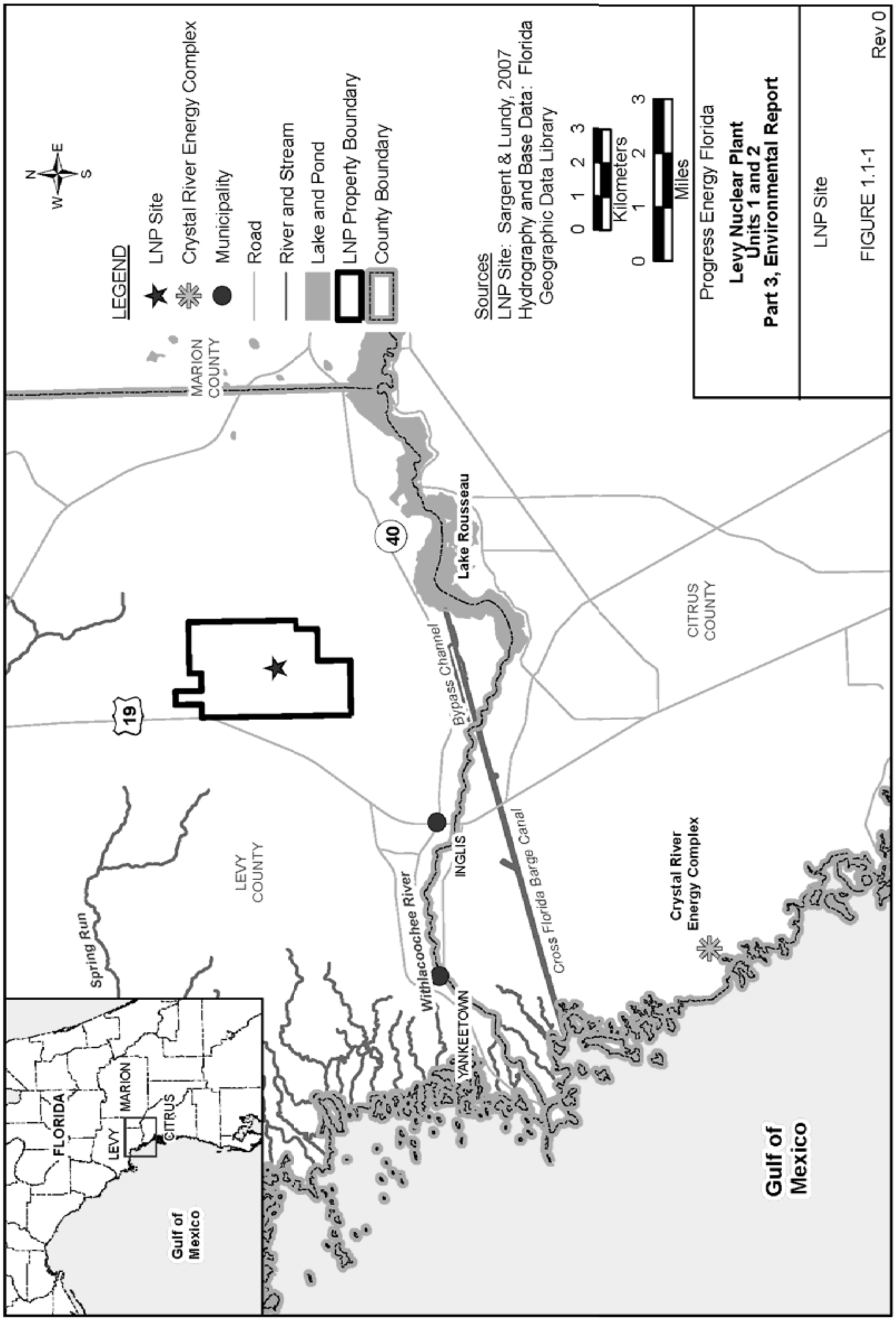

Figure 3-1. Map Showing the LNP Site in Relation to the Gulf of Mexico and Other Waterbodies (PEF 2009a)

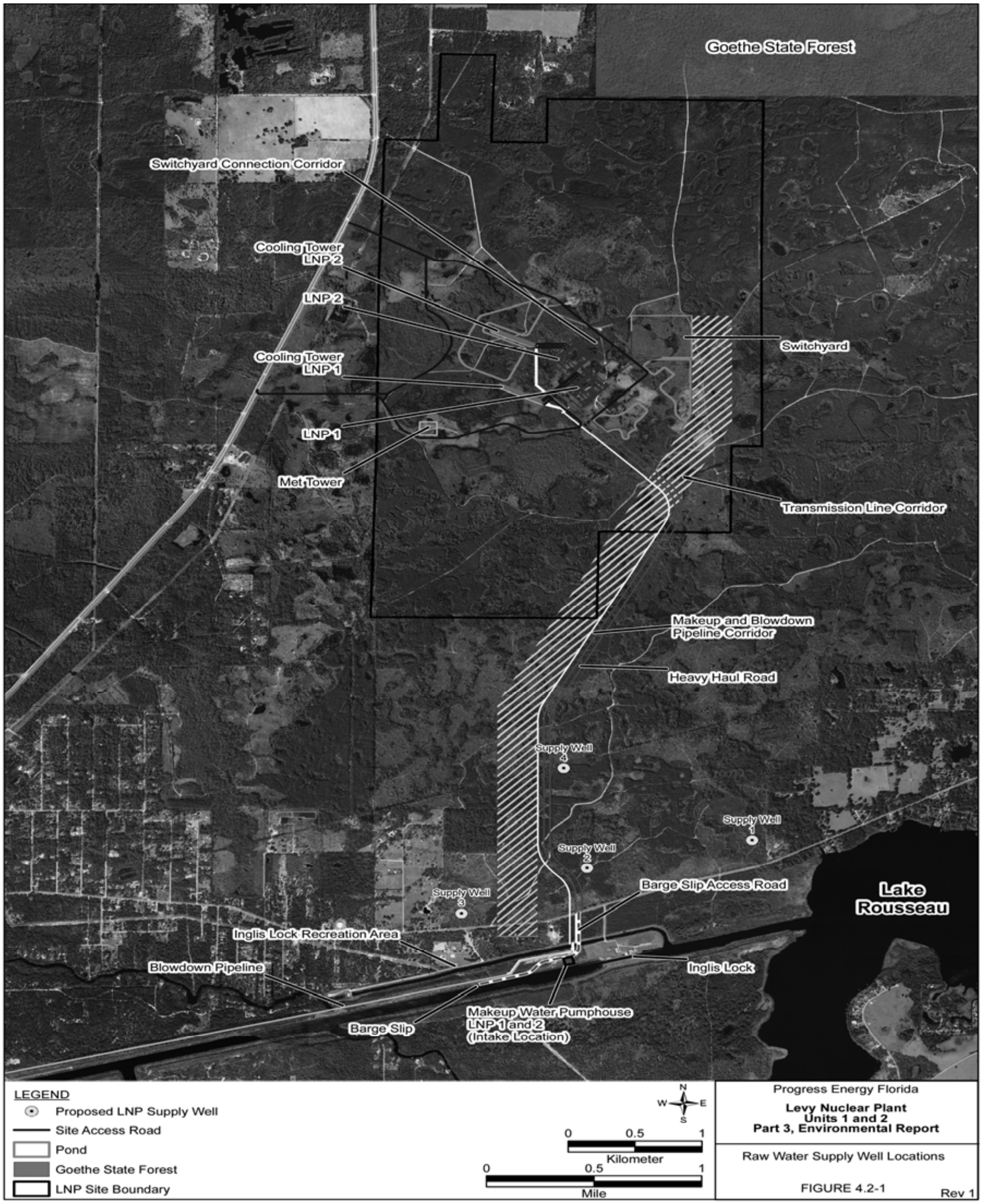

Figure 3-2. Map Showing the Proposed LNP Site Facilities and Infrastructure (PEF 2009a)

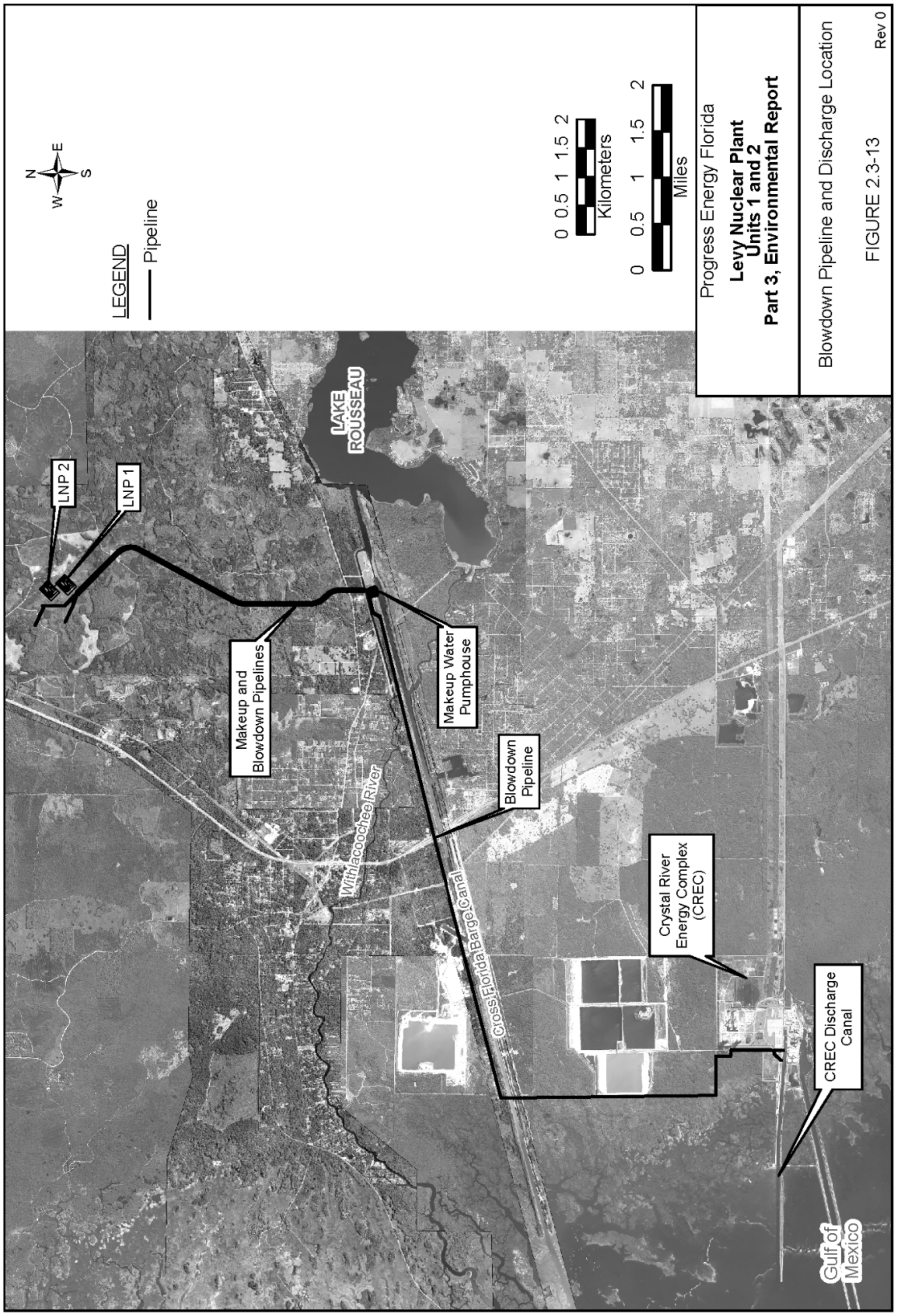

Figure 3-3. Map Showing the Proposed Blowdown Pipeline and Discharge Location (PEF 2009a)

the Brooksville West substation; and the last 230-kV line would extend from the existing Kathleen substation to Griffin substation, then to the Lake Tarpon substation.

3.2 General Aquatic Ecological Resources Onsite

As described in the following sections, site-related aquatic resources are found in the CFBC, OWR, and Crystal Bay.

3.2.1 Cross Florida Barge Canal

In an effort to provide maritime navigation between the Atlantic Ocean and the Gulf of Mexico, construction of a 12-ft-deep by 150-ft-wide Florida cross-peninsular waterway began in the mid-1930s (Noll and Tegeder 2003). Originally intended to be a 171-nautical-mi canal, only 4 percent was complete by 1965 due to lack of funding and congressional support for several decades. Official deauthorization for the barge canal came in 1991, and the Cross Florida Greenway State Recreation and Conservation Area took over the former barge canal properties. The section of western CFBC affiliated with the proposed action is the 7.4-mi stretch from Inglis Lock west to the Gulf of Mexico. It ranges from 8.6 to 18.2-ft deep and from 207 to 262-ft wide. The Inglis Dam was built in 1909 to impound the Withlacoochee River to form 3700-ac Lake Rousseau. An approximately 1.5-mi portion of the historical downstream segment of the Withlacoochee River still runs into the western CFBC below the Inglis Lock (Figure 3-4). A 1.7-mi channel was constructed upstream of the Inglis Lock to reconnect Lake Rousseau waters with the downstream,11-mi portion of the Withlacoochee River, which serves as a bypass around the CFBC. The western portion of the CFBC lies 8 mi to the south of the proposed LNP and is the preferred water source for providing cooling water (see Figure 3-4).

The CFBC discharges into the Withlacoochee Bay estuary in the Gulf of Mexico and is influenced by tidal changes. Water-quality characteristics show a wedge of saltwater extending from the surface waters where the CFBC meets the Gulf of Mexico up toward the Inglis Lock. Characterization of the sediment, salinity, and CFBC biota was conducted over a year of sampling activities from October 2007 through September 2008, and is described further in EIS Section 2.4.2. Overall, fish, plankton, benthic, and macroinvertebrate sampling in the CFBC indicates a biologically diverse and dynamic aquatic community at the offshore and nearshore stations (see EIS Tables 2-9, 2-10, and 2-11). The proposed intake location on the CFBC has a less biodiverse community, but it still has appreciable numbers of sediment-dwelling invertebrates and collections of pelagic species that use the fresher water habitat on a seasonal basis (CH2M Hill 2009b).

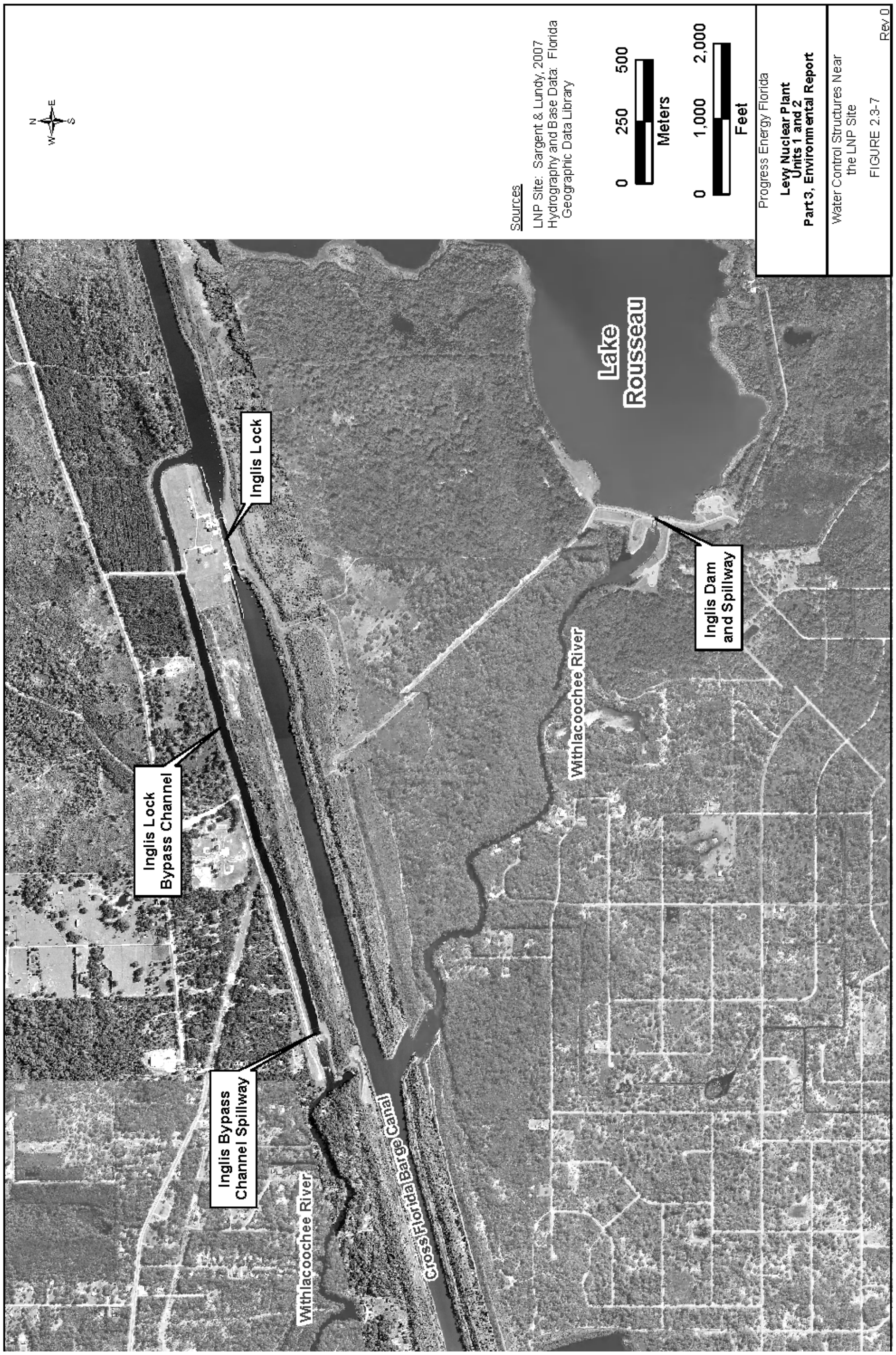

Figure 3-4. The Water-Control Structure near the Proposed LNP Site (PEF 2009a)

3.2.2 Old Withlacoochee River

The portion of the OWR that flows into the CFBC is 1.3 mi long and originates from Lake Rousseau's Inglis Dam. Salinity profiles in the OWR range from 0.14 to 4.38 practical salinity units (psu) at the 3.2-ft depth where it joins with the CFBC (CH2M Hill 2009a). In June and August 2008, sampling was conducted at the junction of the OWR with the CFBC, halfway between the junction and the Inglis Dam and just downstream of the Inglis Dam within this portion of the OWR (Figure 3-4). Benthic macroinvertebrate sampling mirrored the fish sampling results with euryhaline dipteran species predominant at the CFBC-OWR junction station, freshwater oligochaetes and amphipods at the Inglis Dam station, and a paucity of organisms and limited diversity at the midpoint station (CH2M Hill 2009a).

3.2.3 Crystal Bay (Gulf of Mexico)

Aquatic species and habitats associated with the discharge from CREC into Crystal Bay have been characterized using studies conducted during CREC operations (Stone and Webster 1985) and were recently sampled from April through November 2008. Beginning in the early 1990s, seagrass beds have been surveyed as a part of quantifying recovery of the CREC offshore Gulf of Mexico habitats following installation of helper cooling towers (Estevez and Marshall 1993, 1994, 1995). Previously affected seagrass areas were observed to recover with colonization by *Halodule wrightii*, a dominant, quick-growing seagrass. However, between 1995 and 2001, overall seagrass abundance declined, likely from more complex environmental influences (Marshall 2002).

Sampling at the CREC discharge point (Station 3) and immediate offshore Gulf of Mexico area (Station 4) was conducted at multiple time points from April to November 2008 (Figure 3-5). Fish, plankton, and macroinvertebrate sampling in the CREC discharge area of Crystal Bay are indicative of coastal salt marsh and nearshore species and show biodiversity commensurate with similar habitat sampling at nearshore and offshore CFBC sampling locations (EIS Tables 2-9, 2-10, 2-11). However, the influence of CREC discharge may be affecting several of the top forage fish species which are notably absent (bay anchovy, scaled sardine, and silver perch) from the CREC discharge stations.

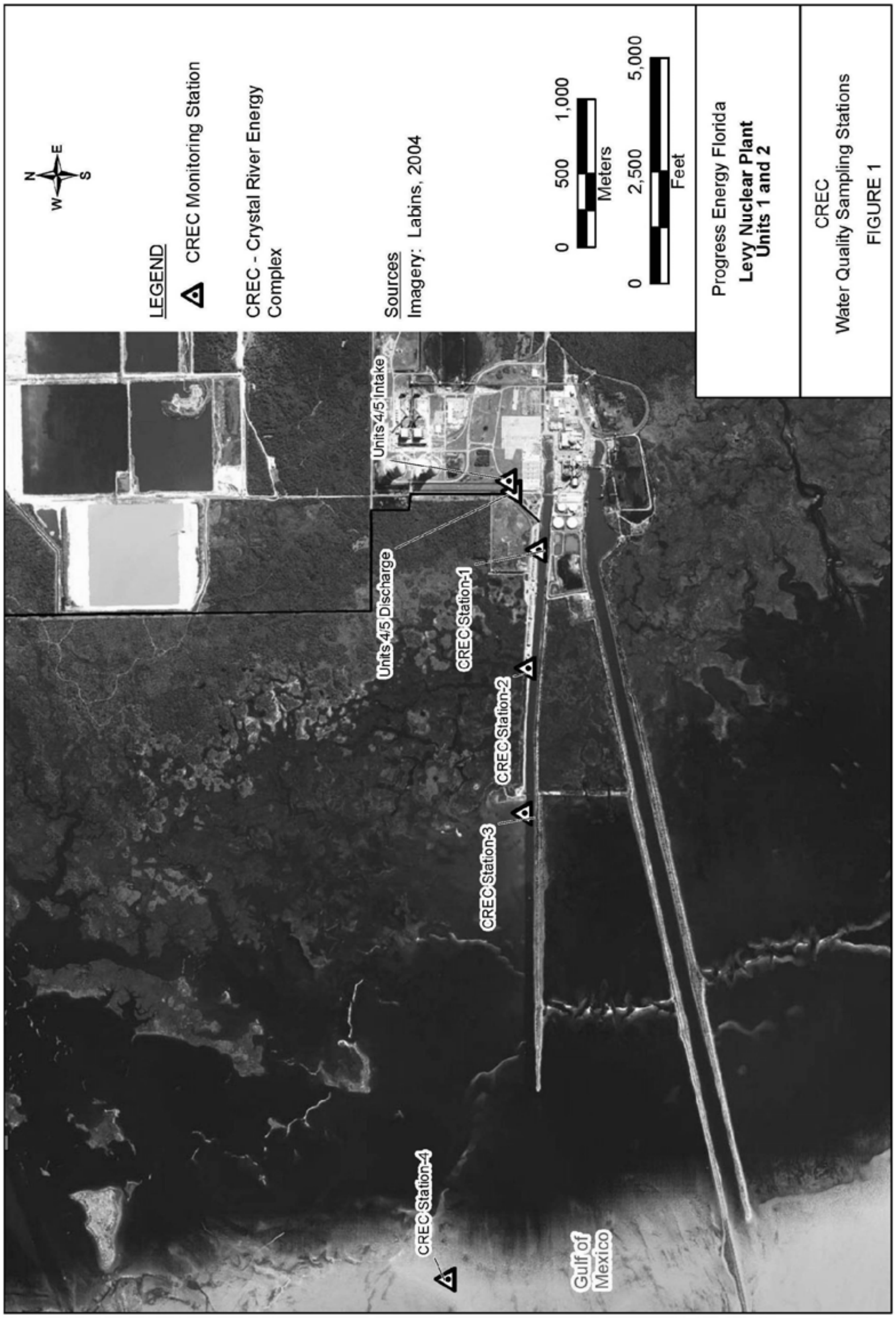

Figure 3-5. Aquatic Sampling Locations for CREC Within the Discharge Canal and Offshore (CH2M Hill 2009b)

3.3 General Aquatic Ecological Resources Along Transmission-Line Corridors

Connection from the proposed LNP to the Citrus substation corridor would cross the Withlacoochee River bypass channel, CFBC, and the OWR. Existing and new corridor extending to the proposed Central Florida South substation would cross the Withlacoochee River at the border of Citrus and Marion Counties and Two Mile Prairie Lake (PEF 2009a). Connection of the CREC switchyard to the new Citrus substation would cross existing corridors over estuarine habitat within Crystal Bay. No known aquatic impacts are currently associated with the existing transmission-line corridors. The existing and proposed transmission-line corridors do not cross any designated critical habitats.

Existing corridors are proposed for the transmission lines extending 50 mi from the Kathleen substation to the Griffin substation and extending west to the Lake Tarpon substation. This corridor crosses the following Outstanding Florida Waters: Blackwater Creek, Trout Creek, Hillsborough River, and Cypress Creek (PEF 2008a). Other waterbodies include Flint Creek, tributaries of Hollomans Branch, Brushy Creek, Rocky Creek, and numerous unnamed intermittent and perennial tributaries of the previously named waterbodies. The review team is unaware of any aquatic impacts currently associated with the existing transmission corridors.

4.0 Environmental Impacts of the Proposed Action

Sections 4.1 and 4.2 provide descriptions of the construction and operation impacts listed in Section 2.0. These construction and operation impacts were determined to potentially affect the species and habitats listed in Table 1-1 based on species habitat affinities and life-history considerations and the type, spatial, and temporal nature of the impacts.

4.1 Construction

This section provides information about the potential aquatic impacts of construction of the proposed new nuclear units at the proposed LNP site and along associated transmission-line corridors.

4.1.1 LNP Site

There are some permanent and temporal shallow ponds on the proposed LNP site that may support small freshwater fish. A few of these would be permanently filled as part of facilities construction, but other onsite ponds would be unaffected. Erosion and runoff control mitigation practices would be used to prevent siltation of preserved ponds onsite (FDEP 2008).

Stormwater management retention and infiltration basins and cessation of forest plantation activities on the site would create improved freshwater aquatic habitat (PEF 2009a).

4.1.2 Cross Florida Barge Canal

The installation of the intake structure, connection of a barge slip and boat ramp to the CFBC, and placement of discharge piping would result in temporary disturbances to the aquatic habitat in portions of the CFBC. Until excavation is complete, preparation of the barge slip would occur on the northern shore of the CFBC in upland areas behind an earth bank that separates building activities from the CFBC. The intake structure would be installed 0.5 mi downstream of the Inglis Lock. Steel sheet piling would be installed at the barge slip and in a cofferdam for intake structure installation. Sheet piles would be installed from land using a pile hammer. Turbidity barriers and erosion-control measures would be installed in the canal during activities associated with sheet-pile installation to control impacts on water quality. Building activities are expected to commence with installation of permanent piling over a 60-week time frame for the barge slip and over a 13-week period for temporary piling at the intake structure. Removal of temporary piling at the intake structure is expected to occur following 6 months of installation activities proposed for an October–March time frame. Turbidity barriers and erosion-control measures are expected to be installed commensurate with piling installation activities and remain in place prior to operations (PEF 2008a). Use of best management practices and water-quality control measures should prevent impacts on the few species that inhabit the portion of the CFBC near the proposed intake. Fish and sea turtles may swim into this portion of the CFBC, but they would be able to swim away or likely would avoid the area due to vibratory noise.

Dredging would be necessary for construction of a trench for the blowdown discharge piping between LNP and CREC. Sediments would be tested before construction using U.S. Environmental Protection Agency (EPA) Method 1311 for toxicity characteristics for determination of final disposition of dredged spoil materials. Non-hazardous sediments would be used to backfill the pipeline trench, as fill material onsite, or disposed in upland areas. Sediments deemed unsuitable for use would be disposed of appropriately in landfills approved for hazardous disposal (PEF 2009d). Residual water from dredging activities would be tested for compliance with NPDES and Florida surface water-quality standards (FDEP 2008). Discharge piping running from the proposed LNP site to the CREC discharge would run parallel along the CFBC berm, then enter and exit CFBC water supported by anchor piers along both CFBC berms (PEF 2009b). Initially proposed routing of the discharge pipeline south of the CFBC crosses several tidal creeks and would adversely impact approximately 4.5 acres of salt marsh habitat. The review team is aware that PEF has proposed to the FDEP an alternate route to avoid this important habitat. FDEP has not made a decision on the proposal. Impacts to habitat related to the discharge pipeline, irrespective of the final routing, would be primarily due to its excavation, placement, and burial associated with construction. Maintenance dredging for the barge unloading facility and CWIS within the CFBC is not proposed because the depth of the CFBC has not changed since construction in the 1960s and increased sediment load is not predicted under operation conditions (CH2M Hill 2009b).

Vessel use during the dredging or the installation of the in-water structures, and transportation of large components for proposed LNP Units 1 and 2 may affect the aquatic resources of the CFBC, particularly the benthos. The main impacts of using vessels would include turbulence from propellers (prop wash), anchor cable scraping across the canal bottom, and accidental spills of materials overboard. Vessels would be used during the installation of the cooling-water discharge pipeline and during offloading of materials from barges. Vessel operation during construction may cause short-term, localized impacts on aquatic species in the CFBC, but impacts on water quality and habitat in the OWR are not anticipated. These impacts should not affect the general resources in the area of the site or the region along this coast of the Gulf of Mexico.

4.1.3 CREC Discharge Canal

The LNP discharge pipeline (two 54-in. high-density polyethylene pipes, per the conceptual design) would discharge directly into the CREC discharge canal, a concrete-lined, open channel just downstream of the discharge culverts for CREC Units 4 and 5. This 0.7-mi open channel drains directly into the CREC discharge canal approximately 1.1 mi from the Gulf of Mexico. A headwall structure would be necessary to join the LNP discharge piping to the CREC discharge canal (PEF 2009b). No building activities would be conducted beyond the point of discharge into the Gulf of Mexico, so no aquatic impacts would be expected to occur with this activity.

4.1.4 Transmission-Line Corridors

PEF would site the new 500-, 230-, and 65-kV transmission lines in accordance with Chapter 62-17, Florida Administrative Code. In addition, PEF has committed to comply (PEF 2009a) with all applicable laws, regulations, and permit requirements and would use good engineering and construction practices as required by the Florida Department of Environmental Protection (FDEP). PEF states that all work would be conducted in accordance with Federal and State permitting requirements for maintaining water quality and protecting natural resources, such as maintenance of a 15 ft or greater buffer of natural vegetation for installation near waterbodies (Citrus County 2006). PEF plans to leave a 25-ft buffer of existing vegetation with mature heights not exceeding 12 ft at locations where the transmission-line corridor crosses a navigable waterway (PEF 2008a).

Permits required include a DA permit, a FDEP Environmental Resources permit, a FDEP and Southwest Water Management District dewatering permit, and a FDEP NPDES construction stormwater permit (PEF 2009a). County listings for threatened and endangered species have been identified for each delineated corridor. Although several threatened or endangered species are listed for Levy and Citrus Counties (as outlined in EIS Section 2.4.2), the activities associated with placement of new transmission lines would not require in-water installation activities. Therefore, the review team finds the impacts on aquatic species under jurisdiction of the NMFS due to transmission-line construction and operation, including upgrades to the system beyond the first substation, to be minimal.

4.2 Operation

This section provides information about the potential aquatic impacts of operation of proposed LNP Units 1 and 2 at the site and along associated transmission-line corridors.

4.2.1 Cooling-Water Intake Impacts

PEF stated in its Environmental Report (ER) that a closed-cycle, mechanical draft system would be used for proposed LNP Units 1 and 2. Depending on the quality of the makeup water, closed-cycle recirculating cooling-water systems can reduce water use by 96 to 98 percent versus the amount a facility would use with a once-through cooling system (66 FR 65256) as is used at CREC. This significant reduction in water withdrawal rate results in a corresponding reduction in impingement and entrainment losses. For threatened and endangered aquatic species under the jurisdiction of the NMFS, the primary concerns are related to operation of the intake structure. Water drawn from the cooling-water source (CFBC) has the potential for organisms to be impinged on the intake screens or entrained into the cooling-water system. Impingement occurs when organisms are trapped against the intake screens by the force of the water passing through the CWIS (66 FR 65256). Impingement can result in starvation, exhaustion, asphyxiation (water velocity forces may prevent proper gill movement or organisms may be removed from the water for prolonged periods of time), and descaling (66 FR 65256). Entrainment occurs when organisms are drawn through the CWIS into the proposed LNP Units 1 and 2 cooling system. Organisms that become entrained are normally relatively small benthic, planktonic, and nektonic (organisms in the water column) forms, including early life stages of fish and shellfish that often serve as prey for larger organisms (66 FR 65256). As entrained organisms pass through a plant's cooling system, they are subject to mechanical, thermal, and toxic stresses. No life stages of the aquatic species listed in Table 1-1 are subject to entrainment losses because of their large size and/or habitat requirements.

For the proposed LNP Units 1 and 2 CWIS, PEF assessed 316(b) impacts for withdrawal of cooling water from the CFBC. The through-screen velocity for the intake bays would be less than 0.5 fps. To achieve these low velocities, the inlet area would be larger than 106.1 ft^2 (PEF 2008a). The zone of hydraulic influence would extend from the CWIS to 5 mi west of the CWIS in the CFBC (PEF 2008a) and use an offshore station in the Gulf of Mexico to estimate impingement and entrainment impacts. Sampling in the area of the proposed CWIS indicated a biologically depauperate environment with relatively poor water quality (PEF 2009a). The species listed in Table 1-1 do not use CFBC habitat for nesting, spawning, or calving. Therefore, based on the percentage of water withdrawn, the planned low through-screen intake velocity, the closed-cycle cooling system design, and the distance away from preferred nesting, spawning, and calving habitat in the Gulf of Mexico, the review team finds that the impacts on the Federally protected species of the Gulf of Mexico from impingement and entrainment would be negligible.

Maintenance of CWIS structures includes the use of screen washes and mechanical scraping to prevent clogging or collection of debris and organisms on intake screens and bar racks. Bar racks would be removed and scraped once per quarter as currently performed at CREC (PEF 2009b). Trash and organisms caught on traveling intake screens would be removed by a high-pressure spray wash and deposited into a collection dumpster. Collected debris and organisms would be disposed of in a licensed landfill.

4.2.2 Discharge Impacts

The effluent discharge from the proposed LNP Units 1 and 2 would be directly into the CREC discharge canal. Section 4.3.2 of the EIS discusses the location and design of the discharge piping. The potential impacts on the Gulf of Mexico from the operation of proposed LNP Units 1 and 2 would include the effects of heated effluents on aquatic resources, chemical impacts, and physical impacts from discharge. The FDEP Conditions of Certification state that PEF would retire its two oldest, once-through coal-fired units at the CREC by December 31, 2020, if LNP Units 1 and 2 are licensed, built, and begin commercial operation without significant delays (FDEP 2010). CREC Units 1 and 2 cessation of operations would significantly reduce the discharge flow from the CREC discharge canal even with the additional discharge flow from LNP Units 1 and 2 (Table 4-1).

4.2.3 Cold Shock

Another factor related to thermal discharges that may affect aquatic biota is cold shock. Cold shock occurs when aquatic organisms that have been acclimated to warm water, such as fish in a power plant’s discharge canal, are exposed to a sudden temperature decrease. This sometimes occurs when single-unit power plants shut down suddenly in winter. Cold shock mortalities at U.S. nuclear power plants are “relatively rare” and typically involve small numbers of fish (NRC 1996). Because the temperature decrease from shutting down one unit is moderated by the heated discharge from the units that continue to operate, cold shock is less likely to occur at a multiple-unit plant. The proposed LNP Units 1 and 2 discharge would be 4.4 percent of the total discharge from combining LNP and CREC discharges. Therefore, the review team finds that the possibility of cold shock due to simultaneous shutdown of LNP Units 1 and 2 would be minimal.

Table 4-1. Comparison of NPDES Discharge Volumes Under Different Operation Scenarios During Summer Conditions.

Operating Unit	CREC Current Combined Discharge (Mgd)	Percent of Total Discharge	Addition of LNP Units 1 & 2 to Current CREC (Mgd)	Percent of Total Discharge	Addition of LNP Units 1 & 2 to Current CREC (Mgd) with Decomissioning of CREC Units 1 & 2	Percent of Total Discharge
CREC 1	446	23.4	446	22.3	-	-
CREC 2	472	24.7	472	23.7	-	-
CREC 3	979	51.4	979	49.1	979	90.9
CREC 4 & 5	10.1	0.5	10.1	0.5	10.1	0.9
LNP 1 & 2	-	-	87.8	4.4	87.8	8.2

Source: PEF 2009c
Note: CREC discharge rates are given as current maximum NPDES-permitted volumes.

4.2.4 Heat Stress

The thermal tolerance for aquatic organisms is defined in different ways. Some definitions relate to the temperature that causes fish to avoid the thermal plume, other definitions relate to the temperature that fish prefer for spawning, and still others relate to the temperatures (upper and lower) that may kill individual fishes. Some of these tolerances are termed “preferred temperatures,” “upper avoidance temperatures,” and “lethal temperatures.”

In EIS Section 5.2.3.1, the review team describes its independent assessment of the incremental impacts of proposed LNP Units 1 and 2 on the water temperatures within the CREC discharge and the Gulf of Mexico using a three-dimensional coastal ocean model. During summer conditions at ebb tide, the surface-water temperatures near the CREC discharge channel would be slightly less under the proposed conditions when compared to current conditions that include operation of CREC Units 1 through 5. The discharge volume of the plume would be increased with the addition of LNP Units 1 and 2, but only a slight increase in surface-water temperature (<0.1°C) would result compared to current conditions. Temperature increase at the entrance of CFBC channel would be between 0.05°C and ~0.1°C during the summer months at ebb tide (Figure 4-1). Similar trends in thermal plume temperatures would be observed during winter conditions with the addition of LNP discharge resulting in a slight temperature drop at the CREC discharge canal, and a slight increase in surface-water temperature beyond the immediate discharge area. Surface-water temperatures at the mouth of the CFBC are expected to increase by less than 0.5°C over the current conditions (Figure 4-2). The increased plume size is likely to have minimal impact on aquatic biota that forage near the CFBC under both extreme conditions. Habitat usage is therefore not expected to be affected under operating conditions.

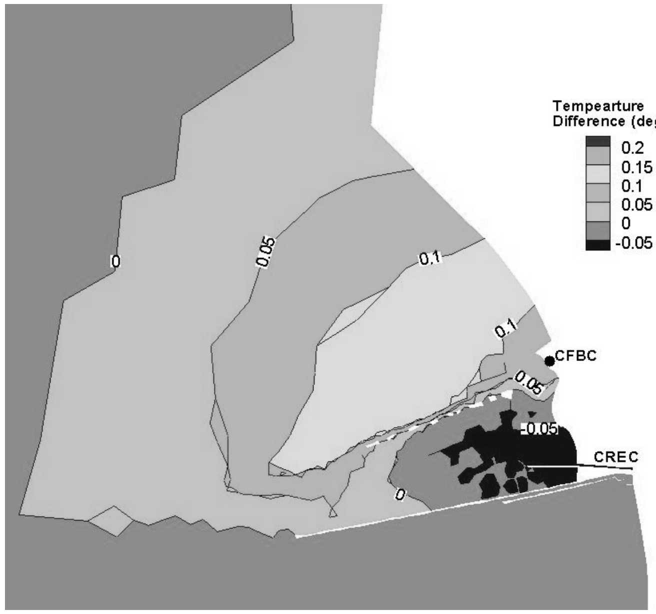

Figure 4-1. Thermal Plume Analysis Using FVCOM (Finite Volume Community Ocean Model) Showing the Temperature Difference Between Current and Proposed Thermal Discharge Under Summer Conditions at Ebb Tide

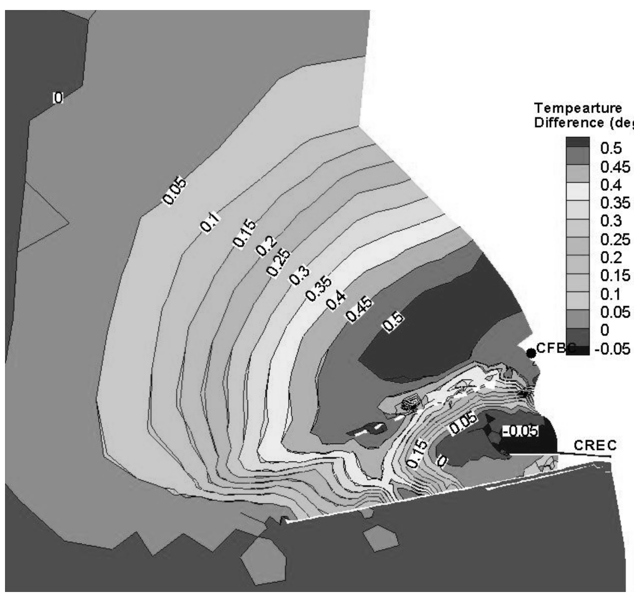

Figure 4-2. Thermal Plume Analysis Using FVCOM Showing the Temperature Difference Between Current and Proposed Thermal Discharge Under Winter Conditions at Ebb Tide

Other discharge-related impacts include the chemical treatment of the cooling water. The ER indicates that chemicals would be added to the circulating, service, and blowdown water systems (PEF 2009a). Intake structures, such as the pump suction housings and sensor tubes, would be coated with a copper-based anti-fouling substance to minimize fouling of these structures. In addition, ClamTrol (CT1300) would be injected every 21 days at a concentration not to exceed 4.5 mL/L into the CWIS to prevent biofouling of marine invertebrates (PEF 2009b). The use of chemicals in the existing CREC discharge is regulated by an NPDES permit, which is granted by the FDEP. The chemical concentrations at the outfall for the existing units meet the NPDES limits (FDEP 2008). Thus, the impacts from the addition of LNP discharge to the Gulf of Mexico would be minimal.

In addition, the NRC staff evaluated the potential for impact due to the increased salinity associated with the LNP Units 1 and 2 blowdown, which would have a total dissolved solids concentration of 1.5 times greater than seawater (PEF 2009b). This increase in total dissolved solids is due to evaporative loss of water through the cooling towers. Because the LNP discharge would be combined with CREC discharge prior to point of discharge into Crystal Bay and the CREC discharge accounts for the vast majority of the discharge volume (>95 percent), the increase in salinity would be slight (0 ppt and ~0.5 ppt) in the coastal region near the CREC discharge channel. The addition of LNP discharge with CREC discharge to the Gulf of Mexico would increase the salinity to between 0.4 ppt and ~0.45 ppt at the mouth of the CFBC (Figure 4-3).

4.2.5 Physical Impacts

The discharge volume of the LNP Units 1 and 2 blowdown water system would be 81.34 Mgd. It would be combined with the CREC Units 1 through 5 discharge of 1651.8 Mgd in the CREC discharge canal, which opens into the Gulf of Mexico. The LNP discharge would account for only 4.4 percent of the total discharge flow and would have little physical scouring impact at the terminus of the discharge canal (PEF 2009a).

4.2.6 Transmission Corridors

Maintenance activities along the four 500-kV, five 230-kV, and two 69-kV transmission lines could lead to periodic temporary impacts on the waterways being crossed. However, it is assumed that the same vegetation-management practices currently used by PEF for the existing CREC facility transmission-line rights-of-way would be applied to the existing and proposed new transmission-line right-of-ways. PEF practices and procedures were developed to prevent impacts on surface waters and wetlands, so impacts on aquatic ecosystems from operation and maintenance of transmission lines would be minimal (PEF 2009a). No impacts on aquatic species are anticipated from maintenance of the transmission lines.

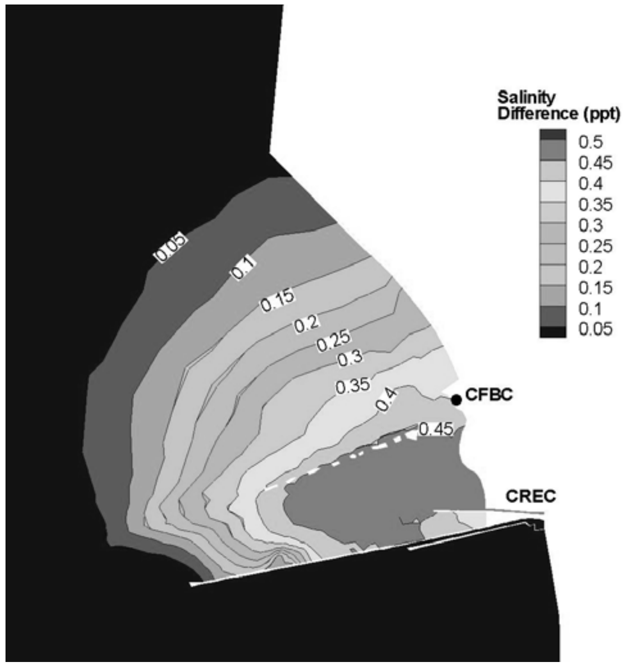

Figure 4-3. Salinity Difference Between the Current and Proposed Discharge Plume at Ebb Tide

5.0 Baseline Conditions for Aquatic Species

This section describes the baseline conditions for aquatic species listed in Table 1-1, which may occur on and in the vicinity of the proposed LNP site and associated transmission-line corridors.

5.1 Whales

The distribution of endangered whales listed in Table 1-1 is worldwide. While there is no habitat used by these whales immediately offshore of the CFBC or the CREC discharge, the deepwater, eastern Gulf of Mexico may serve as a migratory corridor for finback whales (*Balaenoptera physalus*) that migrate toward the lower latitudes from subpolar waters during the winter to calve and then migrate back up the coast to higher latitudes during the summer (NMFS 2009a). Blue (*Balaenoptera musculus*) and humpback (*Megaptera novaeangliae*) whales are rare in the Gulf of Mexico (NMFS 2009b, c). The exact movement patterns of sei (*Balaenoptera borealis*) and blue whales are largely unknown (NMFS 1998, 2009b). Sperm whales (*Physeter macrocephalus*) are rare in waters less than 984 ft deep. Like most north Atlantic cetaceans, sperm whales migrate down the western Atlantic coast in the winter to waters east and northeast of Cape Hatteras, North Carolina. The migration back to the north starts in the spring with a migration range extending from waters off the coast of Virginia up to the Northeast Channel area. Sightings of sperm whales in the Gulf of Mexico are rare (NMFS 2009d). The migration patterns and population structure of humpback whales in the North Atlantic are well known. Humpbacks migrate to Caribbean waters in the winter to calve and migrate up to waters off New England, Canada, and Greenland in the summer to feed (NMFS 2009c). Due to lack of habitat use for inland waters off Florida's Gulf Coast, the review team concludes that construction and operation of LNP Units 1 and 2 would have no effect on any of the whale species, so they are not considered further.

5.2 Sea Turtles

There are two families and six genera of living sea turtles containing eight species (Pritchard 1996). All but one of the species are in the family Cheloniidae – the leatherback turtle (*Dermochelys coriacea*) is the only living member of the family Dermochelyidae. Five of the eight living species of sea turtles occur in the Gulf of Mexico. These species are the loggerhead sea turtle (*Caretta caretta*), the green sea turtle (*Chelonia mydas*), the leatherback sea turtle, the hawksbill sea turtle (*Eretmochelys imbricata*), and Kemp's ridley sea turtle (*Lepidochelys kempii*). The U.S. Department of the Interior, under the authority of the ESA, lists the loggerhead as threatened. Nesting populations of green turtles in Florida and all leatherback, Kemp's ridley, and hawksbill sea turtles are listed as endangered. Although each of these species nests along the coasts of Florida, no critical habitat has been designated in the State for any of them by NMFS. Formal monitoring of sea turtles in the CREC intake canal began in 1998 following the occurrence of eight sea turtle strandings on the CREC Unit 3 trash racks between 1994 and 1997 (PEF 2008b). A Biological Opinion was issued by NMFS in 1999 that defined an incidental take limit biennially to 50 live takes, 8 mortalities not causally related to CREC operations, and 5 mortalities causally related to CREC operations. Due to recovery and increase in numbers of juvenile and subadult of Kemp's ridley sea turtles, the Biological Opinion was modified in 2002 to allow for a biennial take of 75 live takes, no limit on mortalities not attributed to CREC operations, and 3 mortalities causally related to CREC operations (NMFS 2002). Table 5-1 lists the numbers and species of sea turtles sighted or collected near the proposed LNP and CREC sites for comparative purposes. The following sections briefly describe the life history, habitat needs, status and distribution, and factors that contribute to population decline for each of the species, as well as their occurrence and status in the proposed project area.

Table 5-1. Sea Turtle Strandings and Sightings in the Area Around Levy and Citrus County, Florida

Species	Sea Turtle Stranding and Salvage Network 1998 – 2004 (Zone 6 and 7)[(a)]	Crystal River Energy Complex 1999 – 2005[(b)]	Cedar Key (Schmid) 1985 – 1996[(b)]
Loggerhead	81	8	20
Green	105	38	10
Leatherback	5	0	0
Hawksbill	9	1	0
Kemp's ridley	73	92	269
Unknown	10		

(a) Data from Sea Turtle Stranding and Salvage Network (2009) Zones 6 and 7 encompassing Franklin County to Pinellas County, Florida.
(b) Data from Eaton et al. 2008.

5.2.1 Loggerhead Sea Turtle

5.2.1.1 Life History

The loggerhead sea turtle is the most common and abundant turtle in the inshore coastal waters of the Gulf of Mexico (NMFS and FWS 1991). Adults along the southeast coast of Florida have a mean shell length of about 3 ft and weigh about 240 lb. The largest individuals may be 4 ft long and weigh 500 lb. The hatchlings are about 1.7 in. long and weigh about 0.7 oz. Loggerhead turtles have a wide distribution in temperate, subtropical, and tropical seas (Dodd 1988). They are encountered seasonally in continental shelf waters, bays, and estuaries of the Gulf of Mexico. In tropical and subtropical waters, such as the Gulf of Mexico, they may be abundant year round except where water temperature drops below about 15°C in winter. The largest concentration of nesting loggerheads in the Atlantic occurs along the east coast of Florida. However, loggerhead turtles also nest in the southwestern portion of Florida (NMFS and FWS 1991).

5.2.1.2 Habitat Requirements

Adult female loggerheads nest above the high-tide line and sometimes in vegetation at the top of sandy beaches. Approximately 90 percent of the loggerhead nesting activity in the United States is in Florida (Meylan et al. 1994). Loggerheads nesting in southeast Florida are genetically indistinguishable from those nesting along the coast of the Gulf of Mexico in southwest Florida (Bowen and Karl 2007). In south Florida, nesting may occur from late April (rare) to the beginning of September, with peak nesting activity in June and July (NMFS and FWS 1991). Newly emerged turtles immediately crawl toward the sea, probably orienting toward the reflected light of the moon (Dodd 1988). If the beaches where the newly emerged turtles hatch have visible light sources on the landward side of the beach, the hatchlings may crawl in the wrong direction, normally resulting in predation or death. Those that reach the water swim rapidly offshore. The initial swimming frenzy may take them 13 to 17 mi offshore. They remain offshore for 3 to 5 years (NOAA 1989) and are about 1.5 ft long when they return to coastal waters to forage as subadults. Subadult and adult loggerheads are primarily bottom feeders, foraging in coastal waters for benthic mollusks and crustaceans (Plotkin et al. 1993).

5.2.1.3 Status and Distribution

In the Gulf of Mexico, loggerhead turtles appear to be concentrated along the southern west coast of Florida (NMFS and FWS 2008). They also are abundant particularly during the summer all around the coast of the U.S. Gulf of Mexico. Most sightings of loggerheads off the west coast of Florida are within 86 mi of land. Loggerhead turtles nest in relatively large numbers along the southwest and northwest coast of Florida (FFWCC 2009a). NMFS and FWS (2008) estimated that 1001 to 10,000 loggerhead turtle nests occur in southwest Florida. In northwest Florida, NMFS and FWS (2008) estimated that 101 to 1000 loggerhead turtle nests occurred. Recent counts indicate that nesting throughout Florida, including northwest and southwest Florida, is decreasing.

Loggerhead turtles occur all along the Gulf of Mexico coast in shallow coastal and estuarine waters, as well as along the outer continental shelf. The statistics on loggerhead turtle strandings and numbers killed in shrimp trawls indicate the distribution and abundance of loggerhead turtles in the Gulf of Mexico. Henwood et al. (1992) reported that less than 25 percent of loggerhead turtles in their survey killed in shrimp nets were captured in the eastern Gulf of Mexico. Between 1988 and 1993, from 189 to 308 loggerhead turtles were stranded each year along the shores of the Gulf of Mexico (Teas and Martinez 1992; Teas 1992, 1993, 1994a, b), with the largest number of strandings occurring in west Florida. From 1998 to 2004, 81 (28.6 percent) of the 283 sea turtles reported stranded along the Florida coast from Franklin County to Pinellas County were loggerhead turtles (Sea Turtle Stranding and Salvage Network 2009; see Table 2).

5.2.1.4 Factors Contributing to the Population Decline

Most sea turtle mortalities, including loggerheads, are caused by human activities, including incidental take in bottom trawls, longline, and gillnet fisheries; legal and illegal harvest; vessel strikes; beach armoring; beach erosion; marine debris ingestion; oil pollution; and light pollution (NMFS and FWS 2008).

5.2.1.5 Occurrence and Status in the Project Area

Loggerhead turtles are considered threatened throughout their entire range. Therefore, they are considered a threatened species for Levy and Citrus Counties. Based on reviews of several reports, including those of NMFS and FWS (2008) and the Turtle Expert Working Group (2000), the area around Levy and Citrus Counties appears to have lower instances of loggerhead turtles than other areas of Florida to the north and south. Data from the Sea Turtle Stranding and Salvage Network Zones 6 and 7 indicate the possibility that more loggerhead turtles might actually be in the area. However, when compared to other zones throughout Florida, the numbers are substantially smaller (Sea Turtle Stranding and Salvage Network 2009). Factors that may influence these low numbers include (1) a large portion of the Levy and Citrus Counties coastline is not easily accessible for survey, and (2) a Sea Turtle Recovery Team is not currently active in this zone of Florida, but teams are active in other zones (NMFS and FWS 2008). In-water survey data collected in the Levy and Citrus County areas seem to corroborate the lower instances of loggerheads in the area (see Table 5-1). PEF has routinely collected incidental occurence data from the intake canal for the CREC since 1999. For loggerhead turtles, 11 live takes, 4 non-CREC mortalities, and 1 CREC causal mortality were reported from the CREC intake canal between 1999 and 2009 (PEF 2001, 2003, 2004, 2005, 2006, 2007, 2008c, 2009e, 2010). The turtles ranged from juveniles to adults.

5.2.2 Green Sea Turtle

5.2.2.1 Life History

The green turtle is the largest of the hard-shelled sea turtles. The mean size of adult female green turtles nesting in Florida is 3.3-ft standard straight carapace length (SCL) with a weight of 300 lb. Green turtles have a circumglobal distribution in tropical and subtropical waters, particularly in shallow coastal seagrass and hard reef areas (NMFS and FWS 1991). Historically, the most important nesting area for green turtles in the Gulf of Mexico was on Dry Tortugas, west of the Florida Keys, but this population became extinct through human exploitation early in this century (Meylan et al. 1994). Currently, green turtles nest along the southwestern coastline of Florida to the Georgia border and in the northwestern portion of Florida along the panhandle. Nests in these areas seem to be gradually increasing every year (FFWCC 2009b).

5.2.2.2 Habitat Requirements

Green turtles occupy three habitat types at different stages in their life cycle. For nesting, females require the high-energy (wave active), sandy beaches of barrier islands and mainland shores above the high-water line. Upon emergence, hatchlings immediately seek out the shore and open water. The hatchling green turtles weigh about 0.8 oz and have a carapace length of less than 7.9 in. SCL. Hatchling green turtles tend to prefer to swim in open surface waters where they subsist on zooplankton and sea weeds. Juvenile green turtles drift with the prevailing surface-water currents until they reach a size of 12 to 16 in., at 1 to 3 years, and then return to shallow coastal waters. Juvenile green turtles and adults spend most of their lives in shallow benthic feeding grounds. Foraging habitats for juvenile and adult green turtles are primarily pastures of seagrasses or macroalgae in less than 66 ft of water. A favorite seagrass food of green turtles throughout the Caribbean and south Florida is turtle grass (*Thalassia testudinum*). *Thalassia* is a highly productive seagrass and can support as many as 138 adult female green turtles per hectare. However, juvenile green turtles often are found over shallow hard-bottom habitats, such as coral and rocky reefs (NMFS and FWS 1991).

During feeding, subadult green turtles do not wander far, rather they remain within a small area of 0.4 mi^2 or less. A typical dive cycle during feeding in Florida lasts about 33 minutes, of which 1 minute is spent at the surface between dives and 30 minutes is spent on the bottom foraging on seagrass or algae. Thus, green turtles are hard to monitor in their feeding grounds because they spend more than 50 minutes of each hour submerged (Nelson 1994).

5.2.2.3 Status and Distribution

In the last century, heavy exploitation of green turtles by man, mainly for their high-quality meat and eggs, has resulted in a substantial decline in their populations throughout most of their historic range. This exploitation also has led to green turtles that nest in Florida being listed as endangered by NMFS and FWS. According to the Florida Fish and Wildlife Conservation Commission (FFWCC 2009b), 12,752 green turtle nests were noted in Florida in 2007, with 82 percent of the nests occurring in southeastern Florida. No nests were located in the area surrounding Levy and Citrus Counties. Stranding records produce useful information about the distribution of sea turtles. The stranding data indicate that green turtles are most abundant in the U.S. Gulf of Mexico off the west coast of Florida, followed by south Texas. From 1998 to 2004, 105 (37.1 percent) of the 283 sea turtles reported stranded along the Florida coast from Franklin County to Pinellas County were green turtles (Sea Turtle Stranding and Salvage Network 2009). This was the highest noted species in the area (see Table 5-1). Important feeding areas for green turtles located on the west coast of Florida include two locations within Citrus County (Homosassa and Crystal River) and one location within Levy County (Cedar Key) (NMFS and FWS 1991).

5.2.2.4 Factors Contributing to the Population Decline

Most sources of mortality for sea turtles in U.S. coastal waters, including green turtles, are human activities, such as incidental take in bottom trawls, particularly shrimp and summer flounder nets (Henwood et al. 1992); coastal gill net and pound net fisheries (Witzell and Cramer 1995); ingestion of marine debris (Witzell and Teas 1994); and channel dredging (NMFS and FWS 1991). Collisions with boats, particularly boat propellers, are also an important cause of the death of green turtles found stranded on the shore. Oil pollution from spills and tank cleaning may kill some green turtles and other marine turtles through tarball ingestion or fouling of the body with oil from surface slicks. Loss of nesting habitat through coastal development may also be a factor (NMFS 1994).

5.2.2.5 Occurrence and Status in the Project Area

NMFS and FWS currently list the breeding populations of green turtles in Florida as endangered, while all other populations are considered threatened. Although nesting areas have not been found in Levy and Citrus Counties or the immediately surrounding counties, any green turtles noted in these areas are considered endangered. Data from Eaton et al. (2008) and the Sea Turtle Stranding and Salvage Network (2009; see Table 5-1) indicate that green turtles are more abundant in the Levy and Citrus County areas and around the CREC than some of the other turtle species. This is probably due to its proximity to three important feeding grounds that occur in the Levy and Citrus County areas. However, when compared to counties on the southwestern and eastern shores of Florida (from Sarasota to North Carolina), this area has considerably fewer green turtles. At CREC, most green turtle occurrences have been juveniles. For the green turtle, between 1999 and 2009, 47 live takes, 10 non-CREC-related mortalities, and 3 CREC-related mortalities have been reported from the CREC intake canal (PEF 2001 2003, 2004, 2005, 2006, 2007, 2008c, 2009e, 2010).

5.2.3 Hawksbill Sea Turtle

5.2.3.1 Life History

The hawksbill turtle is a medium-sized tropical and subtropical species that inhabits the warm waters of the Atlantic, Pacific, and Indian Oceans (NMFS and FWS 1993). It is the most tropical of the sea turtles and is restricted primarily to warmer waters more than the other four sea turtles found in the Gulf of Mexico. In U.S. territorial waters, hawksbills occur along the U.S. coast of south Texas and along the Gulf and Atlantic coasts of Florida. Adult nesting females have a carapace length of about 34 in. and weigh about 176 lb. The largest hawksbill on record weighed 276 lb. Hatchlings are about 1.7 in. long and weigh 0.5 to 0.7 oz (NMFS and FWS 1993). In the U.S. Caribbean and the Florida Keys, overexploitation severely depleted hawksbills during the 20th century. At present, since banning the sale of turtle shell products, they may no longer be in decline. However, data are not available to indicate that numbers are increasing (NMFS and FWS 1993; NMFS and FWS 2007). In the western tropical North Atlantic and Caribbean Sea, hawksbill nesting populations have continued to decline (Meylan 1989).

5.2.3.2 Habitat Requirements

Hawksbills are solitary nesters, making it difficult to gain insights into their population sizes in areas where they nest. Hawksbills show a high fidelity to their nesting beaches and return to the same or a nearby beach year after year (Bjorndal et al. 1985). There have only been a few verified reports of hawksbill turtle nesting in south Florida, mostly on the east coast (NMFS and FWS 1993). Juveniles and subadults tend to remain and feed on coral reefs near their natal beaches. Like other species of sea turtles, hatchling hawksbills congregate in sargassum rafts to feed and grow for a year or more after emerging from the nest (NMFS and FWS 1993). While in the sargassum rafts, they consume pelagic fish eggs and larvae, small invertebrates associated with the floating algae, and the sargassum itself.

Subadults and adults are omnivorous scavengers. They seem to have a preference for benthic invertebrate prey, particularly sponges and biofouling organisms. Because of their food preferences, they tend to be most abundant in shallow coral and rocky reef habitats. These habitats are rare in the northern Gulf of Mexico, accounting in part for the rarity of hawksbill turtles in the U.S. Gulf of Mexico.

5.2.3.3 Status and Distribution

The hawksbill turtle is the rarest of the five sea turtles in the U.S. waters of the Gulf of Mexico. These tropical turtles undoubtedly are much more abundant in the warmer waters of the Mexican Gulf of Mexico. Strandings of hatchling and yearling hawksbill turtles are frequent in south Texas and occasionally in Louisiana. Northward coastal currents in the western Gulf undoubtedly carry young hawksbill turtles northward along the Texas coast from their natal beaches in Mexico. From 1998 to 2004, 9 (3.1 percent) of the 283 sea turtles reported stranded along the Florida coast from Franklin County to Pinellas County were hawksbill turtles (Sea Turtle Stranding and Salvage Network 2009).

5.2.3.4 Factors Contributing to the Population Decline

Hawksbill turtles are subjected to and share many of the natural and anthropogenic disturbances as the other sea turtles in Gulf of Mexico waters. However, their limited distribution in the U.S. Gulf of Mexico subjects them to less involvement with U.S. commercial and recreational fisheries. Strandings of hawksbills are restricted almost exclusively to Florida, Puerto Rico, and the U.S. Virgin Islands. Hawksbills appear to be unusually vulnerable to ingestion of marine debris, particularly plastics. Nearly 90 percent of the debris ingested by hawksbills is plastic bags, plastic and styrofoam particles, and tar (Witzell and Teas 1994). Six hawksbills that were stranded also were entangled in marine debris or fish nets. Juvenile hawksbills frequently are reported entangled in monofilament gill nets, fishing line, and synthetic rope. Because of the great value of the carapace of hawksbill turtles, called “tortoiseshell” or “bekko,” there is a large illegal trade in subadult and adult hawksbill turtles, particularly in Puerto Rico, the U.S. Virgin Islands, the wider Caribbean, and the Mexican Gulf of Mexico (NMFS and FWS 1993).

5.2.3.5 Occurrence and Status in the Project Area

Hawksbill turtles are endangered throughout their entire range, including the Florida coastal areas off of Levy and Citrus Counties. However, as noted in the data from the Sea Turtle Stranding and Salvage Network, the CREC study, and the Cedar Key study (see Table 2), hawksbill turtles are rarely found in the Florida coastal areas off of Levy and Citrus Counties. The low number of strandings is probably indicative of the rarity of hawksbill turtles in Florida waters of the Gulf of Mexico. Between 1999 and 2009, a single hawksbill turtle was recovered live from the CREC intake canal in 2000 (PEF 2001).

5.2.4 Leatherback Sea Turtle

5.2.4.1 Life History

Leatherback turtles are the largest and most distinctive of the living sea turtles. They reach a length of 78 in. SCL and weigh more than 2000 lb (NMFS 2009e). Large outstretched front flippers may span 106 in. in an adult. Lacking a keratinized shell, they are covered instead with a tough hide. Because they have physiological adaptations for heat conservation, leatherback turtles are more widely distributed as adults than other sea turtles in temperate and boreal waters throughout the world. However, all leatherbacks return to subtropical and tropical shores to nest.

5.2.4.2 Habitat Requirements

Leatherback turtles are a largely oceanic, pelagic species, but they also forage in coastal waters. Juveniles and adults feed throughout the water column to depths of at least 3900 ft (NMFS 2009e), consuming jellyfish and other gelatinous zooplankton, such as salps, ctenophores, and siphonophores (Limpus 1984). Most feeding dives average about 200 ft, but frequently extend from 985 to 1300 ft (Eckert et al. 1986). In the past, the leatherback's seasonal inshore movements off south Texas have been linked to inshore movements of their preferred jellyfish prey. Only a small fraction of the Gulf of Mexico and North Atlantic leatherback populations nest on beaches of the continental United States, mostly in Florida (Meylan et al. 1994) and the U.S. Virgin Islands (Boulon et al. 1994). Nesting occurs from April to July. Little is known about the behavior or distribution of hatchling and juvenile leatherback turtles.

5.2.4.3 Status and Distribution

Because leatherback turtles are a largely oceanic, pelagic species, estimates of their population status and trends have been difficult to obtain. In addition, nesting females do not have the nest-site fidelity exhibited by other turtles and tend to move to different beaches in different years (Tucker 1990). Therefore, it has been difficult to estimate temporal trends in population size. Nesting trends on U.S. beaches have increased in recent years (NMFS 2009e). In Florida, the FFWCC found more than 1400 nests throughout the state in 2007 (FFWCC 2009c). Most were located along the eastern and southeastern coasts. Sarasota, Escambia, Okaloosa, Bay, Gulf, and Monroe Counties were the only southwestern and northwestern counties in Florida with identified nests. Turtle stranding data support the hypothesis that leatherback turtles are rare in coastal waters of the U.S. Gulf of Mexico. Individuals dying in offshore pelagic environments may never wash ashore. From 1998 to 2004, 5 (1.8 percent) of the 283 sea turtles reported stranded along the Florida coast from Franklin County to Pinellas County were leatherback turtles (Sea Turtle Stranding and Salvage Network 2009).

5.2.4.4 Factors Contributing to the Population Decline

Leatherbacks are especially susceptible to entanglement in fishing gear and plastic debris (Witzell and Teas 1994). Because they are adapted to a pelagic existence, they have trouble maneuvering in tight places, swimming backwards, and avoiding obstructions in shallow waters. The large front flippers of leatherbacks often bear cuts, chafing marks, or are severed altogether, possibly due to entanglement. Because of their preferred diet of gelatinous zooplankton, particularly jellyfish, leatherback turtles often ingest floating plastic debris, mistaking it for food (Wallace 1985).

5.2.4.5 Occurrence and Status in the Project Area

Leatherback turtles are considered endangered throughout their entire range, including Levy and Citrus Counties. However, as noted by FFWCC (2009c) and corroborated by data from the Sea Turtle Stranding and Salvage Network (2009), the CREC study, and the Cedar Key study (see Table 5-1), leatherback turtles are rarely found in the Florida coastal areas off of Levy and Citrus Counties. No leatherback turtles have been reported in the CREC intake canal since 1999 (PEF 2001, 2003, 2004, 2005, 2006, 2007, 2008c, 2009e, 2010).

5.2.5 Kemp’s Ridley Sea Turtle

5.2.5.1 Life History

The Kemp’s ridley is one of the smallest living sea turtles. Adult females have shell lengths of 24 to 28 in., and they weigh 77 to 99 lb (NMFS and FWS 1992). Pelagic-phase juvenile ridleys range in size from 2 to 8 in. SCL, subadults are 8 to 24 in. long, and mature adults generally are longer than 24 in. SCL (Marquez 1994). Kemp’s ridley turtles are distributed throughout the Gulf of Mexico and into the Atlantic Ocean. The center of their distribution is in the Gulf of Mexico. The Kemp’s ridley turtle is the most endangered sea turtle in the world (NMFS and FWS 1992) and is listed as endangered throughout its range. The number of females nesting at the only significant ridley nesting beach dropped from more than 40,000 to as low as 702 from 1947 to 1985 (FWS 2009). This is the most severe population decline documented for any species of sea turtles. Since the mid-1980s, an increase has been noted with as many 3600 turtles producing more than 8000 nests during the 2003 season (NMFS 2009f). This is the most severe population decline documented for any species of sea turtles.

5.2.5.2 Habitat Requirements

Nearly all reproduction of Kemp's ridleys takes place along a single 9.3-mi stretch of beach near Rancho Nuevo, Tamaulipas, Mexico, about 200 mi south of Brownsville, Texas (Marquez 1994). A small number of nests have been found in Texas and along the Mexican coast of the Gulf of Mexico between Playa Lauro Villar, Tamaulipas, Mexico, and Isla Aguada, Campeche, Mexico, but nothing that reaches the level of nests at Rancho Nuevo. Nesting occurs in a highly synchronized manner with large numbers of females (called an arribada) coming ashore within a period of a few hours during daylight (Marquez 1994). Hatchlings migrate rapidly down the beach and out to sea where they spend a period of perhaps 2 years in the pelagic zone. They are about 8 in. long at the end of the pelagic period. Little is known about the feeding behavior and food preferences of hatchling Kemp's ridley turtles during their pelagic stage. During the pelagic period, they presumably feed on zooplankton and floating matter, including sargassum weed and the associated biotic community. Following a pelagic feeding stage shortly after hatching and lasting for several months, the juvenile ridleys move into shallow coastal waters to feed and grow. The young subadults often forage in water less than 3 ft deep, but they tend to move into deeper water as they grow. Juvenile to adult ridleys prey on crabs, particularly blue crabs; mollusks; and small fish. Because of their preference for crabs and other primarily shallow-water demersal prey, juvenile and adult ridley turtles concentrate in coastal waters less than 30 ft deep throughout their range. They make long dives to the bottom and may feed on the bottom for an hour or more at a time (Turtle Expert Working Group 2000).

5.2.5.3 Status and Distribution

Ridley turtles are found mainly in the Gulf of Mexico. Comparatively small numbers of juveniles are found along the U.S. Atlantic coast as far north as New England and the Canadian Maritime Provinces (Lazell 1980). The northern and northeastern Gulf of Mexico are prime foraging areas for juvenile, subadult, and post-nesting female ridleys (Marquez 1994). They often are observed associated with portunid crabs (*Callinectes* spp.), their favorite prey. Adults are restricted almost entirely to the Gulf of Mexico, where they range widely between northern (U.S.) and southern (Mexico) regions. The distribution of juveniles in the Gulf of Mexico is restricted primarily to U.S. waters of the northern Gulf of Mexico from Texas to Florida. From 1998 to 2004, 73 (25.8 percent) of the 283 sea turtles reported stranded along the Florida coast from Franklin County to Pinellas County were ridley turtles (Sea Turtle Stranding and Salvage Network 2009). Over the past decade, nesting has increased, indicating that the species may be in the early stages of recovery (NMFS 2009f).

5.2.5.4 Factors Contributing to the Population Decline

The major factors in the historic decline of ridley turtles is thought to have resulted from predation (animal and human) of eggs on the major nesting beach and incidental take in commercial fisheries in the U.S. and Mexican Gulf of Mexico and western North Atlantic (Marquez 1994). Current impacts include anthropogenic disturbance, entanglement in fishing gear (e.g., monofilament fishing line or discarded fishing nets), and marine debris ingestion (e.g., plastic bags and plastic particles). Under some circumstances, chemical pollution may be a threat to ridley turtles.

5.2.5.5 Occurrence and Status in the Project Area

As noted, Kemp's ridley turtles are considered endangered throughout their entire range, including the Florida coastal areas off of the coasts of Levy and Citrus Counties. According to the CREC and Cedar Key studies, ridley turtles are the most common turtle found in the Levy and Citrus County areas (Eaton et al. 2008; Carr and Caldwell 1956; Schmid 1998) while the Sea Turtle Stranding and Salvage Network data indicate that ridley turtles from juveniles up to adults are the third most-frequent species stranded in the area. For the Kemp's ridley turtle, since 1999, 99 live takes, 11 CREC non-causal mortalities, and 5 CREC causal mortalities have been reported in the CREC intake canal (PEF 2001, 2003, 2004, 2005, 2006, 2007, 2008c, 2009e, 2010). Based on these reports, Kemp's ridley turtles appear to be the most likely turtle species to be present in the LNP site area.

5.3 Smalltooth Sawfish

5.3.1 Life History

The smalltooth sawfish (*Pristis pectinata*) is a cartilaginous fish that inhabits coastal inland shallows with muddy or sandy substrate where it feeds on benthic fish and crustaceans. Smalltooth sawfish, like other cartilaginous fish, mature slowly with reproductive age estimated based on growth rates (NMFS 2009g). Reproduction is ovoviviparous, with females retaining developing embryos within a yolk-containing egg sac over 5 months and giving birth to hatched embryos. There is no clear information regarding litter sizes, although information from the largetooth sawfish is assumed to be comparable where females produce litters every other year. Diet includes small fish and crustaceans. The feeding behavior observed in smalltooth sawfish includes slashing sideways through schools of fish to injure or impale prey on rostral teeth (NMFS 2009g).

5.3.2 Habitat Requirements

Juvenile smalltooth sawfish stay close to shallow, coastal estuaries and river mouths with mangrove or mud bank habitats. They show high site fidelity and stay close to natal habitat.

Adults may move further offshore up to depths of 400 ft and can tolerate brackish water (Simpfendorfer and Wiley 2006).

5.3.3 Status and Distribution

Once prevalent in the western Atlantic from the Atlantic U.S. coast through the Gulf of Mexico to Texas, the Caribbean, and down the South American coast to Brazil, the smalltooth sawfish is currently found consistently only near the southern tip of Florida (Simpfendorfer and Wiley 2005). Still under review, critical habitat designation is proposed to protect this population from Charlotte Harbor to Florida Bay (73 FR 70290). In an effort to monitor distribution, migration, and future recovery efforts, the Florida Museum of Natural History maintains a smalltooth sawfish encounter database for public or commercial sightings or incidental catch of this species (FMNH 2010).

5.3.4 Factors Contributing to the Population Decline

The increase in commercial and recreational fishing increased the probability of sawfish entanglement. This species was reported commonly as bycatch. With slow reproduction rates and increases in fishing, the species has seen a rapid decline in abundance (Musick et al. 2000; Seitz and Poulakis 2002). Habitat alteration and degradation are also contributing factors to smalltooth sawfish population declines. In particular, juveniles are vulnerable to impacts associated with mangrove loss as protection from predators (NMFS 2009g).

5.3.5 Occurrence and Status in the Project Area

Observations of smalltooth sawfish north of Port Charlotte are rare. However, since 2000, four juvenile smalltooth sawfish have been either caught or sighted offshore of Citrus County; one at the mouth of the CFBC and another just outside the CREC discharge canal (FMNH 2009). No smalltooth sawfish were observed or collected during the sampling events described in EIS Section 2.4.2.1 for the CFBC, OWR, and CREC discharge area (CH2M Hill 2009b), and none have been reported in the CFBC near the proposed location for the cooling-water intake.

5.4 Gulf Sturgeon

5.4.1 Life History

The gulf sturgeon (*Acipenser oxyrinchus desotoi*) is an anadromous fish within the family Acipenseridae – one of the oldest and most primitive families of existing bony fishes. The gulf sturgeon is a relatively long-lived fish, and maturity in males is at 7 to 9 years while females take 8 to 12 years to attain spawning condition. Spawning migrations occur in early to late spring with a return to saltwater during early to late fall. In the Suwannee River, Florida, sturgeons migrate upriver when temperatures range between 17 to 22°C in mid-February to mid-April.

After the first spawning, females may only spawn at intervals of 2 or 3 years (Huff 1975). Water velocity influences the spawning habitat preference for sturgeon, with research suggesting that higher flows are environmental cues for successful spawning (Chapman and Carr 1995). Clumps of fertilized eggs become attached to rocks or other bottom structures in areas characterized as clean gravel-cobble mix over rock with strong, persistent laminar flows and eddies. Incubation times vary with river temperature, and fry disperse widely downstream of spawning habitats within the river, inhabiting open sandy areas away from shorelines and vegetation (Sulak and Clugston 1998). Juvenile (>1 year) and adult gulf sturgeon typically out-migrate to the marine environment, although some populations tend to hold over in brackish water for a period up to 2 months before moving into the open Gulf of Mexico (Carr et al. 1996). The adult gulf sturgeon is a bottom feeder and makes a diet of invertebrates such as brachiopods, insect larvae, mollusks, oligochaetes, polychaetes, crustaceans, and small fishes. Feeding is almost exclusively in marine waters, and adults eat little while in freshwater. Weight losses of 4 to 15 percent are often observed during the in-river period during late spring, summer, and early fall (Wooley and Crateau 1985).

5.4.2 Habitat Requirements

Historically, the range for this anadromous fish extended from Louisiana to south of Tampa Bay, Florida, where it feeds in the Gulf of Mexico and returns to freshwater for spawning. The current range is limited to the Mississippi River east to the Suwannee River, Florida, where the Suwanee River supports the largest subpopulation of gulf sturgeon (Carr et al. 1996). Critical habitat for Florida nearest to the proposed LNP site is designated for 182 mi of the Suwannee River; 12 mi of the Withlacoochee River, where it branches off to the north of the Suwannee River; and 211 mi^2 of estuarine/marine area of Suwannee Sound that is north of Cedar Key (68 FR 13370). Gulf sturgeon show a high homing fidelity (site-specific) spawning behavior based on gene flow between river drainages (Stabile et al. 1996).

5.4.3 Status and Distribution

Since 1991, the gulf sturgeon has been jointly managed and listed as a threatened species by NMFS and FWS (50 FR 49653), with NMFS managing nearshore and offshore habitat range and FWS managing inland from river mile zero. The gulf sturgeon is extant in major river basins from the Mississippi to Charlotte Harbor, but the only significant spawning populations occur in the Pearl River, Pascagoula River, Escambia River, Blackwater River, Yellow River, Choctawhatchee River, Apalachicola River, Ochlockonee River, and Suwannee River (FWS 1995; Berg 2004).

5.4.4 Factors Contributing to the Population Decline

Prized for their flesh and roe, gulf sturgeon were commercially fished in the late 1890s up to 1984 when the State of Florida banned commercial harvesting. Degradation of riverine habitat with increases in pollution and installation of dams on many of the major rivers along the northern Gulf of Mexico also contributed to the decline in species abundance (Huff 1975; Wooley and Crateau 1985). A recovery plan was initiated in 1995 to prevent further reduction in sturgeon populations and monitor population recovery with habitat restoration efforts (FWS 1995). Critical habitat for Florida was established for the Suwannee River and immediate offshore habitat in the Gulf of Mexico. Gulf sturgeon critical habitat is designated for 182 mi of the Suwannee River, 12 mi of the northern Withlacoochee River where it branches off to the north of the Suwannee River, and 211 mi^2 of estuarine/marine area of Suwannee Sound that is north of Cedar Key (68 FR 13370).

5.4.5 Occurrence and Status in the Project Area

There are no known spawning populations associated in river systems south of the Suwannee River along the Florida coast, and estuarine/marine critical habitat for the gulf sturgeon does not occur south of Cedar Key. No gulf sturgeon were observed or collected during the sampling events described in EIS Section 2.4.2.1 for the CFBC, OWR, or CREC discharge area (CH2MHill 2009b). Adult gulf sturgeon have been caught south of the CFBC offshore of Pinellas County and within Tampa Bay, but these occurrences have been few since 1987 (Wakeford 2001). Although gulf sturgeon may occur in the offshore areas associated with the CFBC or CREC, they have not been documented, and they would likely avoid any anthropogenic activities and would not use the CFBC or OWR as spawning habitat given the unfavorable substrate and lack of downstream flow.

5.5 Corals

Both staghorn (*Acropora cervicornis*) and elkhorn (*Acropora palmata*) corals are Federally threatened reef-building corals found primarily along the Atlantic coast of Florida and the Caribbean. Designated critical habitat for these two species was established in November 2008, and areas off coastal Florida for Palm Beach, Broward, Miami-Dade, and Monroe Counties are listed. Because, there are no known occurrences of either staghorn or elkhorn coral in Florida Gulf of Mexico waters north of Sanibel Island (73 FR 72210), the review team concludes that construction and operation of LNP Units 1 and 2 would have no effect on any of the coral species, and these species will not be discussed further.

6.0 Effects of the Proposed Action on Aquatic Species

The effects of the proposed action on the sea turtles, smalltooth sawfish, and gulf sturgeon are described in the following sections.

6.1 Sea Turtles

Four of the five species of sea turtle are listed as Federally and State endangered, with the loggerhead sea turtle listed by both Federal and State levels as threatened. All sea turtles have certain life-history similarities in that females swim ashore to sandy beaches and deposit eggs in nesting pits that are covered to allow incubation. Neonates hatch, struggle out of the sandy nest, and make their way to their respective ocean habitats. Although there are no sandy coastline habitats in the area of the CFBC or the CREC discharge area, juvenile, subadult, and adult sea turtle life stages have been found offshore or in these vicinities. In particular, several sea turtle species found in the CREC intake canal have been stranded on the intake bar racks. PEF has an ongoing program to monitor the intake canal for the presence of sea turtles, to perform rescues for stranded individuals, to provide rehabilitation, and to release resources when possible. Trash-bar monitoring for LNP, as implemented at CREC for sea turtle rescue and handling, may assist sick sea turtles that are not able to avoid becoming lodged on the trash racks, and to remove and report mortalities.

PEF currently has an incidental take permit from NMFS for CREC that allows incidental live take of 75 sea turtles annually, 3 annual causal sea turtle mortalities, and a reporting requirement for non-causal related mortalities of 8 or more within a 12-month period (NMFS 2002). This most recent Biological Opinion concludes that operation of CREC Unit 3, “is not likely to jeopardize the continued existence of loggerhead, Kemp’s ridley, green, hawksbill and leatherback sea turtles” (NMFS 2002).

For each of the species described below (except for the leatherbacks that are rare north of Sarasota County), construction activities and barge traffic are not likely to affect sea turtles that may be in the vicinity of the CFBC or CREC discharge area because the turtles avoid any noise or disturbances. Due to the reduced intake flow associated with the closed-cycle cooling system proposed for LNP, and the limiting of the through screen velocity of the intake to 0.5 fps or less, the review team concludes that turtle strandings on the LNP intake trash bars is unlikely and would be limted to moribund or compromised turtles. Therefore, for the loggerhead, green, hawksbill, and Kemp’s ridley turtles, the review team concludes that construction and operation of LNP may affect, but is not likely to adversely affect these species. The review team concludes that construction and operation of LNP will have no effect on the leatherback turtle due to its apparent lack of distribution in the vicinity of the LNP site, and its lack of potential to become impinged on the LNP intake trash racks.

6.2 Smalltooth Sawfish

Observations of smalltooth sawfish north of Port Charlotte are rare, but two sightings in the coastal Florida panhandle region have been documented since August 2008 (FMNH 2009). Since 2000, four smalltooth sawfish juveniles have been either caught or sighted offshore of

Citrus County – one at the mouth of the CFBC and another just outside the CREC discharge canal (FMNH 2009). However, no smalltooth sawfish were observed or collected during the sampling events described in EIS Section 2.4.2.1 for the CFBC, OWR, and CREC discharge area (CH2M Hill 2009b). Although the critical habitat for smalltooth sawfish is located along the southwestern coast of Florida, occurrence records indicate that juvenile sawfish are present near the CREC discharge and CFBC areas. However, adverse impacts are unlikely because these fish would avoid activities occurring in these areas. The use of vertical trash bars across the intake screens and the through-screen velocity of 0.5 fps for intake operations should allow healthy smalltooth sawfish of any age to swim away and not become trapped against the intake screens, although distressed and moribund fish may become trapped on the trash bars. Therefore, the review team concludes that construction and operation of LNP may affect, but is not likely to adversely affect the smalltooth sawfish.

6.3 Gulf Sturgeon

Gulf sturgeon were not collected in sampling efforts and are not likely to be encountered during construction in the CFBC or CREC discharge canal because neither of these areas is critical habitat or a preferred spawning area. Adverse impacts are unlikely because juvenile or adult fish would avoid activities occurring in these areas. The use of vertical trash bars across the intake screens and the low-approach velocity of 0.25 fps for intake operations should allow healthy sturgeon of any age to swim away and not become trapped against the intake screens, although distressed and moribund fish may become trapped on the trash bars. Therefore, the review team concludes that construction and operation of LNP may affect, but is not likely to adversely affect the Gulf sturgeon.

7.0 Cumulative Effects

In addition to the impacts from construction, preconstruction, and operations, the cumulative analysis also considers other past, present, and reasonably foreseeable future actions that could affect aquatic ecology. For this analysis, the geographic area of interest is considered to be the proposed LNP site, the entire CFBC, Lake Rousseau, the Inglis Lock bypass channel, OWR, the CREC intake and discharge, the Levy and Citrus County offshore areas of the Gulf of Mexico, and the proposed transmission-line corridors. Other watersheds (Wacassassa Basin) adjacent to these waterbodies are not affected by LNP and are excluded from this cumulative impacts analysis.

Other actions in the vicinity that have present and reasonably foreseeable future potential impacts on the CFBC and Gulf of Mexico offshore of the CREC include operation of the existing CREC, the proposed uprate of CREC Unit 3, continued operation of the Inglis Quarry, widening of the US-19 bridge across the CFBC, a proposed hydropower project on the Inglis Lock bypass channel spillway, proposed Tarmac King Road Limestone Mine, decommissioning of CREC Units 1 and 2, development of a Port District along the CFBC, and natural environmental stressors (e.g., short- or long-term changes in precipitation or temperature and the resulting response of the aquatic community). The review team considered these potential sources of impacts in its evaluation of the cumulative aquatic ecology impacts presented in PEF's ER and in PEF's responses to the NRC staff's Requests for Additional Information.

Historically, the construction and operation of CREC Units 1 through 5 have had some impact on sea turtles in the Gulf of Mexico (described in Section 5.0 of this assessment), which PEF mitigates through guidance for sea turtle rescue and handling. The current CFBC was constructed starting in 1964, but it was never completed as a cross-Florida canal and was officially deauthorized in 1991 (Noll and Tegeder 2003). The western portion of the completed CFBC extends from the Gulf of Mexico to the Inglis Lock at Lake Rousseau and is typical of a tidal canal with marine and estuarine characteristics.

Cumulative impacts on threatened and endangered species within the CFBC are not likely due to activities or events that are distinct from the LNP site. Activities related to construction of the hydropower system on the Inglis Lock bypass channel could affect the downstream migration of fish from Lake Rousseau to the Withlacoochee River, but would not affect the CFBC or OWR. The US-19 bridge expansion will not include in-water construction, and impacts on the CFBC would likely be mitigated through BMPs to control erosion and stormwater runoff during bridge construction. The Inglis Quarry is located on the north side of the CFBC, and drainage ditches are separated from the CFBC by a containment berm (SDI 2008). Barge traffic within the CFBC is likely to be limited to LNP module transportation and should have minimal impact on aquatic resources as discussed in EIS Section 4.3.2. The proposed Tarmac King Road Limestone Mine expansion may affect groundwater discharge to the lower Withlachoochee River (see EIS Section 7.2.2). The CREC Unit 3 power uprate is not expected to have any construction-related impacts except those related to the construction of additional mechanical draft cooling towers on a portion of the CREC site that has been previously disturbed. Any potential onsite construction-related impacts would be mitigated through the use of BMPs. The contribution of LNP construction-related impacts to impacts related to other nearby activities is minor. Impacts from construction of LNP would be temporary, minor, largely mitigated, and mainly confined to the site. Therefore, the review team concludes that the overall contribution of construction to cumulative losses of protected aquatic organisms in the region would be minor, and additional mitigation would not be warranted.

For operational impacts, the review team considered the potential cumulative impacts on the Gulf of Mexico and CFBC related to impingement and entrainment of aquatic organisms and also thermal and chemical releases from both CREC and LNP. Water withdrawn for operation of proposed LNP Units 1 and 2 would require a net intake of 190 cfs (122 Mgd). The source of the 190 cfs, under low flow conditions, would be 50 cfs from leakage of Lake Rousseau water through the Inglis Lock and freshwater springs, emanating in the CFBC in the vicinity of the intake structure; 70 cfs from the discharge of Lake Rousseau water at the Inglis Dam that would enter the CFBC via the OWR; and an inflow of 70 cfs that would come from the Gulf of Mexico.

Currently, CREC Units 1 through 5 withdraw over 15 times more water from the Gulf of Mexico for operations than the required 190 cfs for LNP Units 1 and 2. The proposed CREC Unit 3 uprate would not increase station water intake flow for CREC Units 1, 2, and 3 (PEF 2007). The additional waste heat generated as a result of the CREC Unit 3 power uprate would be dissipated to the atmosphere by the additional mechanical draft cooling tower planned for constrction at the CREC site.

The review team considered the potential incremental cumulative impacts of impingement and entrainment of aquatic organisms related to operation of LNP 1 and 2 along with continued operation of CREC Units 1 through 5. As discussed in Section 5.3.2, the proposed closed-cycle cooling system with mechanical draft cooling towers for proposed LNP Units 1 and 2 would not be expected to result in a discernable impact on populations of aquatic organisms inhabiting Crystal Bay and Withlacoochee Bay areas of the Gulf of Mexico as a result of impingement or entrainment.

The review team is aware that the possibility exists that CREC Units 1 and 2 (fossil-fuel plants) which contribute significantly to the overall impingement and entrainment of aquatic organisms at CREC, would be decommissioned once LNP Units 1 and 2 begin operation. This significant reduction in intake withdrawal volume (greater than 48 percent) at CREC would reduce the cumulative impact of impingement and entrainment related to operation of CREC on aquatic organisms in the Gulf of Mexico, and may result in a net positive impact on local fisheries.

The operation of the proposed Inglis hydropower project would involve the use of bar racks to prevent debris and organisms larger than 2 in. from traveling through the turbine (Inglis 2008). Any potential impacts from the Inglis hydropower project are isolated from the impacts on the CFBC because the Inglis Lock bypass channel and Withlacoochee River are not hydraulically connected to the CFBC. The construction and operation of the hydroelectric facility would have no effect on populations of aquatic organisms inhabiting the CFBC. Therefore, the Inglis hydroelectric project will have no detectable incremental cumulative impact on aquatic resources affected by the building and operation of LNP.

The review team also considered the potential cumulative impacts of thermal discharges on threatened and endangered species. The operation of all five units at CREC with the uprate of CREC Unit 3 and without the LNP Units 1 and 2 discharge would result in no thermal increase with the operation of a new south cooling tower to augment the current modular helper cooling towers (Golder Associates 2008). The review team is aware that the possibility exists that CREC Units 1 and 2 (fossil-fuel plants), which contribute to of the discharge flow, would be decommissioned once LNP Units 1 and 2 begin operation. The review team conducted the following thermal analysis of two cases involving the discharge from CREC.

The first case evaluated the thermal discharge from all five units at CREC, the power uprate from CREC Unit 3 and the blowdown from LNP Units 1 and 2. A second analysis involved CREC Units 3 through 5, the Unit 3 power uprate, and blowdown from LNP 1 and 2. The thermal analyses for these two cases are presented in EIS Section 5.2.3.1. The first scenario concludes that resulting changes in discharges at CREC would be minimal for thermal and chemical impacts with a slight increase in discharge plume size. The addition of LNP Units 1 and 2 discharge would result in an increased discharge volume of 87.93 Mgd, but with no significant increase in thermal plume temperature or salinity over current conditions, as discussed in EIS Section 5.3.2.1.

The second scenario, with the assumed shutdown of CREC Units 1 and 2, would result in a discharge plume much decreased in size when compared to the first scenario. CREC Units 1 and 2 currently contribute 918 Mgd total discharge to the Gulf of Mexico during summer operations. This accounts for greater than 45 percent of the total discharge (PEF 2009c). The predicted thermal plume would decrease during both summer and winter conditions as a result from the decreased discharge plume. Salinity increases would occur under both summer and winter conditions due to increased cycles of concentration with CREC Units 1 and 2 non-operational, but are less than 1.0 psu. The overall impact on aquatic resources is expected to be minimal.

Both scenarios represent a noticeable temperature and salinity change in the immediate Gulf of Mexico waters compared to the same region prior to CREC operations from a cumulative point of view (as discussed in EIS Section 7.2.2.1). However, habitats and aquatic organisms in this area have adapted to the salinity and temperature changes so that the incremental impacts of LNP 1 and 2 discharge, CREC uprate of Unit 3, and decommissioning of CREC Units 1 and 2 would not be noticeable.

The review team considered the potential cumulative impacts on threatened and endangered species from chemical releases, including increases in total dissolved solids in the combined CREC and LNP discharge. CREC Units 1 through 5 are in compliance with the Clean Water Act Section 316(a) (thermal discharges) impacts from cooling-water systems. Chemical releases from the existing unit(s) currently comply with the FDEP NPDES permit requirements, and compliance with the Unit 3 uprate and decommissioning of CREC Units 1 and 2 are expected to continue and would be monitored in the future. Before approving a NPDES permit for the proposed unit(s), the FDEP would take cumulative chemical releases from the existing and proposed unit(s), as well as from other industrial sites discharging to the Gulf of Mexico, into consideration. Given the lack of other discharges into the immediate area of the CREC discharge, it is likely that the cumulative impacts from LNP discharge combined with the discharge from CREC Units 1 through 5 with and without operation of CREC Units 1 and 2 would be minimal.

Anthropogenic activities, such as residential or industrial development near the vicinity of the nuclear facility, can present additional constraints on aquatic resources. Future activities may include shoreline development, such as the proposed Port District, for commercial, industrial, and residential waterfront development along the CFBC to the west of US-19 (Citrus County 2009); increased water needs; and increased discharge of effluents into the Gulf of Mexico or the CFBC.

In addition to direct anthropogenic activities, physical disturbance and climatic events may impose external stressors on aquatic communities (GCRP 2009). Aquatic ecosystem responses to these events are difficult to predict. The level of impact resulting from these activities or events would depend on the intensity of the perturbation and the recovery of the different threatened and endangered species populations.

Cumulative impacts on aquatic ecology resources are estimated based on the information provided by PEF and the review team's independent review. Based on the above analysis, the review team concludes that cumulative impacts on within the geographic area of interest from past, present, and reasonably foreseeable future actions, including the construction and operation of LNP, to Federally-protected threatened and endangered species under the jurisdiction of the NMFS to be minimal.

8.0 Determinations

Based on a review of the potential for impacts given in Section 6.0, including construction, the use of a closed-cycle cooling system, an intake with a design through-screen velocity of less than 0.5 fps, the chemical concentrations estimated by PEF, an existing discharge canal, and the maintenance procedures for the transmission line rights-of-way, threatened and endangered species' life-history data, and past takes at CREC, the review team concludes that the impacts on the CFBC, OWR, Crystal Bay area offshore of the CREC discharge, and the transmission-line rights-of-way from the operation of proposed LNP Units 1 and 2 would be minor, and mitigation beyond that proposed by PEF trackwould not be warranted.

Section 1 identifies five species of whales, five species of sea turtles, two species of fish, and two species of coral that are Federally endangered or threatened and are listed as occurring in Florida waters of the Gulf of Mexico. Of these, the loggerhead sea turtle, green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, gulf sturgeon, and smalltooth sawfish were identified as possibly occurring near the proposed LNP site in the CFBC, OWR, and Crystal Bay area offshore of the CFBC and CREC discharge as described in Section 6.0 (Table 8-1). There are no areas designated as critical habitat for threatened and endangered species in the vicinity of the LNP site or associated structures.

Based on this review, the review team concludes that the impacts on aquatic Federally listed threatened and endangered species from construction and operation of the proposed LNP site would be minor, and additional mitigation would not be warranted.

Table 8-1. Impacts on Federally Listed Threatened and Endangered Species from Construction and Operation of the Proposed LNP

Common Name	Scientific Name	Status[(a)]	Determination
Herpetofauna			
Loggerhead sea turtle	*Caretta caretta*	T	May affect, not likely to adversely affect
Green sea turtle	*Chelonia mydas*	E	May affect, not likely to adversely affect
Hawksbill sea turtle	*Eretmochelys imbricata*	E	May affect, not likely to adversely affect
Leatherback sea turtle	*Dermochelys coriacea*	E	No effect
Kemp's ridley sea turtle	*Lepidochelys kempii*	E	May affect, not likely to adversely affect
Fishes			
Smalltooth sawfish	*Pristis pectinata*	E	May affect, not likely to adversely affect
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	T	May affect, not likely to adversely affect

(a) Federal status rankings determined by the NMFS under the ESA. E=endangered, T=threatened

9.0 References

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Biological Assessment

U.S. Fish and Wildlife Service

Levy Nuclear Plant Units 1 and 2
Combined License Application

U.S. Nuclear Regulatory Commission
Docket Nos. 52-029 and 52-030

Levy County, Florida

August 2010

U.S. Nuclear Regulatory Commission
Rockville, Maryland

U.S. Army Corps of Engineers
Jacksonville District

1.0 Introduction

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application from Progress Energy Florida, Inc. (PEF), for NRC-authorized combined construction permits and operating licenses (COLs) to construct and operate two new nuclear reactors, Levy Nuclear Plant (LNP) Units 1 and 2, on a previously undeveloped site in Levy County, Florida. The U.S. Army Corps of Engineers (USACE) is reviewing an application from PEF for a Department of the Army (DA) Permit pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Federal Water Pollution Control Act (Clean Water Act) to perform site-preparation activities and build the two reactors and supporting facilities. The USACE is cooperating with the NRC to ensure that the information presented in a single environmental impact statement (EIS) prepared under the National Environmental Policy Act of 1969, as amended (NEPA), is adequate to fulfill the requirements of both agencies. The NRC and the USACE have prepared this biological assessment (BA) to support their joint consultation with the U.S. Fish and Wildlife Service (FWS) in accordance with the Endangered Species Act of 1973, as amended (ESA). Decisions by the NRC to issue the COLs and the USACE to issue a DA permit will be made following issuance of the final EIS.

The two proposed new reactor(s), LNP Units 1 and 2, would be located on a greenfield site. The LNP site is in Levy County, Florida, approximately 10 mi northeast of the Crystal River Energy Complex (CREC) and 30 mi due west of Ocala, Florida. Both power generation units would consist of Westinghouse Electric Company, LLC (Westinghouse) AP1000 pressurized water reactors.

The USACE and the NRC have prepared this BA to examine the potential impacts of construction and operation of the proposed LNP Units 1 and 2 on threatened and endangered species pursuant to ESA Section 7(c). This BA examines the potential effects of the proposed action on Federally threatened and endangered species known to occur on the LNP site and in the vicinity, including the proposed offsite transmission line corridors. In a letter dated November 5, 2008 (NRC 2008), the NRC requested that the FWS Ecological Services Field Office in Jacksonville, Florida provide information regarding Federally listed and proposed species and designated and proposed critical habitat at or in the vicinity of the proposed LNP site, in the offsite corridors, and along the associated transmission-line corridors. That information is presented below in Table 1-1.

The review team is aware of recent events in the Gulf of Mexico associated with the Deepwater Horizon oil spill. To date, information associated with aquatic and terrestrial resources is preliminary and inconclusive. Although not included in this BA, the review team will consider information associated with the oil spill for the LNP project as it becomes available.

1 **Table 1-1**. Federally Listed Terrestrial/Aquatic Species Occurring on and in the Vicinity of the
2 LNP Site and in the LNP Offsite Corridors Including Transmission-Line Corridors.

Scientific Name	Common Name	Federal Status	County of Occurrence
Mammals			
Microtus pennsylvanicus dukecampbelli	Florida salt marsh vole	E	Levy
Puma concolor coryi	Florida panther	E	Polk
Trichechus manatus latirostris	Florida manatee	E	Levy, Citrus, Hernando, Hillsborough, Pinellas
Birds			
Ammodramus savannarum floridanus	Florida grasshopper sparrow	E	Polk
Aphelocoma coerulescens	Florida scrub jay	T	Levy, Citrus, Marion, Sumter, Lake, Hernando, Pinellas, Hillsborough, Polk
Charadrius melodus	Piping plover	T	Pinellas, Hillsborough
Mycteria americana	Wood stork	E	Levy, Citrus, Marion, Sumter, Lake, Hernando, Pinellas, Hillsborough, Polk
Picoides borealis	Red-cockaded woodpecker	E	Levy, Citrus, Marion, Sumter, Lake, Hernando, Pinellas, Hillsborough, Polk
Polyborus plancus audubonii	Audubon's crested caracara	T	Polk
Rostrhamus sociabilis plumbeus	Everglade snail kite	E	Marion, Sumter, Lake, Polk
Reptiles			
Alligator mississippiensis	American alligator	T	Levy, Citrus
Drymarchon corais couperi	Eastern indigo snake	T	Levy, Citrus, Marion, Sumter, Lake, Hernando, Pinellas, Hillsborough
Neoseps reynoldsi	Sand skink	T	Marion, Lake, Polk
Fishes			
Acipenser oxyrinchus desotoi	Gulf sturgeon	T	Levy
Plants			
Bonamia grandiflora	Florida bonamia	T	Marion, Lake, Polk
Campanula robinsiae	Brooksville bellflower	E	Hernando
Chionanthus pygmaeus	Pygmy fringe tree	E	Lake, Polk
Chrysopsis floridana	Florida golden aster	E	Pinellas, Hillsborough
Dicerandra cornutissima	Longspurred mint	E	Marion
Eriogonum longifolium var. *gnaphalifolium*	Scrub buckwheat	T	Marion, Lake, Polk
Justicia cooleyi	Cooley's water-willow	E	Hernando
Nolina brittoniana	Britton's beargrass	E	Lake, Hernando, Polk

Table 1-1. (contd)

Scientific Name	Common Name	Federal Status	County of Occurrence
Polygala lewtonii	Lewton's polygala	E	Marion, Lake, Polk
Polygonella myriophylla	Sandlace	E	Polk
Prunus geniculata	Scrub plum	E	Lake, Polk
Warea amplexifolia	Wide-leaf warea	E	Lake, Polk
Warea carteri	Carter's mustard	E	Polk

Source: FWS 2010a
E= Federally endangered and T= Federally threatened

2.0 Proposed Federal Actions

The proposed Federal actions are the issuance of COLs for the construction and operation of two proposed new nuclear reactors at the LNP site pursuant to Title 10 of the Code of Federal Register (CFR) Part 52, and a DA permit pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act.

In a final rule dated October 9, 2007 (72 FR 57416), the NRC limited the definition of "construction" to those activities that fall within its regulatory authority in 10 CFR 51.4. Many of the activities required to construct a nuclear power plant are not part of the NRC action to license the plant. Activities associated with building the plant that are not within the purview of the NRC action are grouped under the term "preconstruction." Preconstruction activities include clearing and grading, excavating, erection of support buildings and transmission lines, and other associated activities. Preconstruction activities may take place before the application for a COL is submitted, during the staff's review of a COL application, or after a COL is granted. Although preconstruction activities are outside the NRC's regulatory authority, many of them are within the regulatory authority of local, State, or other Federal agencies including the USACE. The distinction between construction and preconstruction is not carried forward in this BA. Rather preconstruction and construction are being discussed jointly as construction activities for purposes of this joint consultation.

Prerequisites to construction activities include, but are not limited to, documentation of existing site conditions within the LNP site and acquisition of the necessary permits (e.g., COL, local building permits, a National Pollutant Discharge Elimination System (NPDES) permit, a DA permit, a General Stormwater permit). However, those activities that do not fall under the NRC's regulatory authority in 10 CFR 51.4 (i.e., that are preconstruction) could proceed prior to receipt of a COL. After construction, planned operation of the new reactors would proceed according to 10 CFR 50.57.

The construction and operation activities that could affect the protected terrestrial and freshwater species (Table 1-1) based on habitat affinities and life-history characteristics and the nature and spatial and temporal considerations of the activity are as follows:

- Terrestrial
  - Construction (including preconstruction)
    - Onsite clearing, grading, and other site preparation and construction activities including wetland removal and/or alteration
    - Clearing for expansion of existing transmission-line corridors
    - Clearing for new offsite corridors
    - Installation of new or upgraded transmission lines and towers
    - Installation of the barge slip, boat ramp, and the blowdown and intake pipelines.
  - Operation
    - Groundwater drawdown
    - Vegetation control in transmission-line corridors
    - Transmission line repairs or upgrades
    - Collision with structures
- Aquatic
  - Construction (including preconstruction)
    - New dredging and construction of a barge slip and boat ramp on the north shoreline of the Cross Florida Barge Canal (CFBC)
    - Installation of the cooling-water intake structure (CWIS) on the north CFBC shoreline
    - Installation of the cooling-water discharge pipeline, including dredging and placement of piping in the CFBC
    - Connection of discharge piping with the existing CREC discharge canal
    - Vessel movements associated with in-water work
    - New transmission-line corridors and towers.
  - Operation
    - Impingement, entrainment, and maintenance associated with the CWIS
    - Salinity changes in the CFBC and Old Withlachoochee River (OWR) downstream of the Inglis Dam on Lake Rousseau

- o Discharge plume from the cooling-water system (thermal, chemical, and physical effects)
- o Maintenance of transmission-line corridors.

3.0 Levy Site Description

The proposed LNP site is located in a primarily rural area in Levy County approximately 4 mi northeast from the town of Inglis and 8 mi east of the Gulf of Mexico (Figure 3-1). The LNP site is currently a greenfield site approximately 3105 ac in size. Goethe State Forest borders the northeastern part of the LNP site. A pine plantation is situated just east and south of the LNP site, and an exotic animal hunting ranch and U.S. Highway 19 (US-19) border the western edge of the LNP site.

The LNP footprint would occupy approximately 300 ac for two reactors and the associated power-production infrastructure near the center of the site (Figure 3-2). Two AP1000 reactors are proposed with an electrical output of 1000 MW(e) and 3415 MW(t) each. A closed-cycle cooling system would draw makeup water from the CFBC through a CWIS located on the north side of the canal. A portion of the makeup water would be returned to the environment via the discharge to the existing CREC discharge canal (Figure 3-3). The remaining portion of the water would be released into the atmosphere for evaporative cooling through mechanical draft cooling towers.

3.1 Terrestrial Habitats – Site and Vicinity

The LNP site and vicinity are located in the Gulf Coastal Flatwoods ecoregion of Florida and are characterized by broad, low-elevation flatlands interspersed with shallow depressions (Griffith and Omernik 2008). Pine flatwoods were the predominant vegetative community prior to the mid-20th century, but most have been converted from natural longleaf pine (*Pinus palustris*) and slash pine (*P. elliottii*) communities to managed forests stocked with slash and loblolly pine (*P. taeda*). The LNP site is undeveloped except for a network of limerock roads. Prior to being acquired by PEF, the site was in active forest management and leased for hunting and target practice. Vegetation, soils, and localized drainage patterns had been extensively altered through silviculture activities including clearing, logging, road development, ditching, grading, bedding, and replanting.

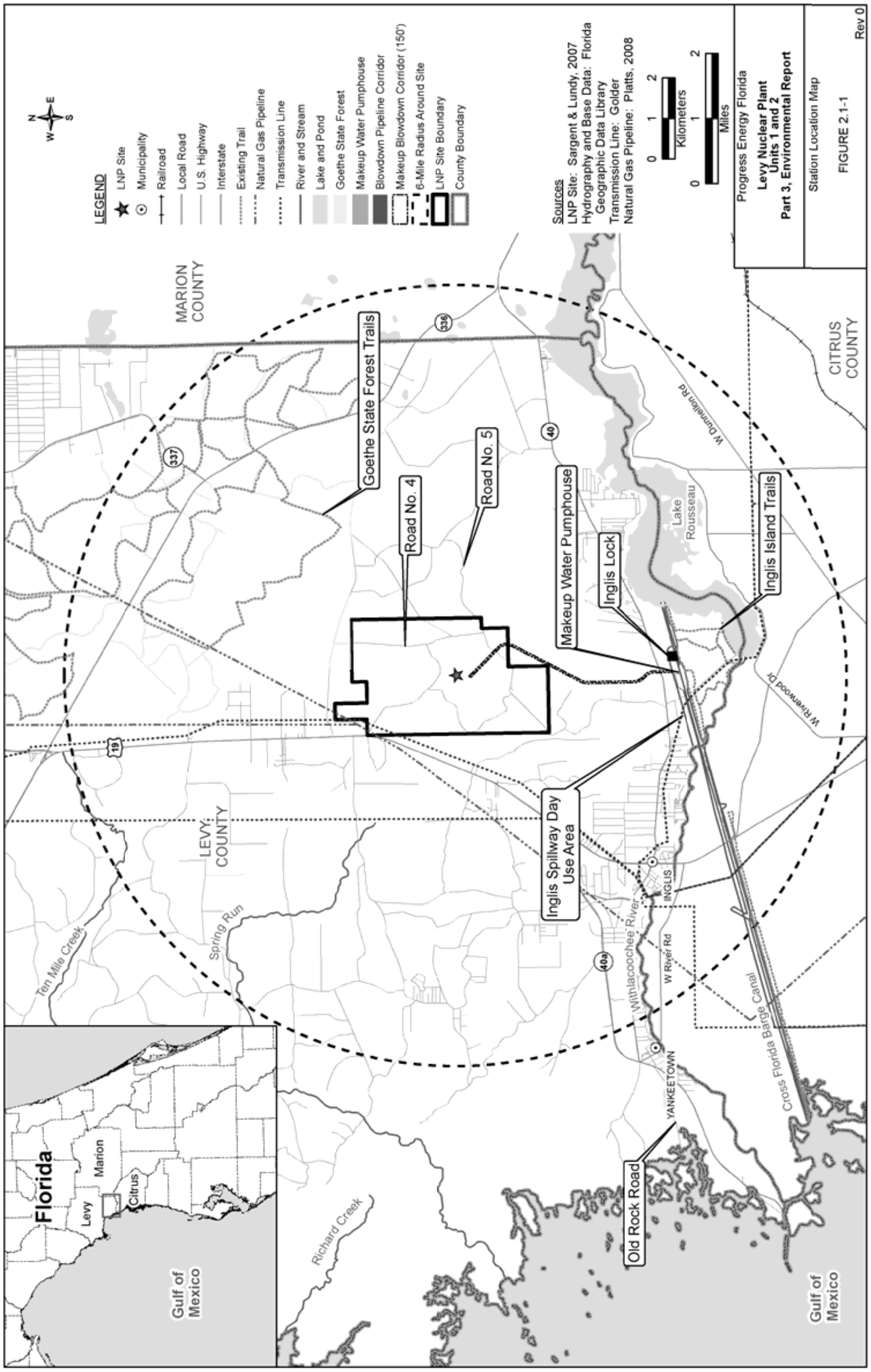

Figure 3-1. LNP Site and Vicinity (PEF 2009a)

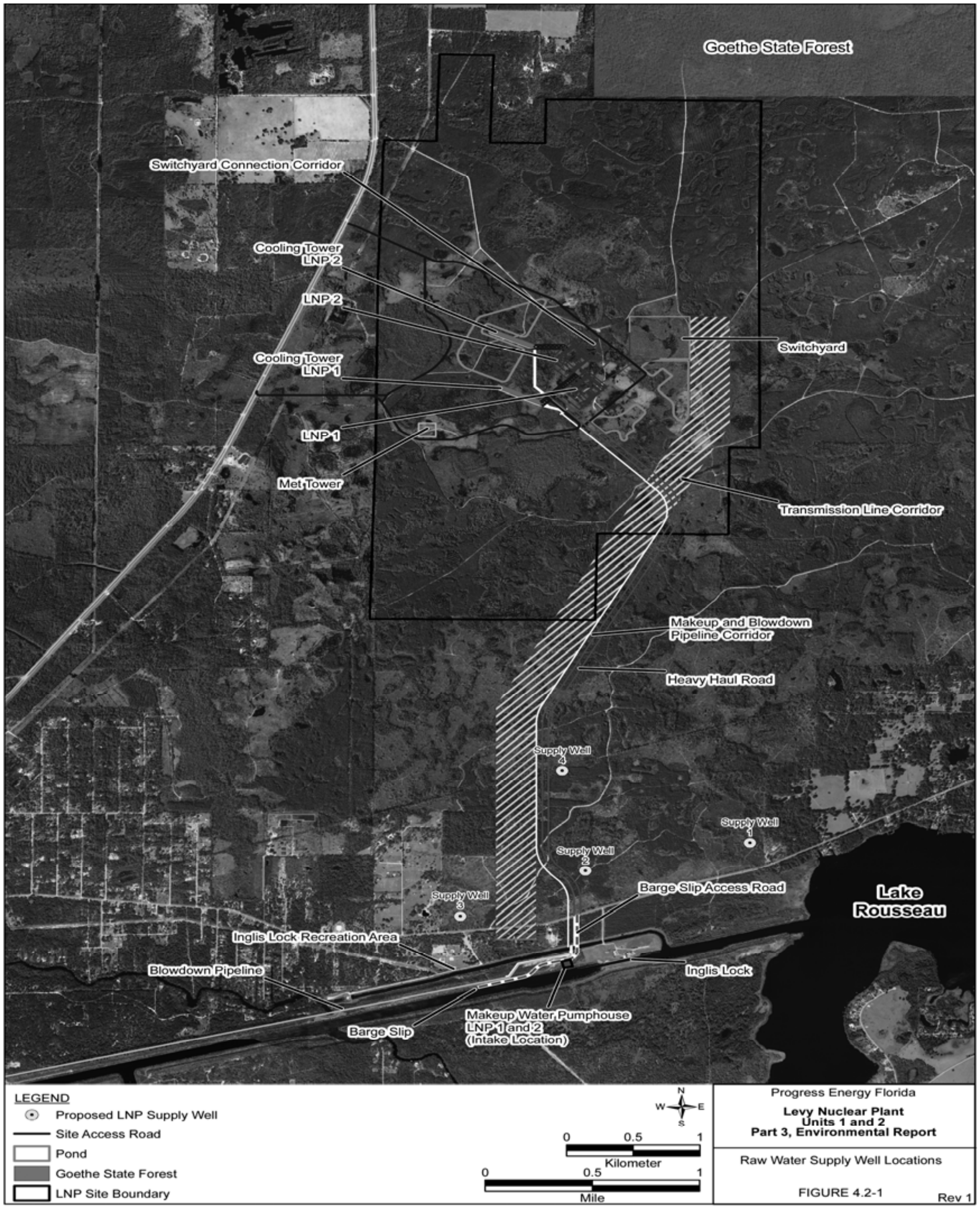

Figure 3-2. LNP Site Map (PEF 2009a)

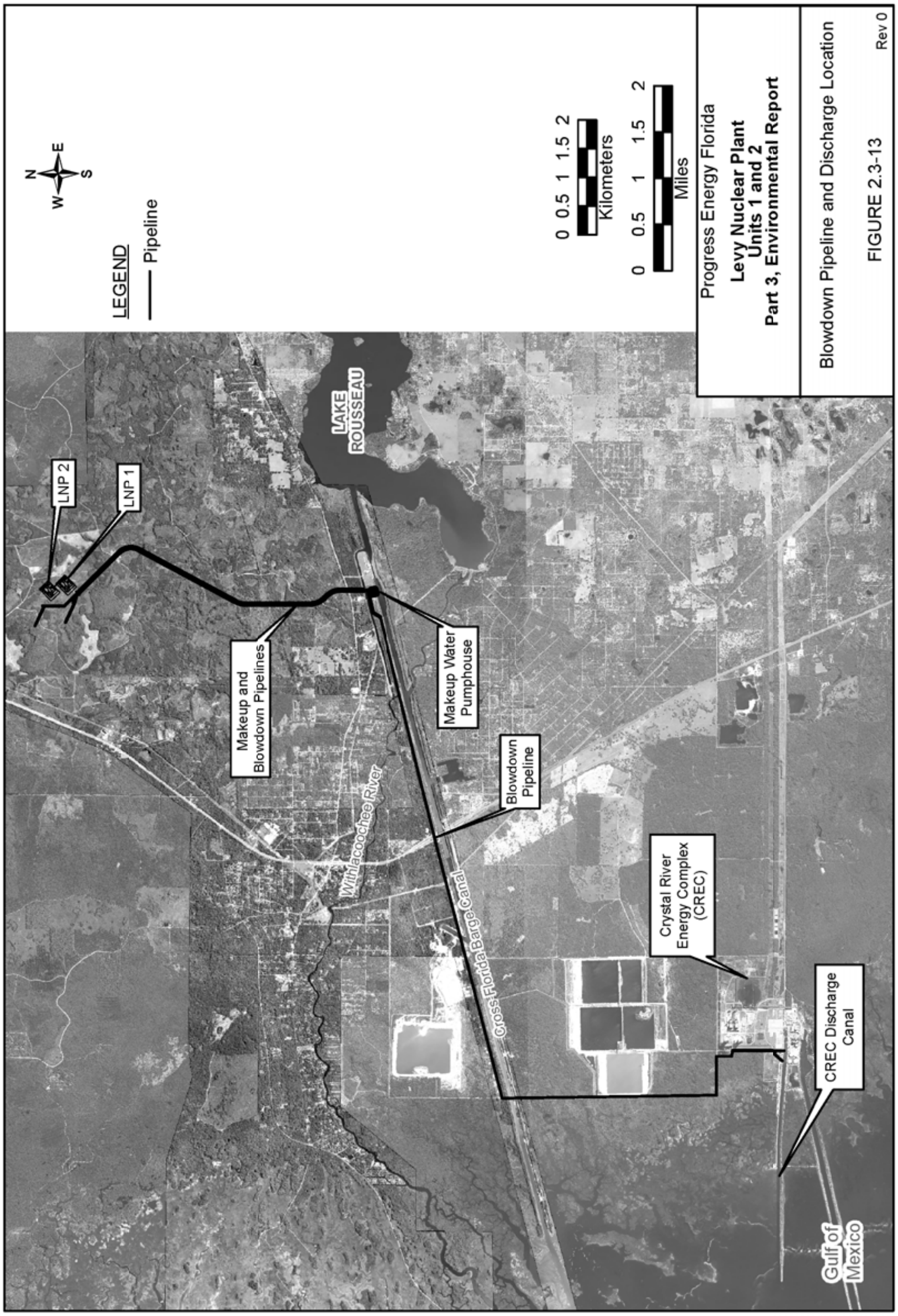

Figure 3-2. Blowdown Pipeline and Discharge Location (PEF 2009a)

Wetlands occur over about two-thirds (2002 ac) of the LNP site. The most common wetland community present consists of pine (mostly slash and loblolly) tree plantations established in seasonally or permanently saturated or shallowly inundated soils (termed wet planted pine), which constitutes about 41 percent of onsite wetlands. Most wetlands on the LNP site have been altered by years of intensive forest management that has included the conversion of native habitats to planted pine plantations, extensive soil disturbance, and modifications of localized drainage patterns. These tree plantations mostly occupy wetter portions of former pine flatwoods and drier portions of former wetlands that have been substantially altered for commercial pine production. Forested wetland swamps (cypress swamps, mixed wetland hardwood forests, and wetland forest mixed stands) constitute another 44 percent of onsite wetlands. Forested wetlands on the site have been logged to varying degrees and range in condition from relatively intact natural forest stands to remnant stands made up of only scattered trees interspersed with herbaceous or scrub vegetation or planted pine saplings. A feature termed treeless hydric savanna, representing about 14 percent of onsite wetlands, constitutes recently clearcut or heavily logged wetland forest stands not yet replanted. Freshwater marshes and wet prairies are less common on the LNP site.

Wildlife populations and habitat on the LNP site have been altered by years of intensive forest management that has converted native forests to planted pine plantations, especially in uplands and drier edges of wetlands. These actions have produced artificially simplified habitats lacking large mature trees, well-developed understory, and other habitat features (e.g., large snags, large woody debris) needed to support a wide assemblage of native wildlife. Nevertheless, the interspersion of wetlands, hardwoods, managed pine stands, and recent clear-cuts provides habitat for many common wildlife species, especially those adapted to early successional stages and frequent landscape disturbance. Wildlife that require mature forest conditions and large blocks of unfragmented habitat are expected to be uncommon. While most mammals, amphibians, and reptiles present are year-round residents, many of the bird species represent individuals that may seasonally migrate to or through this region, including neotropical migrants. A branch of the eastern Atlantic Flyway crosses the region (Birdnature.com 2009).

PEF completed pedestrian surveys on the LNP site between October 2006 and November 2008 to characterize onsite habitats and document the presence of wildlife (PEF 2009g). Direct observations of wildlife, as well as wildlife signs (e.g., scat, tracks), were recorded (PEF 2009a). The Florida Natural Areas Inventory (FNAI) and Florida Fish and Wildlife Conservation Commission (FFWCC) compile and maintain comprehensive databases of biological resources in Florida, including documented occurrences of Federally listed species. The FNAI Occurrence Report generated for the LNP site identified several protected species (e.g., eastern indigo snake and Florida scrub jay) known to occur in the vicinity of the LNP site (FNAI 2009). Although there were no documented occurrences of protected species on the LNP site, both reports identified the site as having the potential to provide habitat for several protected species.

Pedestrian surveys on the LNP site completed by PEF provided additional information about the presence of protected plants and animals and/or their habitats on the LNP site (PEF 2009a, h). No targeted surveys for Federally protected species were completed on the LNP site and critical habitat for threatened and endangered species was not identified; however, there are State sanctuaries, preserves and other lands in the vicinity that have priority protections. There are also jurisdictional wetlands on and in the vicinity of the LNP site.

A condition of certification by the FDEP (2010) would require protocol surveys for all State-listed species (excluding plants) that may occur on the LNP site and associated offsite facilities prior to land "clearing and construction". If listed species are identified during predevelopment surveys or are encountered during development, this condition of State certification by FDEP also requires PEF to consult with the FFWCC to determine the need for appropriate mitigation (FDEP 2010).

3.2 Aquatic Habitats – Site and Vicinity

As described in the following sections, site-related aquatic resources are found in the CFBC, OWR (a remnant arm of the Withlacoochee River), and Crystal Bay.

3.2.1 Cross Florida Barge Canal

In an effort to provide maritime navigation between the Atlantic Ocean and the Gulf of Mexico, construction of a 12-ft-deep by 150-ft-wide Florida cross-peninsular waterway began in the mid-1930s (Noll and Tegeder 2003). Originally intended to be a 171-nautical-mi canal, only 4 percent was complete by 1965 due to lack of funding and congressional support for several decades. Official deauthorization for the barge canal came in 1991, and the Cross-Florida Greenway State Recreation and Conservation Area took over the former barge canal properties. The section of the CFBC affiliated with the proposed action is the 7.4-mi stretch from Inglis Lock west to the Gulf of Mexico. It ranges from 8.6 to 18.2-ft deep and from 207 to 262-ft wide. The Inglis Dam was built in 1909 to impound the Withlacoochee River to form 3700-ac Lake Rousseau. An approximately 1.5-mi portion of the historical downstream segment of the Withlacoochee River below Inglis Dam still runs into the western CFBC below the Inglis Lock (Figure 3-4). A 1.7-mi channel was constructed upstream of the Inglis Lock to reconnect Lake Rousseau waters with the downstream,11-mi portion of the Withlacoochee River, which serves as a bypass around the CFBC. The western portion of the CFBC lies 8 mi to the south of the proposed LNP and is the preferred water source for providing cooling water (Figure 3-4).

The CFBC discharges into the Withlacoochee Bay estuary in the Gulf of Mexico and is influenced by tidal changes. Water-quality characteristics show a wedge of saltwater extending

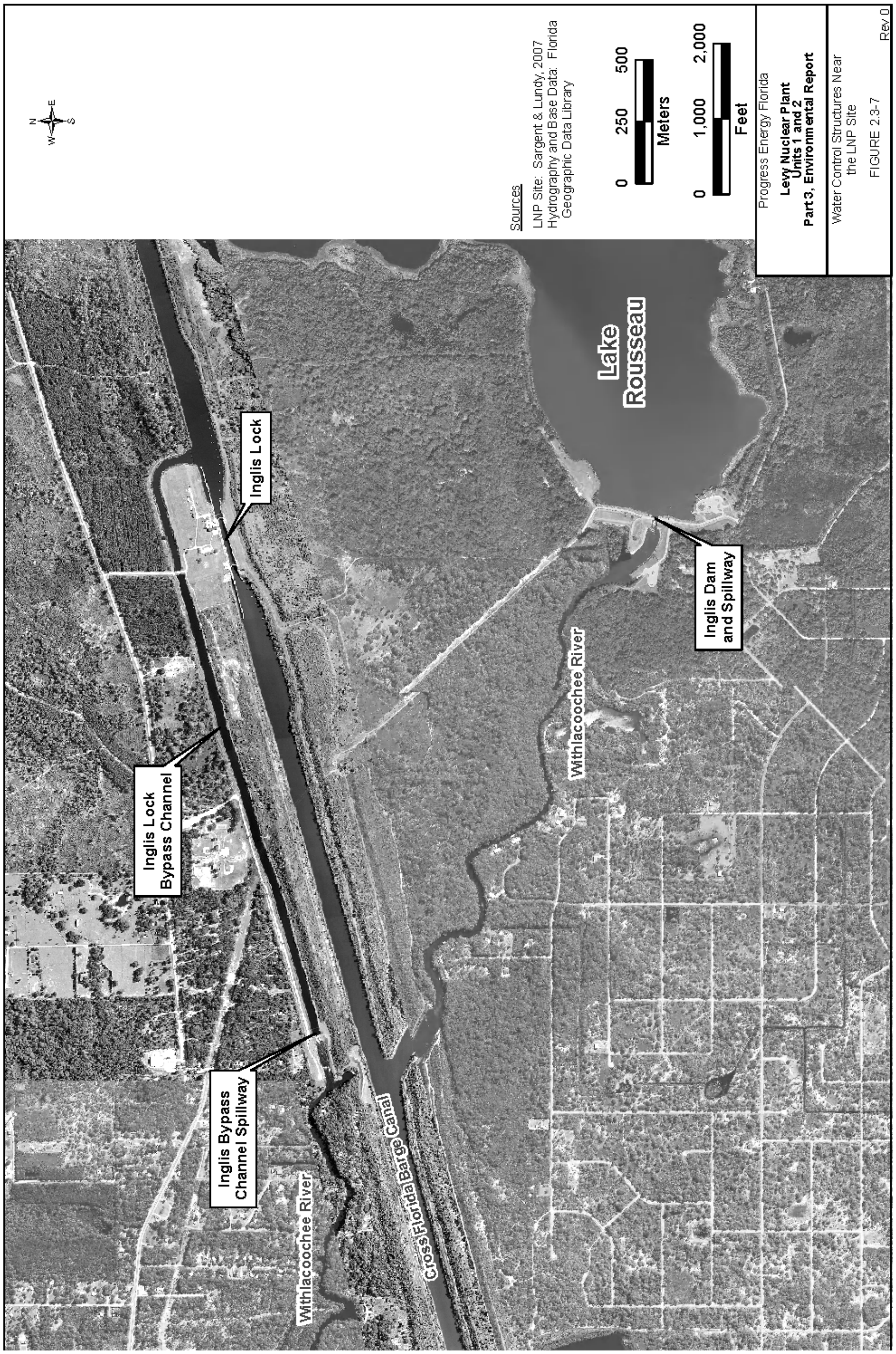

Figure 3-4. Water Control Structures Associated with Lake Rousseau (PEF 2009a)

from the surface waters where the CFBC meets the Gulf of Mexico toward the Inglis Lock. Characterization of the sediment, salinity, and CFBC biota was conducted over a year of sampling activities from October 2007 through September 2008, and is described further in EIS Section 2.4.2. Overall, fish, plankton, benthic, and macroinvertebrate sampling in the CFBC indicates a biologically diverse and dynamic aquatic community at the offshore and nearshore stations (see EIS Tables 2-9, 2-10, and 2-11). The proposed intake location on the CFBC has a less biodiverse community, but it still has appreciable numbers of sediment-dwelling invertebrates and collections of pelagic species that use the fresher water habitat on a seasonal basis (CH2M Hill 2009b).

3.2.2 Old Withlacoochee River

The OWR that flows into the CFBC is 1.3 mi long and originates from Lake Rousseau's Inglis Dam. Salinity profiles in the OWR range from 0.14 to 4.38 practical salinity units (psu) at the 3.2-ft depth where it joins with the CFBC. In June and August 2008, sampling was conducted at the junction of the OWR with the CFBC to downstream of the Inglis Dam within this portion of the OWR (Figure 3-4). Benthic macroinvertebrate sampling mirrored the fish-sampling results with euryhaline dipteran species predominant at the CFBC-OWR junction station, freshwater oligochaetes and amphipods at the Inglis Dam station, and a paucity of organisms and limited diversity at the midpoint station (CH2M Hill 2009a).

3.2.3 Crystal Bay (Gulf of Mexico)

Aquatic species and habitats associated with the discharge from CREC into Crystal Bay have been characterized using studies conducted during CREC operation (Stone and Webster 1985). Aquatic resources were recently sampled from April through November 2008. Beginning in the early 1990s, seagrass beds have been surveyed as a part of quantifying recovery of the CREC offshore Gulf of Mexico habitats following installation of helper cooling towers (Estevez and Marshall 1993, 1994, 1995). Previously affected seagrass areas were observed to recover with colonization by *Halodule wrightii*, a dominant, quick-growing seagrass. However, between 1995 and 2001, overall seagrass abundance declined, likely from more complex environmental influences (Marshall 2002).

Sampling at the CREC discharge point (Station 3) and immediate offshore Gulf of Mexico area (Station 4) was conducted at multiple time points from April to November 2008 (Figure 3-5). Fish, plankton, and macroinvertebrate sampling in the CREC discharge area of Crystal Bay (Figure 3-5) are indicative of coastal salt marsh and nearshore species and show biodiversity commensurate with similar habitat sampling at the mouth of the CFBC (EIS Tables 2-9, 2-10, and 2-11). However, the influence of CREC discharge may be affecting several of the top forage fish species that are notably absent (bay anchovy, scaled sardine, and silver perch) from the CREC discharge stations. .

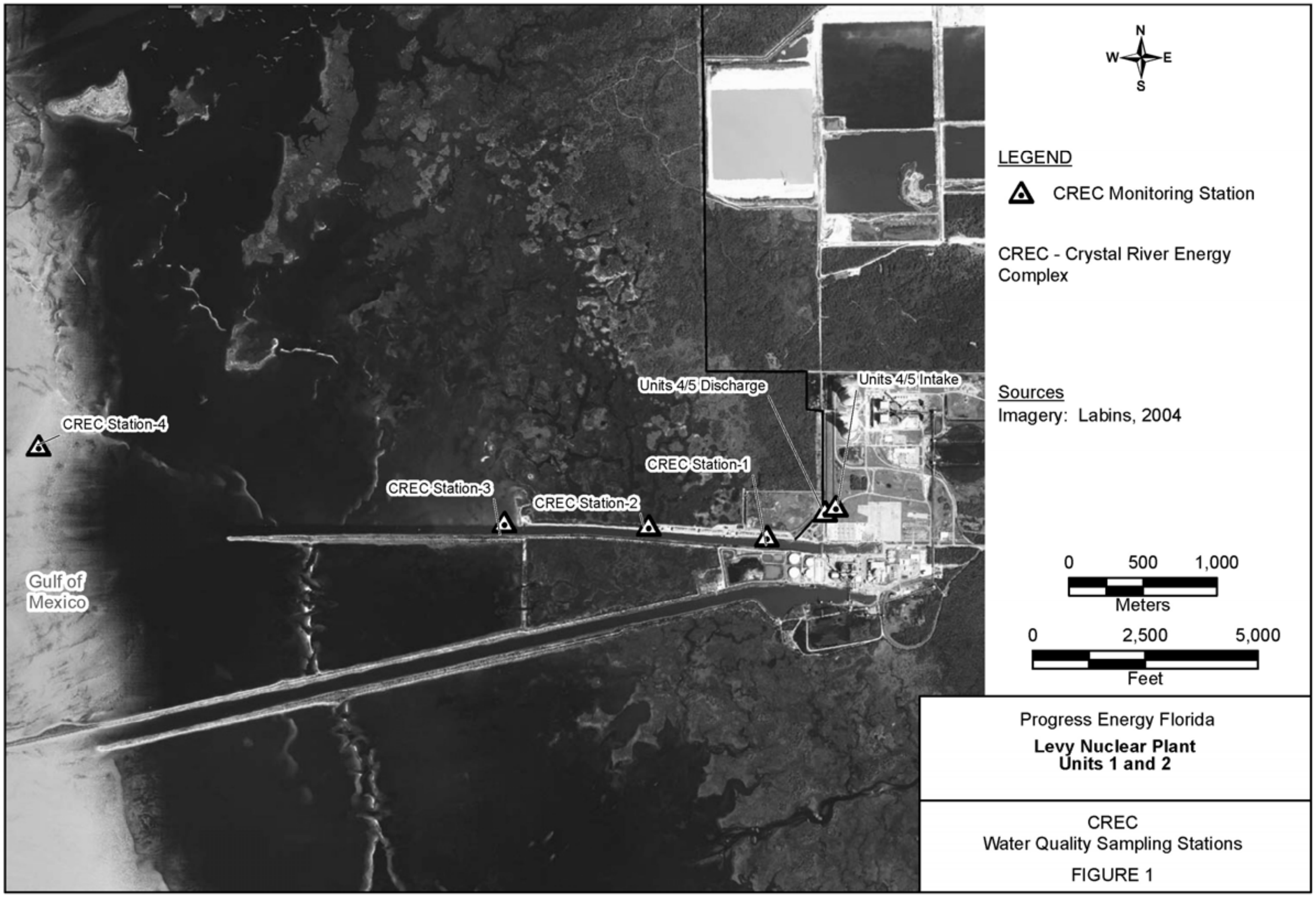

Figure 3-5. Aquatic Sampling Locations for CREC (CH2M Hill 2009b)

3.3 Terrestrial and Aquatic Habitats – Offsite Corridors Including Transmission Lines

Pursuant to the Florida Power Plant Siting Act (PPSA), PEF (2009a, 2008a) has identified corridors for the linear facilities associated with the LNP. The heavy-haul road, makeup-water pipeline, and a portion of the blowdown pipeline would be built in a new common 0.25-mi-wide by 2-mi-long corridor that would extend from the southern boundary of the LNP site to the CFBC (see Figure 3-3). The barge slip and CWIS would be built within this corridor as well. A pipeline for disposal of station blowdown would be built in a new 0.25-mi-wide by 11-mi-long corridor that would extend from the CFBC to the CREC (Figure 3-3). PEF petitioned the State of Florida on April 29, 2010 for a modification to the currently certified corridor for the heavy-haul road, cooling-water makeup pipelines and the blowdown pipelines to be constructed between the LNP site and the CREC (PEF 2010). The purpose of the modification is to provide more flexibility in minimizing impacts to wetlands and other natural resources, including Federally listed species, when siting these facilities, to reduce the use of State-owned lands along the CFBC, and to minimize disruption of recreational activities along the CFBC. Final rights-of-way widths for each facility to be located within the corridor would remain the same.

The delivery of power associated with LNP Units 1 and 2 would require upgrading existing transmission-line corridors and installing new corridors, transmission lines, and substations (Figure 3-6). PEF is responsible for identifying the proposed locations associated with new and upgraded transmission lines. The Florida PPSA provides for the certification of "corridors" within which linear facilities associated with an electrical power plant, such as proposed transmission lines, must be located. Once the final rights-of-way have been approved by the State and acquired, the boundaries of the corridors would be revised to those of the acquired rights-of-way. No on-the-ground surveys for threatened and endangered species were conducted in the associated offsite corridors (including transmission-line corridors). A condition of certification by the FDEP (2010) would require protocol surveys for all State-listed species (excluding plants) that may occur on the LNP site and associated offsite facilities prior to land "clearing and construction". If listed species are identified during predevelopment surveys or are encountered during development, this condition of State certification by FDEP also requires PEF to consult with the FFWCC to determine the need for appropriate mitigation (FDEP 2010).

Systematic terrestrial and aquatic surveys are not included as part of the transmission-line site-selection process. In the absence of empirical data, reconnaissance-level information pertaining to species designated as Federally endangered or threatened associated with the counties in which the transmission lines would occur was derived from the FWS and other records.

Approximately 91 mi of the transmission lines would be four new 500-kV transmission lines that extend from the southern boundary of the proposed LNP site to the first substation for each line.

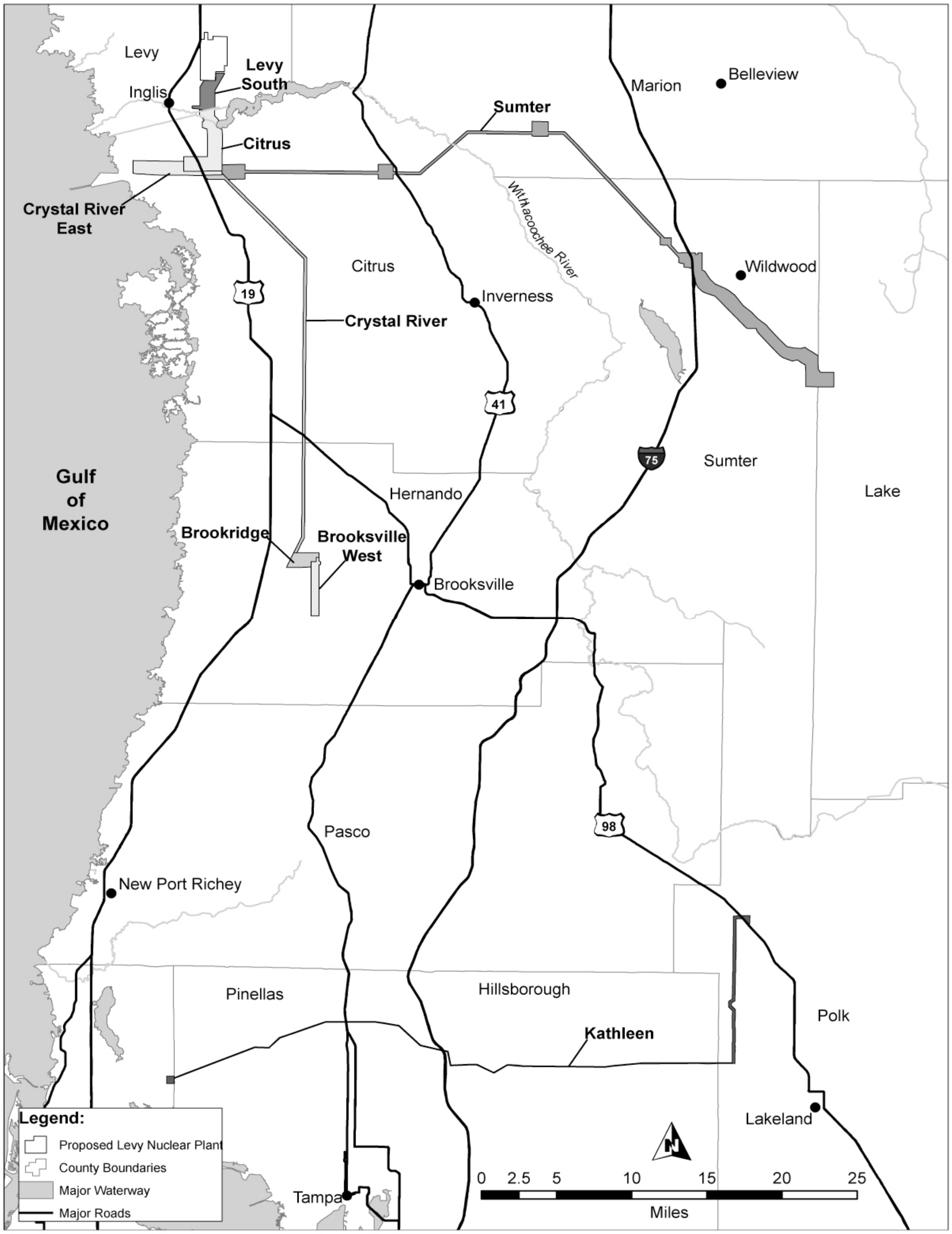

Figure 3-6. Locations of the Proposed Transmission-Line Corridors and Substations for the LNP Site (PEF 2009d)

Two of these 500-kV transmission lines would connect to the proposed Citrus substation, one to the proposed Central Florida South substation, and the last to the CREC 500-kV switchyard (PEF 2008a, 2009a; Golder Associates 2008). All four transmission lines would be collocated in a common corridor from the proposed LNP site to the Citrus substation area, which would require clearing within a 7-mi-long by 1-mi-wide common corridor to site the transmission lines. Most of the remaining 500-kV transmission line extending east to the proposed Central Florida South substation would be collocated with existing PEF transmission lines in a 1000-ft-wide corridor. However, new corridor clearing would be required to site the final 13.5 mi within a 1-mi-wide corridor near Interstate 75 and the Florida Turnpike. The connection of the 500-kV transmission line to the CREC switchyard would follow existing PEF transmission lines, within a 1-mi-wide corridor, for the remaining 6 mi west from the proposed Citrus substation area (PEF 2008a, 2009a; Golder Associates 2008). Connection from the proposed LNP site to the Citrus substation corridor would cross the Withlacoochee River bypass channel, CFBC, and the OWR. Connection of the CREC switchyard to the new Citrus substation would cross existing corridors over estuarine habitat within Crystal Bay.

Additional transmission lines (approximately 89 mi) extending beyond the first substations would be required to link to the electrical grid. Two 230-kV lines would extend from the proposed Citrus substation to the existing Crystal River East substation, a 230-kV line would extend from the CREC switchyard to the Brookridge substation, another 230-kV line would extend from the Brookridge substation to the Brooksville West substation, and the last 230-kV line would extend from the existing Kathleen substation to the Griffin substation then beyond to the Lake Tarpon substation (PEF 2008a, 2009a; Golder Associates 2008). This last corridor crosses the following Outstanding Florida Waters: Blackwater Creek, Trout Creek, the Hillsborough River, and Cypress Creek (PEF 2008a). Other waterbodies include Flint Creek, tributaries of Hollomans Branch, Brushy Creek, Rocky Creek, and numerous unnamed intermittent and perennial tributaries of the previously named waterbodies. Two additional 69-kV lines would be required to support construction at the proposed LNP site and would connect to existing 69-kV lines from the western and the southern boundaries of the LNP site (PEF 2008a, 2009a; Golder Associates 2008). Existing and new corridors extending to the proposed Central Florida South substation would cross the Withlacoochee River at the border of Citrus and Marion Counties and Two Mile Prairie Lake (PEF 2009a).

Corridor segments beyond the first substations include 38 mi, mostly collocated with existing PEF transmission lines from the CREC switchyard to the existing Brookridge substation (corridor width of 1000 ft widens to 1 mi at endpoints). Another 3 mi of corridor (0.5-mi wide) would be collocated with existing PEF transmission lines from the Brookridge substation to the Brooksville West substation. The transmission line extending 50 mi from the Kathleen substation to the Griffin substation, and west to the Lake Tarpon substation, would be collocated with existing PEF transmission lines in a corridor ranging from 300- to 1000-ft wide. Although a specific location for the proposed Citrus substation has not yet been finalized, connection to the existing Crystal River East substation would require new transmission lines sited somewhere within a corridor less than 2.7 mi long and 1 mi wide (PEF 2008a; Golder Associates 2008).

Many areas within the corridors have been altered by prior land uses, such as residential development, forest management, agriculture, and utility development. Nevertheless, various upland, wetland, and aquatic habitats are present. The vegetation cover within corridors up to the first substation reflects the past level of human-induced change that has occurred across the landscape. Much of the historical vegetation on and around the corridors has been cleared or altered for land uses such as agriculture, residential development, forest management, utilities, and for roads and highways. The predominant upland cover types present include disturbed habitats such as cropland and pastureland, utilities, open land, low-density residential and coniferous plantations. However, substantial blocks of relatively undisturbed mixed hardwood-conifer forest are present, along with smaller stands of longleaf pine-xeric oak forest, pine flatwoods, and upland coniferous forest (PEF 2009a).

Almost 2800 ac of forested and herbaceous wetlands are present within corridors up to the first substation. Of these, freshwater marshes, streams and lake swamps, and mixed forested wetlands are the most prevalent. Wetlands range in quality from those exhibiting well-developed floristic and structural characteristics that provide valuable wildlife habitat, such as wetlands adjacent to the Withlacoochee River and Lake Rousseau, to freshwater marshes located within transmission-line corridors and pastures that have reduced functionality due to past and ongoing disturbance (e.g., tree canopy removal, drainage alteration, livestock grazing) (PEF 2008a). Other wetland habitats noted include cypress swamps, wet prairies, saltwater marshes, and intermittent ponds. Aquatic habitats present within corridors up to the first substation include the CFBC, the Withlacoochee River, small unnamed tributaries, reservoirs, small lakes, bays, and estuaries.

Cover types present within the corridors beyond the first substation also reflect a high level of past human-induced change, with much of the historical vegetation on and around the corridors cleared or altered for residential development, utilities, and agriculture. The predominant upland cover types present in the corridors include disturbed habitats such as low-density residential, utilities, open land, and cropland and pastureland, as well as relatively undisturbed longleaf pine-xeric oak forest. Other upland cover types noted include small areas of mixed hardwood conifer forest, coniferous plantations, shrub and brushlands, and pine flatwoods. Predominant wetland cover types present are freshwater marsh, cypress swamps, stream and lake swamps, and mixed wetland forest (PEF 2009a). Freshwater marshes located within transmission-line corridors and pastures have reduced functionality due to past and ongoing disturbance (e.g., tree canopy removal, drainage alteration, livestock grazing) (PEF 2008a). The existing and proposed transmission corridors do not cross any designated aquatic critical habitats.

A wide variety of wildlife common to west-central Florida is expected to occur within corridors supporting associated offsite facilities. Wildlife diversity is expected to be greatest within corridors that support an interspersion of native upland, wetland, and aquatic habitats; and less in disturbed or developed lands. Habitats identified within corridors expected to provide higher value habitat for wildlife include mixed hardwood-conifer forest, longleaf pine-xeric oak forest, streams and lake swamps, mixed forested wetlands, salt marsh, wet prairie, pine flatwoods, cypress swamps, and upland conifer forests (Golder Assoicates 2008, PEF 2009a, FDEP 2010). Lower-quality wildlife habitat is represented by areas cleared for utilities, roads, agriculture and residential development; disturbed habitats such as pastureland, open land, other open land (rural) and coniferous plantations abundant along some corridors; and disturbed freshwater marshes located in utility corridors and on adjacent pastureland.

Limited surveys for wildlife have occurred within corridors supporting associated offsite facilities. Pedestrian and vehicular field reconnaissance of accessible areas was conducted to verify and update the distribution of cover types (PEF 2008a, 2009a, h; Golder Associates 2008). Information about wildlife and wildlife habitat was also collected during the surveys, with most effort directed toward important species. The corridor segment between the LNP site and the CFBC received the most investigation because much of this property has been purchased by PEF. The extent-of-ground reconnaissance was much lower for the long corridor segments that would support the transmission lines.

4.0 Terrestrial Construction Impacts

4.1 Site and Vicinity

Impacts on Federally listed threatened and endangered species from construction on the LNP site would include loss of habitat (temporary and permanent), presence of humans, heavy equipment operation, traffic, noise, avian collisions, outdoor lighting, and fugitive dust. These activities would likely displace or destroy wildlife that inhabits the development areas. Larger and more mobile animals would likely flee the area, while less mobile animals such as reptiles, amphibians, and small mammals would be at greater risk of incurring mortality. Although the surrounding forest and wetland habitat would be available for displaced animals, the movement of wildlife into surrounding areas would increase competition for available space and could result in increased predation and decreased fecundity for certain species. These conditions could lead to a temporary localized reduction in population size for particular species. When site-preparation and construction activities are completed, species that can adapt to disturbed or developed areas may readily re-colonize portions of the site where suitable habitat remains, is replanted, or restored.

Most impacts would occur near the center of the site where the two reactors and ancillary power production facilities would be built. Additional impacts would extend to the southeast corner of the site within a corridor supporting the heavy-haul road, the blowdown and makeup pipelines, and four 500-kV transmission lines. Intensive commercial forest management over many decades has substantially altered terrestrial habitats throughout the site.

Development of LNP facilities would require permanent or temporary disturbance or removal of existing vegetation from approximately 777 ac (25 percent) of the LNP site. Impacts would result from clearing and grubbing, grading, excavation, and the placement of fill. Permanent losses would account for about 627 ac, with impacts on habitat that have been altered by commercial forest management accounting for the greatest losses. Approximately 278 ac of coniferous plantations and 135 ac of wet planted pine would be lost, as well as 74 ac of treeless hydric savanna and 31 ac of other open lands, rural recently clear-cut, but not yet replanted with trees. Permanent impacts on natural cover types (those not substantially influenced by commercial forest management) would be greatest for cypress swamps (54 ac), and wetland forested mixed (29 ac). Permanent impacts on the remaining natural cover types onsite would be minimal.

Temporary impacts would occur on about 150 ac of the site, primarily on cover types that have been altered by commercial forest management, including coniferous plantations (57 ac), wet planted pine (40 ac), treeless hydric savanna (19 ac), and other open lands (9 ac). Temporary impacts on natural cover types onsite would be greatest for cypress (14 ac) and wetland forested mixed (7 ac). Impacts on other natural cover types would be relatively minor. Temporarily disturbed areas would be regraded to pre-existing contours after site-development activities have ceased. Uplands would be seeded in accordance with project-developed sedimentation and erosion control plans, while wetlands would be allowed to regenerate naturally from the existing wetland seed bank (PEF 2009e, h).

Wetlands make up about 64.5 percent (2002 ac) of the 3105-ac LNP site. Approximately 319 ac of wetlands on the LNP site would be permanently filled, representing a permanent loss of approximately 16 percent of the total wetlands onsite. Impacts on wetlands from project development activities on the LNP site would include filling, erosion, sedimentation, alterations to hydrology, and the clearing of vegetation. Wetlands located within and adjacent to the areas where site-preparation activities occur may be subject to three general types of impacts: (1) permanent fill impacts converting wetlands to developed uplands, where all wetland functions are lost indefinitely; (2) temporary disturbance impacts where some or all wetland functions are restored after site development is completed; and (3) partial impacts from the clearing of trees along final transmission-line rights-of-way where nonforested wetland functions would be maintained. Wetlands subject to temporary impacts would be regraded to pre-existing contours after site development has ceased and allowed to regenerate naturally from the existing wetland seed bank (PEF 2009e, h). Review by the USACE and FDEP of wetland delineations performed by PEF's consultants is ongoing. Final approvals of the determination of the presence of jurisdictional waters, including the delineation of wetlands, are expected from the USACE and FDEP by the end of 2010.

Temporary, localized dewatering impacts on wetlands could occur during excavation of the powerblocks for proposed LNP Units 1 and 2. Dewatering of the 75-ft-deep foundation excavations would be required to build each proposed powerblock. Measures would be taken prior to excavation to isolate and seal the dewatering areas and minimize inflow into the excavations. An impervious reinforced diaphragm wall would be installed around the perimeter of each excavation, and the underlying bedrock would be sealed by drilling and pressure grouting (PEF 2009c). Over a roughly 2-year period, inflow and stormwater from within the excavations would be intermittently pumped for each nuclear island and discharged to an infiltration basin sized for the estimated flow rate (PEF 2008a, 2009e, h). These actions are expected to prevent significant drawdowns from occurring in the surficial aquifer system surrounding the excavations that supports hydrologically connected adjoining wetlands (PEF 2009e). No long-term changes to local groundwater levels would occur as a consequence of dewatering during construction (i.e., groundwater would return to pre-disturbance levels after dewatering ceases).

Temporary, localized dewatering of wetlands would also be necessary to install the blowdown and makeup pipelines and some other facilities (PEF 2009c). Dewatering of wetlands traversed by the pipeline excavations would occur in a segmented manner, with excavation, pipe installation, and backfill occurring in short duration. Pumped water would be discharged to infiltration basins sited between the excavation and adjacent wetlands to create a groundwater mound that would minimize impact on wetlands. Because of the short duration of dewatering, the shallow depth of the excavations, and the groundwater recharge achieved through groundwater mounding, no long-term impact on wetlands would be expected from pipeline installation. In deeper excavations, such as for the turbine building and the circulating-water system, pumped water would be discharged to infiltration basins to recharge adjacent wetlands. PEF has committed to monitoring of adjacent surface and groundwater levels to ensure the dewatering impacts are minimized. If any detrimental impact on water levels supporting adjacent wetlands were detected during monitoring, mitigative measures, such as drilling and grouting, sheeting, or re-design of the recharge basins, would be implemented (PEF 2009e)

Wetlands in the LNP vicinity are adapted to a range of seasonal and annual variability in groundwater levels, including periodic drought. No long-term adverse impacts on adjacent wetlands would be expected from dewatering during site development. PEF would be required to prepare a dewatering plan to be approved by the Florida Department of Environmental Protection (FDEP) and Southwest Florida Water Management District (SWFWMD). The plan would include details of the dewatering system, discharge quantities and location, a monitoring plan, and other details as appropriate to demonstrate that it meets the State of Florida Conditions of Certification (FDEP 2010) and complies with all applicable Environmental Resource Permit (ERP) dewatering requirements.

Authorization to affect wetlands on the LNP site would require a Clean Water Act Section 404 permit issued by the USACE and an ERP issued by the State of Florida. In Florida, the ERP application serves as a joint Federal/State permit application to affect wetlands. PEF submitted an ERP in June 2008 as part of the Site Certification Application, initiating the Section 404 and State permitting processes. PEF is required under the Federal and State permitting processes to avoid or minimize wetland impacts to the extent practicable and to mitigate for all unavoidable wetland impacts. The Section 404 permit would also require a Clean Water Act Section 401 Water Quality Certification issued by the FDEP to control the discharge of water caused by site-development activities.

Approximately 75 percent, or 2333 ac, of the LNP site would remain undeveloped, providing a vegetated buffer around the centrally located LNP facilities. Intensive commercial forest management would cease in much of these buffer areas, and pine plantations and other disturbed habitats would be rehabilitated and restored through a series of vegetative management and restorative processes to plant communities more functionally similar to native upland and wetland habitats likely present prior to logging (PEF 2010). PEF would manage most of these lands for wetland mitigation, wildlife habitat, and aesthetic enhancement using a combination of selective tree thinning, prescribed fire, and hydrologic restoration to achieve high ecological value.

4.1.1 Associated Offsite Facilities Including Transmission Lines

4.1.1.1 Associated Offsite Facilities

The development of the associated offsite facilities includes the heavy-haul road; barge slip and barge slip access road; makeup-water and blowdown-water pipelines; cooling-water intake; and transmission lines. For the purposes of this analysis, all impacts that lie within the zone of disturbance (i.e., the development footprint) are treated as permanent impacts. Temporary impacts are represented by a 50-foot buffer adjacent to the pipeline corridor and heavy-haul road between the LNP site and the CFBC. All impacts associated with the transmission lines are treated as permanent impacts.

The locations where associated facilities would be sited are known for all facilities except the transmission lines and their substations. PEF petitioned the State of Florida on April 29, 2010, for a modification to the currently certified corridor for the heavy-haul road, cooling-water makeup pipelines, and the blowdown pipelines to be constructed between the LNP site and the CREC (PEF 2010). The purpose of the modification is to provide more flexibility in minimizing impacts on wetlands and other natural resources when siting these facilities, to reduce the use of State-owned lands along the CFBC, and to minimize disruption of recreational activities along the CFBC. Final right-of-way widths for each facility to be located within the corridor would remain the same.

Development of the associated facilities would result in permanent and temporary impacts on vegetative communities, including wetlands. Impacts for associated facilities, including those listed above, would be the permanent loss of approximately 219 ac. Upland communities such as coniferous plantations, open land, and mixed hardwood/conifer forest would be the primary habitat types lost. Permanent wetland losses (all due to fill) would total approximately 32 ac of mostly cypress swamps and freshwater marsh habitats (PEF 2009a). This wetland loss acreage may change once wetland delineations have been completed in these areas and jurisdictional determinations are reached by the USACE and FDEP.

Temporary impacts for associated facilities would affect another approximately 30 ac of vegetation cover types within a 50-ft buffer adjacent to the heavy-haul road and makeup-water and blowdown pipelines (PEF 2009a). This 50-ft buffer may be affected by activities such as the temporary placement of materials and a roadway (PEF 2009c). Most temporary impacts would involve cover types previously altered by land-management activities, including coniferous plantations and other open lands (rural), which represent unclassified agricultural land. Temporary wetland impacts would total 6.0 ac, with small impacts occurring on cypress, freshwater marshes, and wetland forested mixed cover types. Temporarily disturbed sites would be regraded to pre-existing contours after development activities have ceased. Uplands would be seeded in accordance with project-developed sedimentation and erosion control plans, while wetlands would be allowed to regenerate naturally from the existing wetland seed bank (PEF 2009c, e).

4.1.1.2 Transmission Lines

In compliance with the PPSA, PEF has identified corridors (300 ft to 1 mi wide) within which the transmission lines and their substations would be sited (PEF 2008a, 2009a). More than 90 percent of the new transmission lines would be collocated with existing PEF transmission lines (PEF 2009i). PEF expects to acquire 220-ft-wide rights-of-way for the proposed 500-kV transmission lines and 100-ft-wide rights-of-way for the proposed 230-kV transmission lines (Golder Associates 2008). Once the final rights-of-way have been selected and approved by the State, FDEP would require PEF to complete on-the-ground terrestrial ecology surveys along the rights-of-way so that unavoidable impacts to threatened and endangered species from development of the transmission lines can be fully accounted for and mitigated (FDEP 2010).

The amount of impact on vegetation cover types and wetlands is roughly estimated to be 1510 ac for transmission lines up to the first substation and 279 ac for transmission lines beyond the first substation (PEF 2009a). These estimates were derived using preliminary rights-of-way locations for the proposed transmission lines within the identified corridors (PEF 2009c; Golder Associates 2008). For purposes of this analysis and to provide a conservative estimate of mitigation needs, all impacts associated with transmission-line development were assumed to be permanent (i.e., temporary impacts were treated as permanent impacts). Impacts on cover types and wetlands for transmission lines beyond the first substation are much less than those estimated for transmission lines up to the first substation because most of these lines would be collocated within existing rights-of-way that already have been cleared (PEF 2009i).

Under the PPSA, the final impacts resulting from transmission-line development would be determined through a post-certification process after the final rights-of-way have been selected and approved by the State. To comply with USACE and FDEP regulatory requirements, PEF is obliged to minimize impacts on wetlands and waterbodies while siting final transmission-line rights-of-way and during development of the lines. Transmission-line activities generally would entail erosion control, corridor clearing and site preparation, placement of foundations, assembly and erection of structures, and installation of conductors. Clearing of vegetation from the selected rights-of-way would account for most of the terrestrial and wetland impacts. Because the selected rights-of-way would be narrow (100 to 220 ft wide) and collocated with existing transmission lines over about 90 percent of their distance (PEF 2009e; Golder Associates 2008), the required clearing would be greatly minimized. Wherever existing corridor widths are insufficient for the proposed transmission lines, additional clearing would be necessary. Based on cover type mapping for the identified transmission-line corridors, the most affected upland cover types would be hardwood conifer mixed, coniferous plantations, and longleaf pine-xeric oak forest. Cypress and freshwater marshes would be the most affected wetland cover types (PEF 2009a).

Clearing of vegetation for final transmission-line rights-of-way would be dependent upon pre-existing site conditions, environmental constraints, and line design requirements (PEF 2009a; Golder Assoicates 2008). Vegetation in uplands would be cleared to ground level, stumps would be treated and/or removed, and vegetation would be mulched onsite or burned in compliance with local fire regulations (PEF 2009a; Golder and Associates 2008). As stated by PEF (2009a) and Golder Associates (2008), wetland vegetation would be cleared by hand using chain saws or low-ground pressure shear or rotary machines to reduce soil compaction and minimize damage to retained vegetation. Trees and vegetative growth with a mature height greater than 12 ft would be removed from the final rights-of-way. Other wetland vegetation (outside of access road and structure pad areas) would be left in place. Removed trees would be cut as low as possible and treated with an approved herbicide. Debris would be removed from wetlands using either low-ground pressure equipment or temporary wetland construction mats and disposed of in upland areas.

Clearing for the final transmission-line rights-of-ways would constitute only a partial loss of wetland function because, although trees and tall vegetation would be removed, nonforested wetland functions would be maintained. However, some wetlands may have to be filled to install access roads and to site structure pads. PEF is obligated under USACE and FDEP regulatory requirements to site roads and pads in ways that avoid or minimize wetland impacts, to the extent practicable. Because transmission lines would be collocated with existing transmission lines over about 90 percent of their distance, many opportunities exist to use existing access roads and pad sites. Pursuant to the PPSA, FDEP (2010) would require an accounting of any unavoidable impacts on wetlands under a post-certification process.

Wildlife present on and around the associated facilities would be subjected to many of the same impacts described for the LNP site. Some wildlife would perish or be displaced during clearing, and, as a consequence of habitat loss, fragmentation and competition for remaining resources could occur. Less mobile animals, such as reptiles, amphibians, and small mammals, would incur greater mortality than more mobile animals, such as birds, which would be displaced to adjacent communities. Land clearing done during the spring and/or early summer nesting period would be more detrimental to avian reproductive success than clearing conducted during non-nesting periods. Adjacent undisturbed habitats could support some displaced wildlife, but increased competition for available space and resources could depress population levels.

The collocation of the transmission lines with existing lines over about 90 percent of their distance would greatly reduce potential impacts on wildlife and their habitat. Based on cover type mapping, affected habitats would include upland and wetland forests that may provide high value habitat for wildlife; however, much of the affected habitats have lower wildlife value, including coniferous plantations and existing utility land, mostly existing transmission-line right-of-way. Actual losses of wildlife habitat would be determined upon final siting for the transmission-line rights-of-way, as a post-certification condition pursuant to the PPSA (FDEP 2010).

Creation of new transmission-line corridors could be beneficial for wildlife species, including threatened and endangered species, that occupy early successional habitats or benefit from increased habitat edge (i.e., forest/clearing interface environments). Raptors such as Audubon's crested caracara (*Polyborus plancus audubonii*), would likely hunt the corridors. Forested wetlands within the corridors would be converted to and maintained in an herbaceous or scrub-shrub condition. These wetlands may provide foraging habitat for wading birds. However, species dependent on forest habitats or those that are sensitive to forest fragmentation could decline or be displaced, such as the red-cockaded woodpecker (*Picoides borealis*).

Wildlife would also be affected by equipment noise and traffic, and birds could be injured if they collide with new transmission towers and conductors or the equipment used to install these components. Noise levels associated with installation of the transmission lines would be brief and intermittently spaced and would occur mostly during daylight hours (PEF 2008a). Installation of the transmission lines is expected to take only about 4 weeks per mile. Thus, the impact on wildlife from noise is expected to be temporary and minor. The potential for traffic related wildlife mortality is also expected to be low because relatively small crews (compared to LNP site development) would spend only a limited time in each area as they progress over large geographic areas. Avian mortality resulting from collisions with structures and equipment during transmission-line installation would represent a small hazard for bird populations. As a Condition of Certification, the FDEP (2010) would require PEF to coordinate with the FFWCC in the development of an Avian Protection Plan for the transmission lines that would include measures to reduce potential collision impacts by birds.

4.2 Terrestrial Operation Impacts

4.2.1 Site and Vicinity

Most impacts on terrestrial habitats and species related to the operation of proposed LNP Units 1 and 2 are expected to result from cooling-system operations, groundwater pumping, and the operation and maintenance of the transmission lines. Surface-water withdrawals to support operation of the cooling system can result in local deposition of dissolved solids (commonly referred to as salt deposition); increased local fogging, precipitation, or icing; increased local noise levels; a risk of avian mortality caused by collision with tall structures; and hydrological changes to habitats adjoining the source waterbody. Increased traffic and night-time lighting associated with operation may affect wildlife.

The cooling system proposed for LNP Units 1 and 2 includes a series of mechanical draft cooling towers that would draw makeup water for cooling from the CFBC. It is anticipated that the makeup water would be seawater. This water would be mostly derived from shallow, nearshore waters of the Gulf of Mexico (PEF 2009a). The heat would be transferred to the atmosphere in the form of water vapor and drift. Typically, vapor plumes and drift, including salts and other solutes in the drift, may affect crops, ornamental vegetation, and native plants. Water withdrawals would increase salinity levels in the CFBC and alter shoreline habitat along the CFBC, including tidal marshes near the entrance of the CFBC to the Gulf of Mexico. In addition, bird collisions are possible with mechanical draft cooling towers and other tall structures, and wildlife could be affected by noise generated by operation of the cooling towers.

Groundwater withdrawals to support other plant operations (no groundwater would be withdrawn for the cooling system) may affect water levels in wetlands on and around the LNP site. The State of Florida would require PEF to be in compliance with conditions required by the site certification and this would fall under the regulatory authority of the SWFWMD. In accordance with SWFWMD’s review criteria, groundwater withdrawal cannot cause unacceptable adverse impacts on wetlands or other surface waters, which includes “Habitat for threatened or endangered species shall not be altered to the extent that use by those species is impaired” (PEF 2009e).

Cooling-tower drift, fogging, and icing are expected to have little impact on habitats and should not affect listed species. Increased noise levels near the cooling towers, as well as increased human activity and traffic, may cause these wildlife species to avoid habitats immediately adjacent to proposed LNP Units 1 and 2. However, some level of habituation to these disturbances would likely occur. Listed species that use wetland habitats on the LNP site could be affected by hydrological impacts on wetlands caused by groundwater withdrawal. Although the extent of potential impacts is uncertain, monitoring to identify adverse environmental impacts caused by groundwater withdrawal is stipulated under the State-imposed Conditions of Certification (FDEP 2010). PEF would be required to mitigate the adverse impacts or implement an approved alternative water-supply project that would not affect wetlands (FDEP 2010).

4.2.2 Associated Offsite Facilities Including Transmission Lines

Impacts from the operation and maintenance of the transmission system that may affect threatened and endangered species include bird collision mortality and electrocution, electromagnetic fields (EMFs), and the vegetation maintenance within transmission-line corridors, which includes vegetation control activities such as the application of herbicides and the clearing of woody vegetation. Transmission-line rights-of-way must be kept clear of woody growth through maintenance practices that prevent it from becoming a safety hazard or potentially interrupting service. The collocation of new transmission lines with existing PEF lines would minimize the area of new land that would need to be cleared of vegetation and subsequently maintained for the proposed LNP project. In areas where new corridors are required to accommodate the transmission lines, established maintenance procedures for power transmission systems would be followed to control vegetation, with a goal of maintaining a sustainable groundcover of low-growing, non-woody species (PEF 2009f). The vegetation management practices within rights-of-way owned by PEF are summarized from Golder Associates (2008) and the PEF Environmental Report (ER) (2009a, f). These management practices may differ on rights-of-way where PEF is granted an easement by the landowner.

Impacts on Federally and State-listed species from operation of the proposed LNP are expected to be relatively minor. The likelihood of avian collision with the mechanical draft cooling towers and other tall structures is expected to be minimal. If permanent displacement of listed wildlife into adjacent habitats occurred, competition for finite resources could result in small declines in the local populations. Expected improvements in water quality and biodiversity in the upper reach of the CFBC would likely be beneficial to State-listed wading birds that may forage there. Restoration and enhancement of several thousand acres of low-ecological-value pine plantations are proposed under the conceptual wetland mitigation plan for the LNP project (see EIS Section 4.3.1.7). Commercial forest management would cease over much of the site and most pine plantations and other disturbed habitats would be restored to plant communities functionally similar to native upland and wetland habitats that were present prior to logging. These actions are expected to be highly beneficial to most listed wildlife affected by the proposed LNP and could provide compensation for many potential impacts realized from operation of the LNP and associated offsite facilities. Consequently, operational impacts on Federally and State-listed species are expected to be minor.

PEF would be required to comply with all applicable laws, regulations, and permitting requirements and would use good engineering practices to minimize potential impacts on listed species. If operational impacts on protected wildlife cannot be avoided, PEF would be required to coordinate with the FFWCC on the need for appropriate mitigation as stipulated under the FDEP (2010) Conditions of Certification.

4.3 Aquatic Construction Impacts

4.3.1 LNP Site

There are some permanent and temporal shallow ponds on the proposed LNP site that may support small freshwater fish. A few of these would be permanently filled as part of facilities construction, but other onsite ponds would be unaffected. Erosion- and runoff-control mitigation practices would be used to prevent siltation of preserved ponds onsite (PEF 2008b). Stormwater-management basins and cessation of forest plantation activities on the site would create improved freshwater aquatic habitat (PEF 2009a).

4.3.2 Cross Florida Barge Canal

The installation of the intake structure, connection of a barge slip and boat ramp to the CFBC, and placement of discharge piping would result in temporary disturbances to the aquatic habitat in portions of the CFBC. Until excavation is complete, preparation of the barge slip and boat ramp would occur on the northern shore of the CFBC in upland areas behind an earth bank that separates building activities from the CFBC. The intake structure would be installed 0.5 mi downstream of the Inglis Lock. Steel sheet piling would be installed at the barge slip and in a cofferdam for intake structure installation. Sheet piles would be installed from land using a pile hammer. Turbidity barriers and erosion-control measures would be installed in the canal during activities associated with sheet-pile installation to control impacts on water quality. Building activities are expected to commence with installation of permanent piling over a 60-week time frame for the barge slip and over a 13-week period for temporary piling at the intake structure. Removal of temporary piling at the intake structure is expected to occur following 6 months of installation activities proposed for an October–March time frame. Turbidity barriers and erosion-control measures are expected to be installed commensurate with piling installation activities and remain in place prior to operations (PEF 2008a). Use of best management practices (BMPs) and water-quality control measures should prevent impacts on the few species that inhabit the portion of the CFBC near the proposed intake. Fish and manatees may swim into this portion of the CFBC, but they would be able to swim away or likely would avoid the area due to vibratory noise.

Dredging would be necessary for construction of a trench for discharge piping. Prior to construction, sediments would be tested using Environmental Protection Agency (EPA) Method 1311 for toxicity characteristics to determine final disposition of dredged spoil materials. Nonhazardous sediments would be used to backfill pipeline trench, as fill material onsite, or disposed of in upland areas. Sediments deemed unsuitable for use would be disposed of appropriately in landfills approved for hazardous disposal (PEF 2009d). Residual water from dredging activities would be tested for compliance with NPDES and Florida surface water quality standards (Fla. Admin. Code 62-302). Discharge piping running from the proposed LNP site to the CREC discharge would run parallel along the CFBC berm, then enter and exit CFBC water supported by anchor piers along both CFBC berms (PEF 2009a). Initially proposed routing of the discharge pipeline south of the CFBC crosses several tidal creeks and would adversely impact approximately 5 ac of salt marsh habitat. The review team is aware that PEF has proposed to the FDEP an alternate route to avoid this important habitat. FDEP has not made a decision on the proposal. Impacts to habitat related to the discharge pipeline, irrespective of the final routing, would be primarily due to its excavation, placement, and burial associated with construction. Maintenance dredging for the barge unloading facility and CWIS within the CFBC is not proposed because the depth of the CFBC has not changed since construction in the 1960s and increased sediment load is not predicted under operation conditions (CH2M Hill 2009b).

Vessel use during the dredging or the installation of the in-water structures and transportation of large components for proposed LNP Units 1 and 2 may affect the aquatic resources of the CFBC, particularly the benthos. The main effects from using vessels would include turbulence from propellers (prop wash), anchor cable scraping across the canal bottom, and accidental spills of materials overboard. Vessels would be used during the installation of the cooling-water discharge pipeline and during the offloading of materials from barges. Vessel operation during construction may cause short-term, localized impacts on aquatic species in the CFBC, but impacts on water quality and habitat in the OWR are not anticipated. These impacts should not affect the general resources in the area of the site or the region along this coast of the Gulf of Mexico.

4.3.3 CREC Discharge Canal

The LNP discharge pipeline (two 54-in., high-density polyethylene pipes per conceptual design) would discharge directly into the CREC discharge canal just downstream of the culverts for Units 4 and 5. CREC Units 4 and 5 discharge into a concrete-lined, open channel. This 0.7-mi open channel drains directly into the CREC discharge canal approximately 1.1 mi from the Gulf of Mexico. A headwall structure would be necessary to join the LNP discharge piping to the CREC discharge canal (PEF 2009b). No construction would be conducted beyond the point of discharge into the Gulf of Mexico, so no aquatic impacts are expected to occur as a result of this activity.

4.3.4 Transmission-Line Corridors

PEF would locate the new 500-, 230-, and 65-kV transmission lines in accordance with the Florida PPSA, Chapter 403 of the Florida Statutes, and Florida Administrative Code Chapter 62-17. In addition, PEF would comply with all applicable laws, regulations, and permit requirements and would use good engineering and construction practices. In addition, PEF would comply with all applicable laws, regulations, and permit requirements and would use good engineering and construction practices (FDEP 2008), which include leaving a 25-ft buffer of existing vegetation along the banks with mature heights not exceeding 12 ft at locations where the rights-of-way cross a navigable waterway (PEF 2009a). Although several threatened or endangered species under the jurisdiction of the FWS are listed for Levy, Citrus, Hernando, Hillsborough, and Pinellas Counties, the activities associated with placement of new lines would not require in-water construction activities.

4.4 Aquatic Operation Impacts

4.4.1 Cooling-Water Intake Impacts

PEF stated in its ER that a closed-cycle, mechanical draft system would be used for proposed LNP Units 1 and 2 (PEF 2009a). Depending on the quality of the makeup water, closed-cycle recirculating cooling-water systems can reduce water use by 96 to 98 percent versus the amount a facility would use with a once-through cooling system (66 FR 65256) as is used at CREC. This significant reduction in water withdrawal rate results in a corresponding reduction in impingement and entrainment. For threatened and endangered aquatic species under the jurisdiction of the FWS, the primary concerns related to water intake and operation are related to the relative amount of water drawn from the cooling-water source (CFBC) and the potential for organisms to be impinged on the intake screens or entrained into the cooling-water system. Impingement occurs when organisms are trapped against the intake screens by the force of the water passing through the CWIS (66 FR 65256). Impingement can result in starvation, exhaustion, asphyxiation (water velocity forces may prevent proper gill movement or organisms may be removed from the water for prolonged periods of time), and descaling (66 FR 65256). Entrainment occurs when organisms are drawn through the CWIS into the proposed LNP Units 1 and 2 cooling system. Organisms that become entrained are normally relatively small benthic, planktonic, and nektonic (organisms in the water column) forms, including early life stages of fish and shellfish that often serve as prey for larger organisms (66 FR 65256). As entrained organisms pass through a plant's cooling system, they are subject to mechanical, thermal, and toxic stresses. No life stages of the aquatic species listed in Table 1-1 are subject to entrainment losses because of their larger size.

For the proposed LNP Units 1 and 2 CWIS, PEF assessed 316(b) impacts for withdrawal of cooling water from the CFBC. The approach velocity for the intake bays would be 0.25 fps at the trash bar screens and a velocity of 0.5 fps for through-screen flow. To achieve these low velocities, the inlet area would be larger than 106.1 ft^2 (PEF 2008a). The zone of hydraulic influence would extend from the CWIS to 5 mi west of the CWIS in the CFBC (PEF 2008a) and use an offshore station in the Gulf of Mexico to estimate impingement and entrainment impacts. Sampling in the area of the proposed CWIS indicated a biologically depauperate environment with relatively poor water quality (PEF 2009a). The aquatic species listed in Table 1-1 do not use CFBC habitat for spawning or calving. Therefore, the potential for impingement and entrainment of aquatic organisms during operation of the CWIS, based on the percentage of water withdrawn, the planned low through-screen intake velocity, the closed-cycle cooling system design, and the distance away from preferred spawning and calving habitat in the Gulf of Mexico, the review team finds that the impacts on the Federally protected aquatic species from impingement and entrainment would be negligible.

Maintenance of CWIS structures includes the mechanical scraping of screen washes to prevent clogging or collection of debris and organisms on intake screens and bar racks, respectively. Bar racks would be removed and scraped once per quarter as currently performed at CREC (PEF 2009b). Trash and organisms caught on traveling intake screens would be removed by a high-pressure spray wash and deposited into a collection dumpster. Collected debris and organisms would be disposed of in a licensed landfill.

4.4.2 Discharge Impacts

The effluent discharge from the proposed LNP Units 1 and 2 would be directly into the CREC discharge canal. EIS Section 4.3.2 discusses the location and design of the discharge piping. The proposed LNP Units 1 and 2 discharge would be 4.4 percent of the total discharge from combining the LNP and CREC discharges. The potential impacts on the Gulf of Mexico from the operation of proposed LNP Units 1 and 2 would include the effects of heated effluents on aquatic resources, chemical impacts, and physical impacts from discharge. In addition, FDEP Conditions of Certification state that PEF would retire its two oldest, once-through coal-fired units at the CREC by December 31, 2020 if LNP Units 1 and 2 are licensed, built, and begin commercial operation. CREC Units 1 and 2 cessation of operations would significantly reduce the discharge flow from the CREC discharge canal even with the additional discharge flow from LNP Units 1 and 2 (Table 4-1).

4.4.2.1 Cold Shock

A factor related to thermal discharges that may affect aquatic biota is cold shock. Cold shock occurs when aquatic organisms that have been acclimated to warm water, such as fish in a power plant’s discharge canal, are exposed to a sudden temperature decrease. This sometimes occurs when single-unit power plants shut down suddenly in winter. Cold shock mortalities at U.S. nuclear power plants are “relatively rare” and typically involve small numbers of fish (NRC 1996). Cold shock is less likely to occur at a multiple-unit plant because the temperature decrease from shutting down one unit is moderated by the heated discharge from the units that continue to operate. The proposed LNP Units 1 and 2 discharge would be 4.4 percent of the total discharge from combining LNP and CREC discharges. Therefore, the review team finds that the impacts from cold shock would be minimal.

Table 4-1. Comparison of NPDES Discharge Volumes Under Different Operation Scenarios During Summer Conditions.

Operating Unit	CREC Current Combined Discharge (Mgd)	Percent of Total Discharge	Addition of LNP Units 1 & 2 to current CREC (Mgd)	Percent of Total Discharge	Addition of LNP Units 1 & 2 to current CREC (Mgd) with Decomissioning of CREC Units 1 & 2	Percent of Total Discharge
CREC 1	446	23.4	446	22.3	-	-
CREC 2	472	24.7	472	23.7	-	-
CREC 3	979	51.4	979	49.1	979	90.9
CREC 4 & 5	10.1	0.5	10.1	0.5	10.1	0.9
LNP 1 & 2	-	-	87.8	4.4	87.8	8.2

Source: PEF 2009c
Note: CREC discharge rates are given as current maximum NPDES-permitted volumes.

4.4.2.2 Heat Stress

The thermal tolerance for aquatic organisms is defined in different ways. Some definitions relate to the temperature that causes fish to avoid the thermal plume, others relate to the temperature that fish prefer for spawning, and others relate to the temperatures (upper and lower) that may kill individual fishes. Some of these tolerances are termed "preferred temperatures," "upper avoidance temperatures," and "lethal temperatures."

In EIS Section 5.2.3, the review team describes its independent assessment of the incremental impacts of proposed LNP Units 1 and 2 on the water temperatures within the CREC discharge and the Gulf of Mexico using a three-dimensional coastal ocean model. During summer conditions at ebb tide, the surface-water temperatures near the CREC discharge channel would be slightly less under the proposed conditions when compared to the current conditions that include operation of CREC Units 1 through 5. The discharge volume of the plume would be increased with the addition of LNP Units 1 and 2, but only a slight increase in surface-water temperature (<0.1°C) would result compared to current conditions. Temperature increase at the entrance of CFBC channel would be between 0.05°C and ~0.1°C during the summer months at ebb tide (Figure 4-1). Similar trends in thermal plume temperatures would be observed during winter conditions with the addition of LNP discharge resulting in a slight temperature drop at the CREC discharge canal and a slight increase in surface-water temperature beyond the immediate discharge area. Surface-water temperatures at the mouth of the CFBC are expected to increase by less than 0.5°C over the current conditions (Figure 4-2). The increased plume size is likely to have minimal impact on aquatic biota that forage near the CFBC under both extreme conditions. Habitat usage is therefore not expected to be affected under operating conditions.

4.4.2.3 Chemical Impacts

Intake structures, such as the pump suction housings and sensor tubes, would be coated with a copper-based anti-fouling substance to minimize fouling of these structures. In addition, ClamTrol (CT1300) would be injected every 21 days at a concentration not to exceed 4.5 ml/L, into the CWIS to prevent biofouling by marine invertebrates (PEF 2009b). The use of chemicals in the existing CREC discharge is regulated by an NPDES permit granted by FDEP. The chemical concentrations at the outfall for the existing units meet the NPDES limits (FDEP 2010). Table 4-2 (ER Table 5.3.2-1) lists the water-treatment chemicals, their use, and the concentrations that are anticipated to be discharged from proposed LNP Units 1 and 2 blowdown. The concentrations in the discharge are significantly lower than the LC50 (the concentration that is lethal to 50 percent of the sample population) obtained from the Material Safety Data Sheets. The CREC effluent discharge and water flow from the Gulf of Mexico would further dilute the concentration of these chemicals, so the impacts from the addition of LNP discharge to the Gulf of Mexico would be minimal.

In addition, the review team evaluated the potential for impact due to the increased salinity associated with the LNP Units 1 and 2 blowdown, which would have a total dissolved solids concentration of 1.5 times greater than seawater (PEF 2009b). This increase in total dissolved solids is due to evaporative loss of water through the cooling towers. Because the LNP discharge would be combined with CREC discharge prior to point of discharge into Crystal Bay and the CREC discharge accounts for the vast majority of the discharge volume (>95 percent), the increase in salinity would be slight (0 ppt and ~0.5 ppt) in the coastal region near the CREC discharge channel. The addition of LNP discharge with CREC discharge to the Gulf of Mexico would increase the salinity to between 0.4 ppt and ~0.45 ppt at the mouth of the CFBC (Figure 4-3).

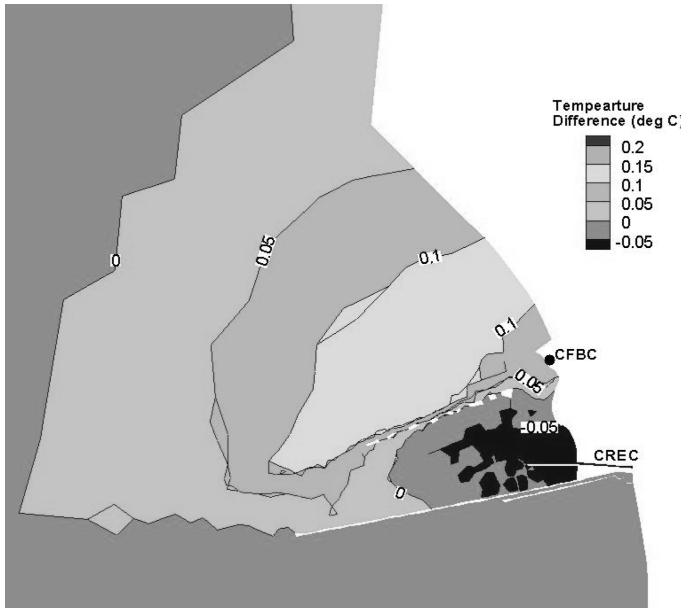

Figure 4-1. Thermal Plume Analysis Using FVCOM (Finite Volume Community Ocean Model) Showing the Temperature Difference Between Current and Proposed Thermal Discharge Under Summer Conditions at Ebb Tide

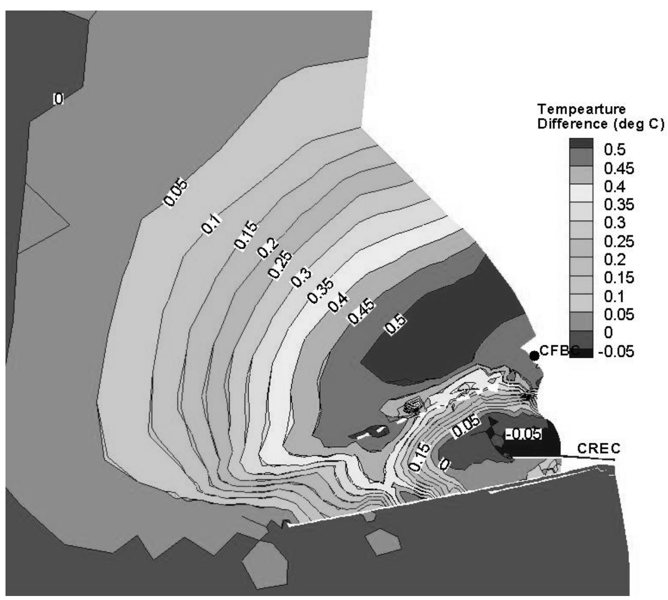

Figure 4-2. Thermal Plume Analysis Using FVCOM Showing the Temperature Difference Between Current and Proposed Thermal Discharge Under Winter Conditions at Ebb Tide

Table 4-2. Chemical Discharges to the Gulf of Mexico from Proposed LNP Units 1 and 2

Chemical	Use	Concentration at Discharge Point
Sodium hypochlorite	Biocide	0.2 ppm residual chlorine or 0.36 sodium hypochlorite
Ammonium chloride	Algaecide	0.2 ppm residual chlorine or 0.303 ppm ammonium chloride
Sulfuric acid	pH adjuster	2.237 ppm sulphuric acid
Orthopolyphosphate	Corrosion inhibitor	30 ppm orthopolyphosphate
Polyacrylate	Silt dispersant	150 ppm polyacrylate
Phosphonate	Antiscalant	20 ppm phosphonate

Source: PEF 2009a

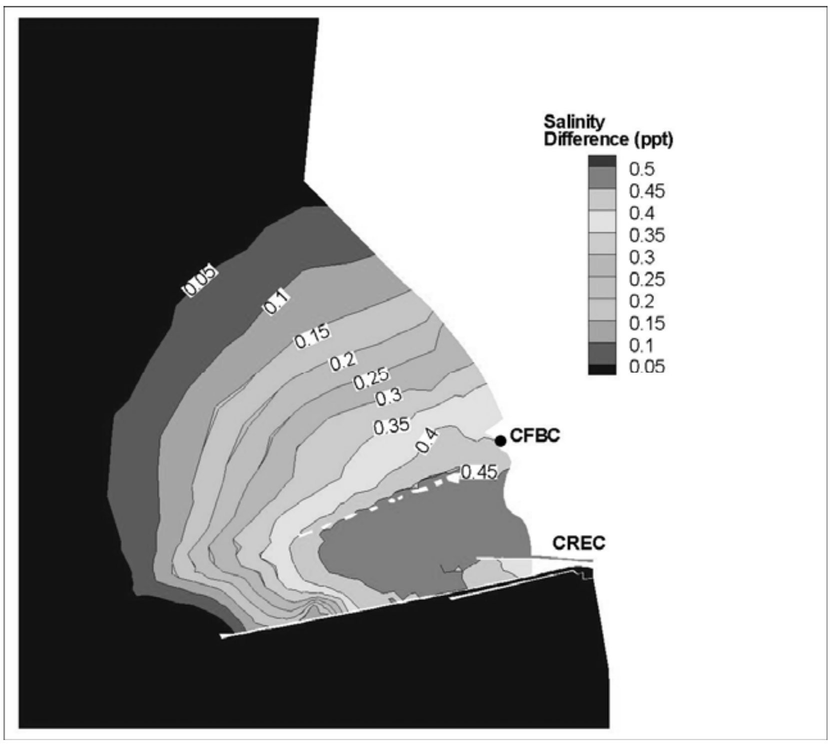

Figure 4-3. Salinity Difference Between the Current and Proposed Discharge Plume at Ebb Tide

4.4.2.4 Physical Impacts

The discharge volume of the LNP 1 and 2 blowdown would be 81.34 Mgd and would be combined with the CREC Units 1 through 5 discharge of 1651.8 Mgd in the CREC discharge canal, which opens into the Gulf of Mexico. The LNP discharge would account for only 4.4 percent of the total discharge flow and would have little physical scouring impact at the terminus of the discharge canal (PEF 2009a).

Transmission-Line Corridors

Maintenance activities along the four 500-kV, five 230-kV, and two 269-kV transmission lines could lead to periodic temporary impacts on the waterways being crossed. However, it is assumed the same vegetation-management practices currently used by PEF for the existing CREC facility transmission-line rights-of-way would be applied to the proposed existing and new transmission-line rights-of-way. PEF practices and procedures were developed to prevent impacts on surface waters and wetlands, so impacts on aquatic ecosystems from operation and maintenance of transmission lines would be minimal (PEF 2009a). Impacts on Federally protected aquatic species from maintenance of the transmission lines are not anticipated.

5.0 Protected Species Descriptions

This section describes the life history and habitat use for Federally listed terrestrial and aquatic species that may occur in or near the LNP site and LNP offsite facilities listed in Table 1-1.

The Florida salt marsh vole (*Microtis pennsylvanicus dukecampbelli*), listed as endangered under the ESA, is known from only one coastal marsh site on privately owned land in Waccasassa Bay, a separate bay from where the discharge pipe for the proposed LNP Units 1 and 2 would be located (FWS 1997a). This species inhabits salt marshes with dominant vegetation of smooth cordgrass (*Spartina alterniflora*), black rush (*Juncus roemeranus*), salt grass (*Distichlis spicata*), and glasswort (*Salicornia* spp.) (FWS 1997a). Loss of habitat due to climatic changes and resulting sea-level rise is thought to be the main contributor to the decline of the Florida salt marsh vole and only a few sites from the marshes along the Florida Gulf Coast sampled have appropriate habitat (FWS 1997a). In addition, there are no plans to impact salt marshes with this proposed project (FDEP 2010).

The Florida panther (*Puma concolor coryi*), listed as endangered under the ESA, is one of the most endangered large mammals in the world (FWS 1999). Historically this species had a range of six southern-tier states; Alabama, Arkansas, Florida, Georgia, Mississippi, and South Carolina (FWS 2008b; PEF 2008b). Currently, the Florida panther only occurs in 5 percent of its historical range and the only known reproducing population is in southern Florida (FWS 2008b). This species prefers native, upland forests of hardwood hammocks and pine flatwoods, but will also use wetlands and disturbed areas (FWS 1999). Home range size is influenced by the quality of available habitat; the best habitat (allowing for smaller home ranges) generally has a dense understory that enhances the opportunity for denning, resting, and feeding (FWS 1999). The only remaining breeding populations of Florida panther are found in counties South Florida, south of the Caloosahatchee River (FWS 2008b). All potential habitat patches identified by the FWS are located only in the southern portions of Polk County well outside the proposed transmission line corridors for LNP Units 1 and 2 (FWS 2008b, PEF 2009a).

The Florida manatee (*Trichechus manatus latirostris*) is a large, slow-moving herbivore, and the only sirenian in North American waters (FWS 2007). It is listed as endangered under the ESA. There are two subspecies of manatees, the Antillean manatee (*Trichechus manatus manatus*) and the Florida manatee (*Trichechus manatus latirostris*) (FWS 2007). Although both subspecies are found in the Gulf of Mexico, interactions in Levy and Citrus Counties are more likely to be with the Florida manatee. Thus, the following discussion will concentrate on this subspecies. Adults average 10 ft in length and 800 to 12,000 lb in weight. The calving interval is 2 to 5 years, and individuals are believed to live as long as 60 years (FWS 2007, 2008a; USGS 2009). The Florida manatee is one of the most endangered marine mammals in the United States.

During summer, the Florida manatee is found primarily in the shallow fresh, brackish, and marine waters along both coasts of Florida. Individuals usually remain in 10- to 16-ft-deep waters, and rarely venture into water exceeding 20 ft. Historically, the distribution of manatees shifts south of central Florida in winter because of their intolerance of temperatures below 20°C (Irvine 1983). However, over the years, the winter distribution has shifted northward because of habitat loss and the construction of power plants/industrial sites that discharge warm-water effluent. According to the FWS (2007), approximately 12 percent of the Florida population now occurs in the northwestern portion of the state. Approximately half of those animals (around 280 manatees) have been found in Kings Bay at the head of the Crystal River just south of the CREC (FWS 2007).

A recent synoptic aerial survey conducted by the FFWCC's Fish and Wildlife Research Institute (FWRI) in January 2009 documented the presence of 3807 manatees throughout the Florida manatee's winter range, topping the previous high in 2001 by more than 500 animals (FFWCC 2009a). Of these, 1654 were sighted along Florida's west coast. However, such counts are considered approximate at best because estimating manatee abundance and trends is difficult (FFWCC 2009a).

Most human-caused manatee deaths are from collisions with watercraft. Flood gates, canal locks, and marine debris also cause manatee deaths, but not as often. A loss of natural springs due to increasing water demands and potential loss of warm water from power plants that are eventually shutting down could limit the available habitat for manatees (FWS 2008a). For non-adults in the northwestern region of Florida, perinatal mortality is the most common cause of death, with watercraft collisions ranked second. Most of the deaths associated with watercraft result from the impact not from propeller wounds (Table 5-1). It is unclear whether these deaths are due to violations of protective measures or a lack of adequate measures because collisions are rarely reported and carcasses drift with the currents in the area. No-wake zones, manatee protection areas, and an extensive educational effort have been implemented by State and Federal agencies to mitigate these adverse human impacts

Table 5-1. FWRI Manatee Mortality Database for Citrus and Levy County Areas

Year	Watercraft	Flood Gate/ Canal Lock	Other Human	Perinatal	Cold Stress	Natural	Undetermined	Total
Citrus County								
1989	2	0	0	0	0	1	2	5
1990	1	0	0	1	0	2	0	4
1991	0	0	0	4	0	1	0	5
1992	3	0	0	3	0	2	1	9
1993	1	0	1	2	0	1	3	8
1994	2	0	0	0	0	3	0	5
1995	0	0	0	4	0	1	1	6
1996	2	0	0	3	0	0	1	6
1997	1	0	1	2	0	0	1	5
1998	2	0	0	1	0	0	1	4
1999	3	0	0	2	0	1	0	6
2000	1	0	1	2	0	0	2	6
2001	1	0	0	6	0	0	2	9
2002	3	0	1	4	0	1	0	9
2003	3	0	0	2	2	1	2	10
2004	1	0	0	1	2	1	2	7
2005	6	0	0	9	0	0	3	18
2006	2	0	1	2	1	1	3	10
2007	5	0	0	3	0	2	2	12
2008	8	0	0	6	0	5	3	22
Grand Total	47	0	5	57	5	23	29	166
Levy County								
1989	0	0	0	0	0	0	0	0
1990	1	0	0	2	0	0	0	3
1991	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0
1993	0	0	0	1	0	0	1	2
1994	0	0	0	3	0	0	0	3
1995	0	0	0	0	0	0	0	0

Table 5-1. (contd)

Year	Watercraft	Flood Gate/Canal Lock	Other Human	Perinatal	Cold Stress	Natural	Undetermined	Total
1997	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0
1999	1	1	0	0	1	0	0	3
2000	1	0	1	0	0	0	1	3
2001	0	0	0	9	0	0	1	10
2002	0	0	0	3	0	0	0	3
2003	0	0	0	0	0	0	1	1
2004	0	0	0	1	0	0	0	1
2005	1	0	0	0	0	0	0	1
2006	0	0	0	0	0	0	2	2
2007	0	0	0	0	0	0	0	0
2008	0	0	0	1	0	0	3	4
Grand Total	4	1	1	20	1	0	9	36

Source: FFWCC 2009b

(FWS 2008a). These efforts appear to be successful in areas such as Citrus County in that, although the number of vessels using manatee habitat is high, the number of manatee mortalities in this area is quite low. Studies are currently underway to assess the effectiveness of manatee protection measures.

The State of Florida “designated the entire State as a ‘refuge and sanctuary for manatees’” (FWS 2008a). Two Federal manatee protection areas, the Crystal River National Wildlife Refuge (NWR) and the Blue Waters Manatee Sanctuary, are south of the CREC. The Crystal River NWR is at the head of the Crystal River, and the Blue Waters Manatee Sanctuary is located toward the head of the Homosassa River near Homosassa Springs State Park. Both areas are inland from the coastline, so the activities of the CREC do not directly affect these areas. However, the mouth of the Crystal River is approximately 2.5 mi south of the Crystal River effluent canal, which is within an area that manatees from the NWR could frequent.

Manatees are considered endangered throughout their entire range including Levy and Citrus Counties. Based on reviews of several reports, including those by the FWS, United States Geological Survey (USGS), and FFWCC’s FWRI, the area around Levy and Citrus Counties appears to have lower instances of manatees than other areas of Florida to the south. In fact, the FWS does not list Levy County as having manatees, only Citrus County (FWS 2009d). During aquatic sampling activities from October 2007 to November 2008, manatees were observed in Levy County in the CFBC, OWR, and in the CREC discharge canal throughout the sampling period (CH2MHill 2009b).

The Florida grasshopper sparrow (*Ammodramus savannarum floridanus*), listed as endangered under the ESA, is a resident sub-species endemic to dry prairies of central and south Florida and is dependent on a regular fire regime for survival (FWS 1999). This species requires large (greater than 124 ac) open grasslands dominated by saw palmetto (*Serenoa repens*) and dwarf oaks (*Quercus minima*) with groundcover species such as blue stem grasses (*Andropogon* spp.) and wiregrasses (*Aristida* spp.) along with St. John's wort (*Hypericum* spp.) (FWS 1999). Frequent fires are an important component of the Florida grasshopper sparrow habitats as they prevent trees from colonizing the prairies and maintain a percentage of bare ground required for foraging (FWS 1999). This species is listed as endangered in Polk County and could be found along transmission-line routes where suitable habitat exists (FWS 2010a).

The Florida scrub jay (*Aphelocoma coerulescens*), listed as threatened under the ESA, occupies fire-dominated, low-growing oak scrub habitat found on well-drained sandy soils and requires bare sandy patches for foraging habitat (FNAI 2009; PEF 2008b; FWS 1999). This habitat generally corresponds with FLUCFCS 413 (sand pine) and FLUCFCS 421 (xeric oak) neither of which have been mapped on the LNP site. Populations of this species may persist in areas with sparser oaks or overgrown scrub, but at lower densities. Although scrub jays have been documented in the vicinity (PEF 2008a; FNAI 2009), no scrub jays were observed on the LNP site during pedestrian surveys conducted over a 2-year period (PEF 2009a). The conversion of most upland habitats to pine plantations where oaks and other hardwoods are excluded has removed suitable habitat for this species and reduced its potential occurrence onsite. Florida scrub jays have, however, been documented in several of the counties crossed by the offsite facilities, and potentially suitable habitat is present within some corridors (PEF 2008b; FWS 1999). Because wildlife reconnaissance surveys within the offsite facilities corridors have been limited, it is possible that other scrub jay populations could occur on or near the associated offsite corridors.

The entire project, including the LNP site and associated offsite and transmission line corridors, is within the Florida scrub jay FWS consultation area (FFWCC 2008). This habitat-specific, territorial species is declining because of degradation, fragmentation, and loss of oak scrub habitats throughout Florida (FWS 1999).

The piping plover *(Charadrius melodus)* is a small shorebird whose Atlantic Coast population (which includes the Gulf coast) is listed as threatened under the ESA, and known to occur in Pinellas and Hillsborough Counties, both of which are crossed by the proposed transmission lines. Populations of this species are found in three regions in the United States: the Atlantic Coast, the Northern Great Plains, and the Great Lakes (FWS 2010b). Although this species does not breed in Florida, critical overwintering habitat has been identified in several counties including those crossed by the proposed transmission lines, such as Hillsborough and Pinellas

Counties (FWS 2001). Although the blowdown pipeline corridor extends into mudflats at the western edge of the CREC facility, piping plovers have not been observed on the CREC (PEF 2008b).

The wood stork (*Mycteria americana*), listed as endangered under the ESA, is a highly colonial species that usually nests and feeds in freshwater and brackish wetlands (FWS 1997b). Nesting occurs in a variety of inundated, forested wetlands, including cypress strands and domes, mixed hardwood swamps, sloughs, and mangroves (FNAI 2009). Nesting colonies in central and northern Florida generally form in February and March. The species forages in a wide variety of shallow-water wetland habitats, ranging from drainage ditches to marshes, ponds, and hardwood swamps. Wood storks are tactile rather than visual feeders, using their bills to probe shallow water for small fish, their primary prey. They feed preferentially in depressions where the prey can become concentrated during low-water periods.

Wood storks have been observed feeding in ditches and wetlands on the LNP site, but no nesting colonies have been detected (PEF 2009a). Primarily because of forest-management activities and a lack of suitable open water habitat, suitable rookery habitat is limited. The LNP site is not located within the 13-mi (North Florida) or 15-mi (Central Florida) core foraging area of any active wood stork rookery (FWS 2009b). However, wood storks could be found in suitable wetland habitats in or near the proposed offsite corridors, including transmission-line corridors.

The red-cockaded woodpecker (*Picoides borealis*), listed as endangered under the ESA, is endemic to open, mature, and old-growth pine ecosystems in the southeastern United States (FWS 2003a). The species requires open pine woodlands and savannahs with large, old pines for nesting and roosting. In northern and central Florida, it generally occupies mature longleaf pine flatwoods (FNAI 2009). This cooperative breeding species excavates nest cavities in large older pines from stands containing little to no hardwood in the midstory and overstory. Suitable foraging habitat consists of mature pines with an open canopy, low densities of small pines, little or no hardwood or pine midstory, few or no overstory hardwoods, and abundant native bunchgrass and forb groundcovers (FWS 2003a).

No red-cockaded woodpeckers have been observed on the proposed LNP site or on the nearby CREC property (PEF 2008b, 2009a). The heavily managed pine plantations that characterize the site do not provide suitable nesting habitat. A large population of red-cockaded woodpeckers does occur in the Goethe State Forest, which is directly north of the LNP site (FDA&CS 2009). This species is not known to nest on the LNP site and is considered unlikely to do so because of the absence of its preferred nesting habitat. However, there may be suitable habitat along the proposed offsite corridors, including the transmission-line corridors associated with the LNP site, because there have been recorded sightings in Citrus, Hernando, Hillsborough, Levy, Marion, Pinellas, Polk, and Sumter Counties (PEF 2009a; FWS 2009a).

The Audubon's crested caracara (*Polyborus plancus audubonii*), listed as threatened under the ESA, is a large, nonmigratory raptor that is found in dry or wet prairies with scattered cabbage palm (*Sabal palmetto*) surrounded by open habitats but can also be found in lightly wooded areas and improved pastures (FWS 1999). Loss of habitat due to agricultural and residential development has led to the decline of the Audubon's crested caracara. Although historically common in South-Central Florida, the current range is limited to several South Florida Counties and is most abundant in Glades, Desoto, Highlands, Okeechobee and Osceola counties. However, the FWS recognizes this species as threatened in Polk County (FWS 2010a). One of the proposed LNP transmission corridors crosses the northwestern corner of Polk County.

The Everglade snail kite (*Rostrhamus sociabilis plumbeus*), listed as endangered under the ESA, is a medium-sized raptor found in freshwater marshes in six freshwater systems in southern Florida with dominant emergent vegetation consisting of spike rush (*Eleocharis cellulosa*), maidencane (*Panicum hemitomon*), sawgrass (*Cladium jamaicense*), and/or cattails (*Typha* spp.) (FWS 1999). The historical range for this species was the entire peninsular Florida (FWS 1999). The main food source for the snail kite is the apple snail that inhabits the marshes. The hydrology and water quality of wetlands is crucial to the snail kite's survival due primarily to its restricted range and highly specific diet (FWS 1999). A portion of the Central Florida South and Kathleen transmission line corridors intersect the federal consultation area for the Everglades snail kite, so it is possible this species could be found in these areas where suitable habitat exists (FFWCC 2008, FWS 2003b).

The American alligator (*Alligator mississippiensis*) is classified as a Federally threatened species because of its similarity in appearance to the endangered American crocodile (*Crocodylus acutus*) (FNAI 2009, PEF 2008b). The range of the American crocodile, however, is limited to coastal estuarine marshes and tidal swamps at the southern end of the Florida peninsula and does not include the LNP site. The American alligator is a common inhabitant of most types of freshwater bodies in Florida, including marshes and swamps such as those found on the LNP site and in the proposed offsite corridors (including transmission-line corridors). One juvenile American alligator was observed on the LNP site during field surveys conducted by PEF, and they have been observed in swampy areas at the CREC (PEF 2009a, 2008b).

The Eastern indigo snake (*Drymarchon couperi*), listed as threatened under the ESA, occupies a broad range of habitats, varying from scrub and sandhill habitats to moister communities such as wet prairies and swamps (FNAI 2009). This species requires large tracts of habitat to survive. It often winters in gopher tortoise burrows, especially in northern Florida where temperatures are cooler. Although the eastern indigo snake was not identified during field surveys of the LNP site (PEF 2008b, 2009a), the species has been documented in the general site vicinity (PEF 2008b). There is potential for this species to occur on the LNP site and in proposed offsite corridors, including transmission-line corridors where suitable habitat exists.

Sand skinks (*Neoseps reynoldsi*), listed as threatened under the ESA, occupy xeric upland habitats in sandy substrates between high pine and scrub habitats and are listed as threatened in Marion and Lake Counties (FWS 1999a, e; 2009e). This species requires loose sand in sparsely-covered scrub of various types (PEF 2008b). It is possible this species would be present in areas along the transmission-line corridors where suitable habitat is present. The sand skink is not identified as potentially occurring in Levy County (FWS 2009a; FNAI 2009), and the sandy scrub habitats it prefers do not occur on the LNP site. No sand skinks were observed on the LNP site during pedestrian surveys conducted over a 2-year period (PEF 2009a). Therefore, it is unlikely that sand skinks would be affected by activities on the LNP site. No sand skinks were observed during limited reconnaissance surveys conducted for wildlife within the corridors. However, preferred scrub habitats, although not prevalent, are present along portions of the corridors (PEF 2008a). Activities on the corridors therefore have the potential to affect the sand skink and its habitat.

The gulf sturgeon (*Acipenser oxyrinchus desotoi*), an anadromous fish within the family Acipenseridae, is one of the oldest and most primitive families of existing bony fishes. The gulf sturgeon is a long-lived fish, and maturity in males is 7 to 9 years while females take 8 to 12 years to attain spawning condition. Spawning migrations occur in early to late spring with a return to saltwater during early to late fall. In the Suwannee River, Florida, sturgeons migrate upriver when temperatures range between 17 and 22°C in mid-February to mid-April. After the first spawning, females may only spawn at intervals of 2 or 3 years (Huff 1975). Water velocity influences the spawning habitat preference for sturgeon, with research suggesting that higher flows are environmental cues for successful spawning (Chapman and Carr 1995). Clumps of fertilized eggs become attached to rocks or other bottom structures in areas characterized as clean gravel-cobble mix over rock with strong, persistent laminar flows and eddies. Incubation times vary with river temperature, and fry disperse widely downstream of spawning habitats within the river, inhabiting open sandy areas away from shorelines and vegetation (Sulak and Clugston 1998). Juvenile (>1 year) and adult gulf sturgeon typically outmigrate to the marine environment, although some populations tend to hold over in brackish water for a period of up to 2 months before moving into the open Gulf of Mexico (Carr et al. 1996). The adult gulf sturgeon is a bottom feeder that makes a diet of invertebrates such as brachiopods, insect larvae, mollusks, oligochaetes, polychaetes, crustaceans, and small fishes. Feeding is almost exclusively in marine waters, and adults eat little while in freshwater. Weight losses of 4 to 15 percent are often observed during the in-river period during late spring, summer, and early fall (Wooley and Crateau 1985).

Historically, the range for this anadromous fish extended from Louisiana to south of Tampa Bay, Florida, where it feeds in the Gulf of Mexico and returns to freshwater for spawning. The current range is limited to the Mississippi River east to the Suwannee River, Florida, where the Suwannee River supports the largest subpopulation of gulf sturgeon (Carr et al. 1996). Critical habitat for Florida nearest to the LNP site is designated for 182 mi of the Suwannee River; 12 mi of the Withlacoochee River, where it branches off to the north of the Suwannee River; and 211 mi^2 of estuarine/marine area of Suwannee Sound, which occurs north of Cedar Key (68 FR 13370). Gulf sturgeon show a high homing fidelity (site-specific) spawning behavior based on gene flow between river drainages (Stabile et al. 1996).

The Gulf sturgeon was jointly managed and listed as a threatened species by the National Marine Fisheries Service (NMFS) and FWS in 1991 (56 FR 49653), with NMFS managing the nearshore and offshore habitat range and FWS managing inland from river kilometer (river mile) zero. The gulf sturgeon is extant in major river basins from the Mississippi River to Charlotte Harbor, but the only significant spawning populations occur in the Pearl River, Pascagoula River, Escambia River, Blackwater River, Yellow River, Choctawhatchee River, Apalachicola River, Ochlockonee River, and Suwannee River (FWS and GSMFC 1995; Berg 2004).

Prized for their flesh and roe, gulf sturgeon were commercially fished in the late 1890s up to 1984 when the State of Florida banned commercial harvesting. Degradation of riverine habitat also contributed to a decline in species abundance with increases in pollution, as did installation of dams on many of the major rivers along the northern Gulf of Mexico (Huff 1975; Wooley and Crateau 1985). A recovery plan was initiated in 1995 to prevent further reduction in sturgeon populations and monitor population recovery with habitat restoration efforts (FWS and GSMFC 1995).

There are no known spawning populations associated in river systems south of the Suwannee River along the Florida coast, and estuarine/marine critical habitat for the gulf sturgeon does not occur south of Cedar Key. No gulf sturgeon were observed or collected during the sampling events described in EIS Section 2.4.2.1 for the CFBC, OWR, or CREC discharge area (CH2MHill 2009b). Adult gulf sturgeon have been caught south of the CFBC offshore of Pinellas County and within Tampa Bay, but these occurrences have been few since 1987 (Wakeford 2001). Although gulf sturgeon may occur in the offshore areas associated with the CFBC or CREC, they will likely avoid any anthropogenic activities and will not use the CFBC or OWR as spawning habitat given the unfavorable substrate and lack of downstream flow.

Florida bonamia (*Bonamia grandiflora*), listed as threatened under the ESA, is a perennial vine that occurs in sunny openings in sand pine and oak scrub and is listed as threatened in Marion, Lake, and Polk Counties (FWS 2005b; PEF 2008b). This species is also found in disturbed sites such as along roadsides, rights-of-way, clear-cuts, and other areas free of trees and shrubs (FWS 2005b). Habitat destruction is the main threat to this species primarily due to agricultural and residential development (FWS 2005b). It is possible that this species could be found in areas along the proposed transmission-line corridor where suitable habitat exists.

Brooksville bellflower (*Campanula robinsiae*), listed as endangered under the ESA, is an annual herb that occurs on wet, grassy slopes and drying pond edges primarily on the Brooksville Ridge in north-central Hernando County; however, since 2006 it has been recorded at three sites at Hillsborough River State Park in Hillsborough County (PEF 2008b; FWS 2010a) 5-year Review of the Brooksville bellflower (*Campanula robinsiae*). Habitat destruction is the main threat to Brooksville bellflower as ponds and wet prairies are replaced with urban and agricultural development (FWS 2010a). It is possible that this species could be found in areas along the proposed transmission-line corridor in Hernando and Hillsborough Counties where suitable habitat exists.

Pygmy fringe tree *(Chionanthus pygmaeus),* listed as endangered under the ESA, is a shrub that primarily occupies scrub, high pineland and xeric hammocks in Central Florida and is listed as endangered in Lake and Polk Counties (FWS 1999). This species prefers excessively drained sandy soils and may form thickets at some sites (FWS 1999). Populations are known from west of Lake Apopka in Lake County and along the Lake Wales Ridge in Polk County (FWS 1999). It is possible that this species could be found in areas of sandy scrub along the proposed transmission-line corridor in Lake and Polk Counties.

Florida golden aster (*Chrysopsis floridana),* listed as endangered under the ESA, is a perennial herb that occurs in sand pine scrub, and areas of excessively well-drained fine sands along railroad and highway corridors (FWS 1999). This species is listed as endangered in Pinellas and Hillsborough Counties and prefers open, sunny areas (FWS 2010a). Because Florida golden aster is known to occur in transportation and/or utility rights-of-way, it can be affected by management practices including widening of these corridors. It is possible that this species could be found in areas along the proposed transmission-line corridor in Pinellas and Hillsborough Counties where suitable habitat exists.

Longspurred mint (*Dicerandra cornutissima*), listed as endangered under the ESA, is a short-lived perennial herb that occurs in open areas in sand pine and oak scrub and is listed as endangered in Marion County. Six of the 15 known occurrences are on the Cross Florida Greenway State Recreation and Conservation Area in Marion County (FWS 2009e). The primary cause of the decline of longspurred mint is habitat loss due to development (FWS 2009e). It is possible that this species could be found in areas along the proposed transmission-line corridor in Marion County where suitable habitat exists.

Scrub buckwheat (*Eriogonum longifolium*), listed as threatened under the ESA, is a perennial herb that occurs in turkey oak barrens and high pine habitats and is listed as threatened in Marion, Lake, and Polk Counties (FWS 2010a; FWS 1999). This species is known to occur with several other threatened or endangered species, including Lewton's polygala (*Polygala lewtonii*) in remnant high pine habitat in Lake County (FWS 1999). Loss of suitable habitat is the main cause of decline for scrub buckwheat and continued residential growth and agricultural practices are the primary threat (FWS 1999). It is possible that this species could be found in areas along the proposed transmission-line corridor in Marion, Lake, and Polk Counties where suitable habitat exists.

Cooley's water willow *(Justicia cooleyi),* listed as threatened under the ESA, is a rhizomatous, perennial herb that occurs along streams or small gullies in mesic hardwood hammocks in the Brooksville Ridge, and is listed as endangered in Hernando County (FWS 2005a; Conservation Outdoors 2010). Residential and agricultural development is the main threat to this endemic species, but limestone mining also affects Cooley's water willow (FWS 2005a). Several populations have also been located on two sites in Sumter County on recently acquired land for Whithlacoochee State Forest (FWS 2005a). It is possible that this species could be found in areas along the proposed transmission-line corridor in Hernando and Sumter Counties where suitable habitat exists.

Britton's beargrass (*Nolina brittoniana*), listed as endangered under the ESA, is a long-lived perennial species that occurs in a variety of upland habitat types from open scrub, to sandhill, scrubby flatwoods, and xeric hammocks that are fire-dependant and fire-maintained (FWS 1999). This species is listed as endangered in Hernando, Lake, and Polk Counties, and the main cause of decline is habitat loss or modification due to development and agricultural practices (FWS 2010a). It is possible that this species could be found in areas along the proposed transmission-line corridor in Hernando, Lake, and Polk Counties where suitable habitat exists.

Lewton's polygala (*Polygala lewtonii*), listed as endangered under the ESA, is a relatively short-lived, fire-dependent perennial herb that occurs in oak scrub and high pine, most abundantly in the edges between the two community types (FWS 1999). This species is listed as endangered in Marion and Polk Counties and is often found along roadsides and other disturbed areas that are open and sunny (FWS 1999). The main threat to Lewton's polygala is conversion of oak scrub and high pine to agricultural fields and residential housing (FWS 1999). It is possible that this species could be found in areas along the proposed transmission-line corridor in Marion and Polk Counties where suitable habitat exists.

Sandlace or Small's jointweed (*Polygonella myriophylla*), listed as endangered under the ESA, is a low, lateral branching shrub endemic to central Florida's upland ridge that occurs in open, bare white or yellow sandy areas created by moderate disturbance (FWS 1999). Sandlace is believed to produce allelotoxins, which may provide a mechanism for the plant to maintain sufficient bare sand in order for the species to persist (FWS 1999). Sandlace is listed as endangered in Polk County and it is possible that it could be found in areas along the transmission-line corridor where suitable habitat exists.

Scrub plum (*Prunus geniculata*), listed as endangered under the ESA, is a small shrub endemic to the high pine and oak scrub communities of the Lake Wales Ridge and has adapted to both high frequency and low intensity, as well as low frequency and higher intensity fire regimes respectively (FWS 1999). This species is listed as endangered in Polk County and prefers xeric, sunny sites with nutrient-poor soils (FWS 1999). It is possible that scrub plum could be found in areas along the transmission corridor in Polk County where suitable habitat exists.

Wide-leaf warea (*Warea amplexifolia*), listed as endangered under the ESA, is an annual herb with an extremely limited distribution along the northern portion of the Lake Wales Ridge and is listed as endangered in Polk County (FWS 1999, 2010a). This species is endemic to the sandhill (high pine) habitats and is found in open, dry woods with well-drained soils (FWS 1999). Loss of suitable habitat to agriculture, residential and commercial development, mining and alteration of the natural fire regime have all contributed to the decline of wide-leaf warea (FWS 1999). State maps indicate that this species may also occur in Lake County (FNAI 2009). It is possible that wide-leaf warea could be found in areas of open, dry woods with well-drained soils along the transmission-line corridor.

Carter's mustard (*Warea carteri*), listed as endangered under the ESA, is an annual herb that occurs in xeric sandhill, scrubby flatwoods, and scrub habitats on the Lake Wales Ridge and is listed as endangered in Polk County (FWS 1999, 2010a). This species is often found in disturbed areas such as roadsides and is threatened mainly by residential development and conversion of natural habitat to citrus groves and other agricultural activities (FWS 1999). It is possible that Carter's mustard could be found in areas of xeric sandhill, scrubby flatwoods, and scrub habitats along the transmission-line corridor.

6.0 Potential Environmental Effects of the Proposed Actions

This section describes the potential impacts from construction and operation of the proposed Units 1 and 2 on species listed in Table 1-1.

Florida salt marsh vole (*Microtis pennsylvanicus dukecampbelli*). Suitable habitat for the salt marsh vole does not exist onsite. The Florida salt marsh vole is not identified as potentially occurring in the counties through which the corridors would pass (FWS 2009a; FNAI 2009). However, salt marsh habitat preferred by this species is present within a portion of the blowdown pipeline corridor between the LNP site and the CREC. Considering the proximity to known locations for this species, it is possible (though unlikely considering the rarity of this species) that salt marsh habitat along the blowdown pipeline corridor route could support the salt marsh vole. If this species is present, development activities along this corridor could affect the Florida salt marsh vole and its habitat. FDEP could require protocol surveys for Florida salt marsh vole prior to "clearing and construction" of salt marshes in finalized rights-of-way (FDEP

2010). If salt marsh voles are detected and impacts cannot be avoided, PEF would be required to coordinate with the FFWCC to determine the need for appropriate mitigation. Therefore, the review team has determined that construction and operation activities on the LNP site and in the offsite corridors may affect, but would not likely adversely affect the Florida salt marsh vole.

PEF petitioned the State of Florida on April 29, 2010, for a modification to the currently certified corridor for the heavy-haul road, cooling-water makeup pipelines and the blowdown pipelines to be constructed between the LNP site and the CREC (PEF 2010a). This modification to the route would avoid all salt marsh habitat and would avoid impacts to the salt marsh vole.

Florida panther (*Puma concolor coryi*). The Florida panther is a currently restricted to a small population of less than 100 animals in southwest Florida (Land et al. 2008). Young transient males are occasionally documented outside of the known breeding range. Considering the distance from the LNP site to the current breeding range of this species (more than 175 mi), it is unlikely that Florida panther would be affected by activities on the LNP site.

The 230-kV Polk-Hillsborough-Pinellas transmission-line corridor would pass through the eastern perimeter of Polk County, which is identified as potentially supporting the Florida panther (FWS 2009a; FNAI 2009). Although outside of the known breeding range for the Florida panther, it is possible that young transient males could occasionally occur in Polk County. Therefore, project activities along the transmission-line corridor have the potential to affect the Florida panther. These impacts would likely be limited to temporary disturbance and displacement of individual animals that may at times travel north of the known breeding range. Because the final right-of-way for the Polk-Hillsborough-Pinellas transmission line would be narrow (about 100 ft wide) and mostly collocated with existing corridors, little clearing of habitat would occur. Consequently, the potential for fragmentation of suitable forest habitat that could support the Florida panther would be limited. Therefore, the review team has determined that the LNP project may affect, but would not likely adversely affect the Florida panther.

Even though the review team has concluded that the LNP project may affect, but would not likely adversely affect the Florida panther, the NRC and the USACE still plan to informally consult with the FWS regarding possible effects on the Florida panther. The USACE follows a Panther Key established by the FWS to determine whether it must consult regarding possible effects of pending DA permits on the Florida panther (Souza 2007). No part of the LNP project, including the transmission corridors, lies within the Panther Focus Area identified in the key. However, the key directs the user to consult with the FWS on projects outside of the Panther Focus Area that are greater than one acre and will cause a net increase or change in vehicle traffic patterns or are otherwise capable of causing other identifiable effects on panthers or their habitat. The LNP project could affect more than 2,500 acres of land and alter the traffic level of service on several roads near the LNP site (Kimley-Horn 2009). The FWS recognizes increased traffic, even in areas outside of the Panther Focus Area, as a significant threat to the Florida panthers, who commonly move long distances in search of prey and mates.

Florida manatee (*Trichechus manatus latirostris*). The Florida manatee northwest Florida population, which includes Citrus and Levy Counties, makes up approximately 12 percent of the total manatee population. Manatees migrate to warmer waters in the winter near the coast; are known to occur in the CREC discharge canal, particularly in the fall and winter (PEF 2008b), and have been sighted in the CFBC and OWR throughout the year (CH2MHill 2009b). FFWCC sets boating speed restrictions to limit the potential of boat and propeller strikes on manatees within the CFBC and the OWR (FFWCC 2002). To prevent impacts on manatees in the vicinity of construction activities, PEF would comply with the boating speed restrictions and Standard Manatee Conditions for In-Water Work (FDEP 2010) for construction activities in the CFBC. While boating activities are not allowed within the CREC, construction of discharge piping from LNP to the CREC may require in-canal activities.

PEF has a Manatee Protection Plan approved by FDEP for minimization of hazards to manatees while performing in-water work associated with the CREC, including avoidance of in-water work in the discharge canal from November 15 through March 31 when manatees use the warmer waters in this system as a refuge. PEF would likely expand the current Manatee Protection Plan to include the CFBC and OWR for approval by FDEP. As part of the existing plan, during construction activities, a biologist would be present to visually monitor for threatened and endangered species that may appear in the CREC or CFBC. Manatees might approach these areas, and their presence within 50 ft of the construction areas during activity would require a temporary halt to work until the manatees have cleared the 50-ft buffer zone (FDEP 2010). No impacts on Florida manatees are anticipated from installation of transmission-line corridors or structures because no in-water work would be necessary. PEF plans to use BMPs to prevent erosion and runoff into waterways spanned by transmission lines (PEF 2008a).

Manatees are known to occur in the CREC discharge canal, particularly in the fall and winter (PEF 2008b), and they have been sighted in the CFBC and OWR throughout the year (CH2MHill 2009b). Given the low approach velocity, intake operational impacts on manatees in the CFBC would not adversely affect this species. The approach velocity for the intake bays would be 0.25 fps at the bar screens and 0.5 fps for through-screen flow. Trash bar racks would prevent migration of manatees into forebay areas, and intake screens would be pressure washed when rotated out of service. A similar operational design is used at CREC for the intakes for Units 1, 2, and 3, but with intake velocities double (1.0 fps) the proposed velocity for LNP (AEC 1973), but distressed and moribund manatees may become trapped on the trash bars. Trash bar monitoring for LNP, as implemented at CREC for sea turtle rescue and handling, could be established to assist sick manatees that are not able to avoid becoming lodged on the trash racks, and to remove and report mortalities. No operational impacts are noted for manatees at the CREC intake or discharge. Operational impacts for the CREC discharge canal would not adversely affect manatees, because the LNP discharge would contribute less than 5 percent more of the current CREC discharge with no significant change in thermal energy. PEF has submitted an application (PEF 2008c) to the USACE for a permit to construct a barge slip and boat ramp on the CFBC. The barge slip and boat ramp will be constructed on property that is now part of the Marjorie Harris Carr Cross-Florida Greenway and Conservation Area and presumably there would be public access to the boat ramp. The boat ramp would likely result in increased recreational boating and fishing in the CFBC and OWR. An increase in recreational boating and fishing could result in collisions with manatees in these two waterbodies. Additionally, the construction of the barge slip would result in increased barge traffic in the CFBC associated with the construction and operation of LNP, however the potential for adverse impacts to manatees due to the increase in barge traffic would be mitigated through the implementation of the PEF Manatee Protection Plan.

Maintenance activities along the transmission lines would be performed using PEF practices and procedures to prevent impacts on surface waters and wetlands (PEF 2009a). Therefore, the review team anticipates no impacts on manatees from maintenance of the transmission lines.

The review team has determined that construction and operation of the LNP may affect, but is not likely to adversely affect the Florida manatee. Manatees have been observed in the CFBC, OWR, and the CREC. Increases in recreational boating and fishing in the CFBC due to the new boat ramp and barge traffic related to the construction and operation of the LNP could result in collisions with manatees. However, the LNP is not located in an Important Manatee Area or an Area of Inadequate Protection, construction and operation of the facility is not expected to significantly alter submerged aquatic vegetation, the discharge of CREC is not expected to be changed such that alterations in manatee occurrence or habitat would occur, and PEF will implement a Manatee Protection Plan (FDEP 2010), approved by the FDEP, to minimize hazards to manatees. Therefore, the review team concludes that adverse impacts to manatees would be minimal. This conclusion is consistent with the application of the USACE effects determination key for the Florida manatee. The use of the key was approved by the FWS (Souza 2008) and is used by the USACE to determine whether it must conduct a Section 7 consultation for manatees with the FWS prior to issuing DA permits. According to the key, projects that involve the creation of new slips to accommodate docking of repeat use vessels result in a “may affect” determination and require consultation with the FWS.

Florida grasshopper sparrow (*Ammodramus savannarum floridanus*). The Florida grasshopper sparrow is not found in Levy County and will not be impacted by construction and operation at the LNP site. There are no known populations of grasshopper sparrows north of Avon Park Air Force Range in south Polk County (FWS 1999). The only proposed transmission line corridor that occurs in Polk County is the existing Kathleen line, which is in the far north western corner of Polk County (PEF 2009a). Therefore, the Florida grasshopper sparrow is not addressed in the EIS. However, because the project falls within the FWS consultation area for this species, it is addressed in this BA. The proposed project would not convert large expansions of open grasslands, of which the grasshopper sparrow is dependent on, to other habitat types. Corridor maintenance activities would also help maintain grassland habitats, free of trees. The Florida grasshopper sparrow was not identified by the FFWCC as a species that would potentially be impacted by the proposed project in the 2008 Agency Report or in the conditions for certification modification for the proposed LNP site or any of the offsite corridors, including the transmission-line corridors (FFWCC 2008, FDEP 2010). Therefore, the review team has determined that construction and operation activities on the LNP site and in the offsite corridors would have no effect on the Florida grasshopper sparrow.

Florida scrub jay (*Aphelocoma coerulescens*). Although no Florida scrub jays were identified during field surveys conducted over a 2-year period on the proposed LNP site, the species has been documented in the general site vicinity (PEF 2008a 2009a; FWS 1999). Substantial blocks of xeric, well-drained scrub habitats preferred by scrub jays are lacking on the site. The conversion of most upland habitats to pine plantations where oaks and other hardwoods are excluded has removed suitable habitat for this species and reduced its potential occurrence onsite. It is therefore unlikely that Florida scrub jays would be affected by development activities on the LNP site.

The Florida scrub jay has been observed in the proposed transmission-line corridors where suitable habitat exists along the routes in Marion, Sumter, Lake, Hernando, Hillsborough, Pinellas, and Polk Counties (FWS 2010a). Based on cover type mapping, areas of potentially suitable habitat, although not prevalent, may occur within portions of the corridors (PEF 2008a). The entire project, including the site and associated onsite corridors, is within the Florida scrub jay Federal consultation areas. There are known occurrences of the scrub jay within 1000 meters of the proposed LNP site and within the proposed transmission corridor from the facility to the proposed Central Florida South substation (FFWCC 2008). Six scrub jays were observed in Marion County during reconnaissance surveys conducted along the 500-kV LNP-Central Florida South transmission-line corridor (PEF 2008a). In addition, populations are known to occur in the Halpata Tastanaki Preserve in Marion County, the southern perimeter of which is crossed by this corridor. FNAI records indicate the scrub jay also occurs along the blowdown pipeline and near the transmission corridor in Citrus County (PEF 2008a).

Even though there are known occurrences of the scrub jay near the LNP site, no suitable habitat has been mapped onsite. Therefore, the Florida scrub jay is not expected to be impacted during construction and operation activities onsite. Because wildlife reconnaissance surveys have been limited within the corridors and potentially suitable habitat is present in some places, it is possible that additional scrub jay populations could occur on or near the associated offsite corridors. Clearing the associated corridors has the potential to affect the Florida scrub jay and its habitat. Because most final rights-of-way would be narrow (100 to 220 ft wide) and mostly collocated with existing corridors, the actual extent of clearing would be limited, thereby reducing the potential for scrub jay impacts.

A Condition of Certification by the FDEP requires protocol surveys for the Florida scrub jay prior to "clearing and construction" for the LNP project, including the site and offsite corridors (FDEP 2010a). If impacts to scrub jays cannot be avoided, PEF would be required to coordinate with the FFWCC to determine the need for appropriate mitigation. Therefore, the review team has determined that clearing habitat in transmission line corridors may affect, and is likely to adversely affect the Florida scrub jay, but is not likely to jeopardize the continued existence of the Florida scrub jay.

Piping plover *(Charadrius melodus).* There were no piping plovers observed on the LNP site and suitable habitat is not present. FDEP did not identify the piping plover as occurring or potentially occurring onsite or in any of the offsite corridors (FDEP 2010). No piping plovers were observed during limited reconnaissance surveys conducted within the corridors. However, saltwater marsh is present within a small portion of the 230-kV CREC-to-Brookridge transmission-line corridor, as well as near the blowdown pipeline corridor adjacent to the western edge of the CREC facility (PEF 2008a, b). Consequently, it is possible, but unlikely that tidal mudflats used by piping plover may occur on portions of these corridors. Nevertheless, impacts on this species are expected to be inconsequential and limited, perhaps, to a very minor disturbance to loafing and foraging birds. Therefore, the review team has determined that building and operation activities within the offsite corridors may affect but would not likely adversely affect the piping plover.

Wood stork (*Mycteria americana*). Wood storks have been observed feeding in ditches and wetlands on the proposed LNP site, but no nesting colonies have been detected (PEF 2009a). Primarily because of forest-management activities and a lack of suitable open water habitat, suitable rookery habitat is limited. The LNP site is not located within the 13-mi (North Florida) or 15-mi (Central Florida) core foraging area of any active wood stork rookery (FWS 2009b). Wood storks have been observed roosting with other wading birds in forest stands 8 to 9 mi west of the LNP site (Entrix 2010). Long-term forest management on the LNP site and a lack of favored open water habitat limit suitable rookery habitat. Activities on the LNP site could remove or alter potential foraging habitat for the wood stork, and birds foraging onsite could be disturbed or displaced. Because wood storks are highly mobile and similar habitats are abundant in the project vicinity, it is unlikely that the species would be directly affected.

The wood stork is listed as potentially occurring in all counties through which associated corridors would pass (FWS 2009a, b). No wood stork rookeries were observed during limited reconnaissance surveys within these corridors; however, individuals were observed on the 230-kV Polk-Hillsborough-Pinellas transmission-line corridor, and areas of potentially suitable habitat (forested wetlands, shallow emergent wetlands, and ditches) occur throughout portions of all corridors (PEF 2008a). In addition, the proposed corridors pass within the 15-mi (Central Florida) and 18.6-mi (South Florida) core foraging area of a number of active wood stork rookeries (FWS 2009c). Development and maintenance activities in the associated corridors have the potential to affect the foraging and nesting habitat of the wood stork. Because final rights-of-way would be narrow (100 to 220 ft wide) and collocated with existing corridors over most of their range, the actual extent of clearing required to site associated facilities is greatly limited, reducing the potential for impact on wood storks.

Even though FDEP does not identify the wood stork as potentially occurring in the project area, there are known occurrences of foraging individuals on the LNP site. Therefore, FDEP may require protocol surveys for the wood stork prior to "clearing and construction" (FDEP 2010). If wood storks are detected and impacts cannot be avoided, PEF would be required to coordinate with the FFWCC to determine the need for appropriate mitigation. The *Wetland Mitigation Plan for the Levy Nuclear Plant and Associated Transmission Lines* has identified several mitigation parcels (Figure 3-6) to mitigate for wetland alteration and loss from the proposed project that would be beneficial to the wood storks foraging on or near the site and in or near the associated offsite corridors including the transmission-line corridors (Entrix 2010). Therefore, the review team has determined that activities within the offsite corridors may affect, and are likely to adversely affect the wood stork, but it is not likely these activities would jeopardize the continued existence of this species.

This conclusion is consistent with a conservative application of a Wood Stork Key that the USACE uses to determine whether it must consult with the FWS regarding the wood stork prior to issuing DA permits (Souza 2010). According to the key, projects within 0.76 km of an active wood stork colony site or otherwise impacting more than 0.20 ha of suitable wood stork foraging habitat "may affect" the wood stork, and hence warrant FWS consultation. No part of the LNP project lies within 0.76 km of a known active wood stork colony, but building the LNP facilities would disturb several hundred acres of suitable wood stork foraging habitat. The key allows the USACE to decide upon a "not likely to adversely affect" determination, and thereby not consult with FWS, if a wetland mitigation plan meets several specific criteria regarding the provision of favorable wood stork habitat. The wetland mitigation plan submitted by PEF (Entrix 2010) would provide substantial areas of restored and enhanced habitat for wood storks, but the USACE has not yet reviewed the plan against the specific criteria in the key. For this reason, the review team concludes that the 'may affect' conclusion is appropriate because it is a conservative interpretation of the key.

Red-cockaded woodpecker (*Picoides borealis*). No red-cockaded woodpeckers were observed on the LNP site during pedestrian surveys conducted over a 2-year period, (PEF 2008a, 2009a). This species is not known to nest on the LNP site and is considered unlikely to do so because of the absence of its preferred nesting habitat. The young (<30-years-old), heavily managed pine plantations that occupy most uplands on the LNP site do not provide favorable habitat. The species does, however, occur on the Goethe State Forest, located immediately north of the LNP site. Several active clusters (an aggregation of cavity trees used by a family group of red-cockaded woodpeckers) lie between 1.5 and 2.5 mi from the LNP site boundary (Petersen 2010). Considering the size of red cockaded woodpecker home ranges (100-400 ac; FWS 2003a), the distance of these active clusters from the LNP site and the lack of suitable habitat on site, no more than incidental use of LNP site would be expected by red cockaded woodpeckers. In addition, the PEF (2010) wetland mitigation plan for the LNP project has identified a mitigation parcel on the Goethe State Forest, adjacent to the LNP site, that has 32 active red-cockaded woodpecker trees (PEF 2010). Although the restoration efforts will be focused on wetlands, the red-cockaded woodpecker would benefit from those efforts. Consequently, it is unlikely red-cockaded woodpeckers would be affected by activities on the LNP site.

The red-cockaded woodpecker is listed as potentially occurring in all counties through which the corridors pass (FWS 2009a, b). The LNP site is within the Federal consultation area for the red-cockaded woodpecker and the proposed transmission line corridor from the LNP site to the Brookridge substation intersects known nesting locations (FFWCC 2008). The proposed transmission line from the LNP site to the proposed Central Florida South substation also intersects known nesting locations and is within 1000 meters of nesting locations within the Withlacoochee State Forest, the Halpata Tastanaki Preserve, the Lake Panasoffkee Management Area, and the Flat Island Preserve (FFWCC 2008). Clearing activities (i.e.,cavity tree removal, noise, increased habitat fragmentation) in the corridors where new rights-of-way are needed, therefore, have the potential to affect the red-cockaded woodpecker and its habitat. Because final rights-of-way would be narrow (100 to 220 ft wide) and mostly collocated within existing corridors, the actual extent of clearing would be greatly limited, thereby minimizing the potential for impact on red-cockaded woodpeckers. However, in areas where a new corridor is required, increased habitat fragmentation could negatively impact the red-cockaded woodpecker.

A Condition of Certification by the FDEP would likely require protocol surveys for red-cockaded woodpeckers prior to “clearing and construction” (FDEP 2010). If impacts cannot be avoided, PEF would be required to coordinate with the FFWCC to determine the need for appropriate mitigation. The impacts to the red-cockaded woodpecker would be localized and minimized by collocating corridors and using existing corridors, where possible. Therefore, the review team has determined that activities within the offsite corridors may affect, and are likely to adversely affect the red-cockaded woodpecker, but it is not likely these activities would jeopardize the continued existence of this species.

Audubon’s crested caracara (*Polyborus plancus audubonii*). Although the Audubon’s crested caracara is listed as threatened in Polk County, there is a low probability that this species would occur in the extreme northwest portion of Polk County where the transmission corridor would be located. Consequently, the Audubon’s crested caracara is not addressed in the EIS. Nevertheless, because the project falls within the FWS consultation area for this species, it is addressed in this BA (FFWCC 2008). The presence of Audubon’s crested caracara in the vicinity of the proposed corridor would likely be limited to incidental occurrence. Should this species occur incidentally in this area, LNP project activities may affect but are not likely to adversely affect the Audubon's crested caracara.

Everglade snail kite (*Rostrhamus sociabilis plumbeus*). The current range for this raptor is limited to six large freshwater systems in the central and south part of Florida and includes: the Upper St. Johns drainage, Kissimmee Valley, Lake Okeechobee, Loxahatchee Slough, the Everglades, and the Big Cypress basin (FWS 1999). Although it is listed as endangered in Marion, Lake, Polk, and Sumter Counties, those portions of the proposed LNP transmission lines that occur within those counties do not lie within the watersheds inhabited by the snail kite. Consequently, the Everglade snail kite is not addressed in the EIS. However, because the project falls within the FWS consultation area for this species, it is addressed in this BA (FFWCC 2008). The presence of the Everglade snail kite in the vicinity of the proposed corridor would likely be limited to incidental occurrence. Should this species occur incidentally in this area, LNP project activities may affect but are not likely to adversely affect the Everglade snail kite.

American alligator (*Alligator mississippiensis*). The American alligator is a common inhabitant of most types of freshwater bodies in Florida, including marshes and swamps such as those found on the LNP site. One juvenile American alligator was observed on the LNP site during field surveys conducted by PEF, and they have been observed in swampy areas at the CREC (PEF 2008b, 2009a). Alligators may occasionally occur wherever permanent water is present. Habitat suitability for many onsite wetlands and swamps is low for the alligator because these wetlands are subject to seasonal drying. Nevertheless, potentially suitable wetlands and swamps would be filled, and activities in and around wetlands may temporarily disturb and displace alligators. Because alligators adapt easily to different aquatic and wetland habitats, individuals would likely relocate to adjacent areas with suitable habitat. Because the surrounding landscape is rural, movement of alligators into urban and suburban areas where they could pose a nuisance or danger is not likely.

None of the proposed transmission-line corridors are within the range of the endangered American crocodile (whose range in Florida is limited to South Florida). Some wetlands that may support alligators would be filled during development of offsite facilities, but most habitats affected by transmission lines would only experience overstory vegetation removal, retaining the open-water component required by alligators. Higher-quality lake and stream habitats would generally be spanned by transmission lines, avoiding any impact on alligator habitat. Activities in and around wetlands could temporarily disturb and displace alligators. Because alligators adapt easily to different aquatic and wetland habitats, individuals would likely relocate to adjoining natural areas with suitable habitat. Because the surrounding landscape is generally rural, movement of alligators into urban and suburban areas where they could pose a nuisance or danger is not likely to occur.

Although the American alligator is known to occur on the LNP site and is expected to occur in the vicinity of the offsite corridors, the LNP project lies outside of the range of the American crocodile. The review team has therefore reached a conclusion of no effect for the American alligator.

Eastern indigo snake (*Drymarchon couperi*). No eastern indigo snakes were observed on the LNP site during pedestrian surveys conducted over a 2-year period (PEF 2009a). However, the species has been documented in the site vicinity (PEF 2008b). Most of the upland habitat on the LNP site has been converted to pine plantation and provides poor-quality habitat for eastern indigo snakes. Potentially suitable, though highly fragmented, forested wetland habitat is scattered throughout the site. Gopher tortoise burrows are present in the southeastern portion of the site (PEF 2009a). These factors suggest a potential for eastern indigo snakes to occur on the LNP site. However, their presence is likely limited due to highly fragmented habitat conditions and the dominance of pine plantations across the landscape.

Proposed development activities on the LNP site have the potential to affect the eastern indigo snake and its habitat. Because this species is not readily observed, its presence and extent of site use cannot be confirmed. Although the potential for impact on this species is thought to be low, incidental mortality to eastern indigo snakes is a possibility. During site development, *Standard Protection Measures for the Eastern Indigo Snake* would be implemented to minimize impacts on this species (FWS 2004). Examples of protection measures would include educating site workers about the snake prior to work and avoiding snakes when observed during work (FWS 2004). Under mitigation plans proposed for the LNP site, intensive commercial forest management would cease on some remaining undisturbed lands, and some pine plantations and other disturbed habitats would be rehabilitated and restored to native plant communities. The restored communities would likely provide higher-quality habitat for eastern indigo snakes than the existing pine plantations and other vegetation altered by recent logging.

Eastern indigo snakes have been documented in the general vicinity of the LNP site and listed as potentially occurring in all counties through which the proposed corridors would pass; therefore, there is a potential for this species to occur in or around the offsite corridors, including transmission-line corridors, where suitable habitat exists (FWS 2009a, b). Potentially suitable habitats and areas with prevalent gopher tortoise burrows are present along portions of the corridors, and one eastern indigo snake was observed in Sumter County during limited reconnaissance surveys conducted in the corridors (PEF 2008a). Because this species cannot be readily observed, its presence and extent of use within corridors cannot be readily confirmed.

The FWS *Standard Protection Measures for the Eastern Indigo Snake* would be implemented during development of the LNP project to minimize impacts. These measures require that clearing activities temporarily cease when eastern indigo snakes are observed to provide time for them to escape. The likelihood that undetected individuals could escape disturbance is high, especially for offsite corridors where final rights-of-way would be narrow (100 to 220 ft wide) and collocated with existing corridors over most of their range, limiting the actual extent of required clearing. A Condition of Certification by the FDEP would likely require surveys for and relocation of any gopher tortoises that could be harmed during "clearing and construction" of offsite facilities (FDEP 2010a). Any eastern indigo snakes recovered during gopher tortoise burrow excavations would be relocated in accordance with applicable guidelines. The species is a habitat generalist and the impacts would be localized within only a small part of the known range. Therefore, the review team has determined that building and operation activities on the LNP site and associated transmission-line corridors may affect, and are likely to adversely affect the eastern indigo snake. However, those impacts are not likely to jeopardize the continued existence of the eastern indigo snake.

This conclusion is consistent with a conservative application of the key that the USACE uses to determine whether it must consult with the FWS regarding the eastern indigo snake prior to issuing DA permits (Souza and Hankla 2010). According to the key, projects impacting areas containing gopher tortoise burrows, holes, cavities, or other potential eastern indigo snake refugia and impacting more than 25 ac of xeric habitat "may affect" the eastern indigo snake, and hence warrant FWS consultation, even if the FWS *Standard Protection Measures for the Eastern Indigo Snake* will be followed. Gopher tortoise burrows were observed on portions of the LNP site and the offsite corridors. Although most xeric habitats on the site have been substantially degraded by a history of intensive forest management, portions of the offsite corridors contain xeric habitats that have not been heavily degraded by commercial forestry. For these reasons, the review team concludes that the "may affect" conclusion is appropriate.

Sand skinks (*Neoseps reynoldsi*). Sand skinks are listed as threatened in Marion, Lake and Polk Counties (FWS 1999, 2010a). It is possible this species could be present in areas along the transmission-line corridors where suitable scrub habitat is present. Because final rights-of-way would be narrow (100 to 220 ft wide) and mostly collocated with existing corridors, the actual extent of clearing is greatly limited, thereby reducing the potential for impacts. In addition, FDEP did not identify the sand skink as occurring or potentially occurring onsite or in any of the offsite corridors (FDEP 2010). A Condition of Certification by the FDEP may require surveys for sand skink prior to clearing finalized rights-of-way if suitable habitat is present (FDEP 2010). If sand skinks were identified and impacts could not be avoided, PEF would be required to coordinate with the FFWCC to determine the need for appropriate mitigation. Therefore, the review team has determined that building activities within the associated offsite corridors may affect but would not likely adversely affect the sand skink.

Gulf sturgeon (*Acipenser oxyrinchus desotoi*). Gulf sturgeon were not collected during sampling efforts and are not likely to be encountered in the CFBC or CREC discharge canal because neither of these areas is critical habitat or a preferred spawning area. Adverse impacts are unlikely because straying juvenile or adult fish would avoid any construction activities occurring in these areas. No impacts on gulf sturgeon are anticipated from installation of transmission-line corridors or structures because no in-water work would be necessary. PEF plans to use BMPs to prevent erosion and runoff into waterways spanned by transmission lines (PEF 2008a).

Gulf sturgeon were not collected in sampling efforts and are not likely to be encountered in the CFBC or CREC discharge canal because neither of these areas is critical habitat or a preferred spawning area. Adverse impacts are unlikely due to the use of vertical trash bars across the intake screens reduces the approach water velocity to 0.25 fps versus 0.5 fps at the screens for intake operations, as discussed in EIS Section 4.2.1. The low approach velocity of 0.25 fps for intake operations should allow healthy gulf sturgeon to swim away and not become trapped against the bar racks, although distressed and moribund fish may become trapped on the trash bars. Maintenance activities along the transmission lines would be performed using PEF practices and procedures to prevent impacts on surface waters and wetlands (PEF 2009a). No impacts on Gulf sturgeon are anticipated from maintenance of the transmission lines.

The review team has determined that construction and operation of the LNP may affect, but is not likely to adversely affect the Gulf Sturgeon because of the restrictive current range of the species, the use of close-cycle cooling, and the planned low through screen intake water velocities.

Vascular Plants

No Federally listed plant species are known to occur in Levy and Citrus Counties (FWS 2009a; FNAI 2009). Consequently, it is unlikely that such plants would be affected by development activities on the LNP site.

There are thirteen Federally listed plant species that are identified as potentially occurring within the counties crossed by the associated offsite corridors (Table 1-1). These plants would be potentially impacted primarily due to the clearing and development of new corridors and vegetation maintenance activities as discussed in EIS Sections 4.1.2 and 4.2.2. PEF uses chemical and mechanical control methods appropriate for the location, terrain, and vegetation or habitat present. Chemical methods include the use of nonrestricted-use herbicides (only herbicides registered by the EPA) to control any vegetation that may interfere with the transmission-line corridor. The consistent use of herbicides results in the growth of low-growing, non-woody vegetation such as grasses and other native plants. Mechanical methods of vegetation control include hand clearing, pruning, mowing, and felling (Golder Associates 2008; PEF 2009a, h).

None of the plants listed in Table 1-1 were observed during the limited reconnaissance surveys conducted within the corridors (PEF 2009a; Golder Associates 2008). There is, however, one documented occurrence for the longspurred mint (*Dicerandra cornutissima*) from the PEF (2008a) and FNAI (2009) databases. Potentially suitable habitat for these species may be present within portions of the corridors. Eleven of these plant species are usually associated with well-drained, sandy, xeric upland habitats, such as sandhill and scrub, and several may also occur on scrubby flatwoods, which are found on moderately well-drained sandy flatland. These include the Florida bonamia, pygmy fringe tree, Florida goldenaster, longspurred mint, scrub wild buckwheat, Britton's beargrass, Lewton's polygala, Small's jointweed or Sandlace, scrub plum, wide-leaf warea, and Carter's mustard. Although not prevalent, sandhill and scrub habitats are present along corridors supporting the associated offsite facilities. Should these species occur in areas of the corridor to be cleared, development and operation activities may affect, and are likely to adversely affect these species and their habitats. The pygmy fringe tree, wide-leaf warea, and Carter's mustard are found in Central Florida, generally in the Lake Wales Ridge district, which is not in close proximity to the proposed transmission-line corridors in Lake and Polk Counties. Therefore, building and operation activities within the associated transmission line corridors may affect but are unlikely to adversely affect these species.

Two of the Federally listed plants are associated with wetlands may also occur on the offsite corridors: Brooksville bellflower, which is found on wet grassy slopes and drying pond edges in Hernando County, and Cooley's water-willow *(Justicia cooleyi*), which occurs in mesic hardwood hammocks of central Florida. These two plants and their habitats may also be affected by development activities. PEF has a wetland mitigation plan that has identified several mitigation sites in close proximity to the proposed transmission-line corridors (PEF 2010). These two wetland species could benefit from the proposed mitigation efforts.

Although suitable habitat may exist for the species listed above, targeted surveys for threatened and endangered plants have not been conducted on the LNP site or in any of the associated offsite corridors, including transmission lines. PEF has procedures in place that minimize adverse impacts on threatened and endangered species habitats such as floodplains and wetlands (Golder Associates 2008; PEF 2009a, h). Because most final rights-of-way for the transmission lines would be narrow (100 to 220 ft wide) and collocated with existing corridors over most of their range, the actual extent of clearing required is limited. This would greatly reduce the area over which these Federally listed plant species could be affected. Corridor-maintenance activities would be performed by PEF in compliance with applicable Federal, State, and local laws, regulations, and permit requirements. If any of the Federally listed plants occur within the offsite corridors, then construction and operation activities may affect and are likely to adversely affect these species.

7.0 Cumulative Effects

7.1 Terrestrial

In addition to the impacts from construction, preconstruction, and operations, the cumulative analysis also considers other past, present, and reasonably foreseeable future actions that could affect threatened and endangered species and habitats. For this analysis, the geographic area of interest is considered to encompass the 20-mi radius around the LNP site, plus the corridors associated with the proposed transmission lines and other offsite linear features. Corridors range in width from approximately 300 ft to 1 mi. This area is expected to encompass the locations of possible development projects potentially capable of substantially influencing threatened and endangered species on and close to the LNP project. This geographical area of interest includes watersheds providing direct runoff from the LNP site to the Gulf of Mexico, as well as the lower watersheds of the Withlacoochee and Waccasassa River basins.

Terrestrial and wetland habitats in the geographic area of interest have been modified over time from urbanization (e.g., residences, commercial development, roads, and utility development), agricultural practices (including commercial forest management), mining, construction of the CFBC, and development of the CREC. Extensive areas of habitat have been altered for forest management, agriculture, mining, and low-density residential development. Development and operation of power plants at the CREC, which began in the 1960s, have contributed cumulatively to many of the same types of impacts on threatened and endangered species as those associated with the proposed LNP project. The cumulative impacts resulting from CREC operation would continue for the geographic area of interest. Habitat degradation in the geographic area of interest has already resulted from the conversion of natural landscapes to intensively managed forests, pastureland and other agricultural uses, rural residential development, and other developments causing fragmentation of the landscape. This cumulative loss, degradation, and fragmentation of habitat have already contributed to declines in wildlife populations and biodiversity within the area. In addition, decreased precipitation, sea-level rise, more frequent storm surges, increased intensity of coastal storms, and increased temperatures resulting from global climate change may already be contributing to wetland losses and exacerbating the ongoing trend (GCRP 2009).

Future actions or conditions within the geographic area of interest that would contribute to cumulative effects on threatened and endangered species and habitats would include the proposed Tarmac King Road Limestone Mine, the US-19 bridge expansion at the CFBC, renewal of the CREC operating license for an additional 20 years (beginning in 2017), the Inglis Lock Bypass Channel Spillway Hydropower Project, proposed expansion of the Florida Gas pipeline, the proposed Suncoast Toll Road, continued urbanization (e.g., commercial, industrial and residential expansion; creation and/or upgrading of transmission lines; new road development and expansion), the operation and expansion of existing limestone quarries, future agricultural and forestry management activities, increased outdoor recreation, and future climate change. For example, at the proposed Tarmac King Road Limestone Mine that would be built about 2 mi west of the LNP site, approximately 2700 ac of wetlands and uplands would be mined, with an additional 1300 ac disturbed to site a quarry processing plant, roads and other infrastructure. Total wetland impacts are estimated at 1140 ac (BRA 2010). Tarmac America LCC (Tarmac) plans to mitigate for wetland impacts by conducting a variety of conservation measures on a 4500-ac site adjacent to the proposed mine that would be protected through a conservation easement. Other future actions or conditions that would contribute to cumulative impacts on threatened and endangered species and habitats would include building and/or upgrading of transmission lines and other utilities, other new road development and expansion, continued industrial and urban development throughout the geographic area of interest, increased outdoor recreation, nonpoint source runoff from activities such as agriculture, forestry and ranching, and global climate change.

Future urban, industrial and utility development, new transmission-line corridors, and the effects of future changes in climate may potentially affect threatened and endangered species that occur near the LNP project primarily by decreasing or degrading the available habitat for these species. Habitat loss may occur through loss of upland and wetland habitats for urban development, sea-level rise, increasing salinity of estuarine areas, and inundation or filling of wetland habitats. Sea-level rise resulting from climate change along the Gulf Coast of Florida could accelerate the loss of wetlands and estuaries, thereby eliminating breeding and foraging habitat for commercial, game, and threatened and endangered wildlife (Ning et al. 2003; GCRP 2009). Global climate change could also cause shifts in species ranges and migratory corridors as well as changes in ecological processes (GCRP 2009). Loss or alteration of habitats could affect the numerous Federally listed plant species that may occur near the LNP project (see Table 1-1).

Federally listed birds such as the piping plover use tidal marshes and estuaries along the Florida Gulf Coast in the area near the LNP project. Threats posed to this species include the loss or degradation of foraging habitat and the loss of breeding habitat as a result of sea-level rise and increased salinity caused by climate change. Numerous other Federally listed birds may occur within or adjacent to the predominantly inland areas near the LNP project (see Table 1-1). Wading birds such as the wood stork would be affected by activities that alter or destroy wetland and marsh habitats where birds forage, and by activities that affect or disturb rookeries where these birds breed. Removal of mature pine forest could degrade breeding and foraging habitat for red-cockaded woodpeckers, and clearing oak scrub habitats could affect Florida scrub jay.

Federally listed reptiles and amphibians could be affected by projects involving land clearing, habitat loss or fragmentation, wetland fill or degredation, and increased vehicle traffic on roads and rights-of-ways. Species that may occur near the LNP project wherever suitable habitat is present include the sand skink and eastern indigo snake (Table 1-1). These species could be displaced and would likely suffer increased mortality. The American alligator, listed as threatened under the ESA (due to similarity of appearance to the American crocodile) is found in areas near the LNP project, but is considered to have fully recovered (52 FR 21059). Although trends and conditions, such as urbanization, industrialization, and global climate change, could affect the American alligator's habitat and local distribution, none of the identified present or future projects is expected to affect the recovered species.

Cumulative impacts on threatened and endangered species and habitats are estimated based on the information provided by PEF and the review team's independent evaluation. Past, present, and reasonably foreseeable future activities exist in the geographic area of interest that could affect Federally protected terrestrial ecological resources in ways similar to the proposed LNP project. Development and expansion of transmission-line corridors and infrastructure to support proposed future projects would likely affect wildlife and may be detrimental to wetland habitats. Loss of wildlife habitat, increased habitat fragmentation, impacts on Federally protected species, and increased loss of wetlands from continued development and as a consequence of climate change are unavoidable and would continue to occur. Detectable alteration of habitat, loss of habitat, and increased habitat fragmentation, and increased risk of avian collision and electrocution within a branch of the Eastern Atlantic Flyway that crosses central Florida would contribute to the cumulative impacts. Based on this analysis, the review team concludes that cumulative impacts from building and operating the proposed LNP units and from past, present, and reasonably foreseeable future actions on Federally protected species and their habitats would noticeably alter, but would not likely destabilize, those resources.

7.2 Aquatic

In addition to the impacts from construction, preconstruction, and operations, the cumulative analysis also considers other past, present, and reasonably foreseeable future actions that could affect aquatic ecology. For this analysis, the geographic area of interest is considered to be the proposed LNP site, which encompasses all waterbodies associated with LNP activities, the entire CFBC, Lake Rousseau, the Inglis Lock bypass channel, OWR, the CREC intake and discharge, the Levy and Citrus County offshore areas of the Gulf of Mexico, and the proposed transmission-line corridors. Other watersheds (Wacassassa Basin) adjacent to these waterbodies are not affected by LNP and are excluded from this aquatic cumulative impacts analysis.

Other actions in the vicinity that have present and reasonably foreseeable future potential impacts on the CFBC and the Gulf of Mexico offshore of the CREC include operation of the existing CREC, the proposed uprate of CREC Unit 3, current operation of the Inglis Quarry, widening of the US-19 bridge across the CFBC, a proposed hydropower project on the Inglis Lock bypass channel spillway, the proposed Tarmac King Road Limestone Mine, decommissioning of CREC Units 1 and 2, development of a Port District along the CFBC, and natural environmental stressors (e.g., short- or long-term changes in precipitation or temperature and the resulting response of the aquatic community). The review team considered these potential sources of impacts in its evaluation of the cumulative aquatic ecology impacts presented in PEF's ER and in PEF's responses to the NRC staff's Requests for Additional Information.

Historically, the construction and operation of CREC Units 1 through 5 have had some impact on fisheries in the Gulf of Mexico that PEF mitigates by hatchery supplementation. The current CFBC was constructed starting in 1964, but it was never completed as a cross-Florida canal and was officially deauthorized in 1991 (Noll and Tegeder 2003). The western portion of the completed CFBC extends from the Gulf of Mexico to the Inglis Lock at Lake Rousseau and is typical of a tidal canal with marine and estuarine characteristics.

Cumulative impacts on threatened and endangered aquatic species within the CFBC are likely due to activities or events that are distinct from the LNP site. Activities related to construction of the hydropower system on the Inglis Lock bypass channel could affect the downstream migration of fish from Lake Rousseau to the Withlacoochee River, but would not affect the CFBC or OWR. The US-19 bridge expansion will not include in-water construction, and impacts on the CFBC will likely be mitigated through the use of BMPs to control erosion and stormwater runoff. The Inglis Quarry is located on the north side of the CFBC, and drainage ditches are separated from the CFBC by a containment berm (SDI 2008). Construction of the barge slip and boat ramp and the intake structure would be land based and employ best management practices minimizing impacts to the CFBC. Barge traffic within the CFBC is likely to be limited LNP module transportation, and should have minimal impact on aquatic resources, as discussed in EIS Section 4.3.2. Recreational boating in the CFBC and the OWR would likely increase due to boat ramp. The proposed Tarmac King Road Limestone Mine expansion may affect groundwater discharge to the lower Withlacoochee River (see EIS Section 7.2.1.2). The CREC Unit 3 power uprate is not expected to have any construction-related impacts except for the construction of additional mechanical draft cooling towers on the CREC site that has been previously disturbed. Any onsite construction-related potential impacts would be mitigated through the use of BMPs. The contribution of LNP construction-related impacts to impacts related to other nearby construction activities would be minor. Impacts from the construction of LNP would be temporary, largely mitigated, and mainly confined to the site. Therefore, the review team concludes that the overall contribution of construction to cumulative losses of aquatic organisms in the region would be minor, and mitigation would not be warranted.

For operations, the review team considered the potential cumulative impacts on the Gulf of Mexico and CFBC related to impingement and entrainment of aquatic organisms and also thermal and chemical releases from both CREC and LNP. Water withdrawn for operation of proposed LNP Units 1 and 2 would require a net intake of 190 cfs (122 Mgd). The source of the 190 cfs, under low flow conditions, would be 50 cfs from leakage of Lake Rousseau water through the Inglis Lock and freshwater springs emanating in the CFBC in the vicinity of the intake structure, 70 cfs from the discharge of Lake Rousseau water at the Inglis Dam that would enter the CFBC via the OWR, and an inflow of 70 cfs that would come from the Gulf of Mexico.

CREC Units 1 through 5 withdraw over 15 times more water from the Gulf of Mexico for operations than the required 190 cfs for LNP Units 1 and 2. The proposed CREC Unit 3 uprate would not require additional water-intake volume for CREC Units 1, 2, and 3 (Golder Associates 2008).

The review team considered the potential cumulative impacts of impingement and entrainment of aquatic organisms related to operation of LNP 1 and 2 and CREC. As discussed in EIS Section 5.3.2, the proposed closed-cycle cooling system with mechanical draft cooling towers for proposed LNP Units 1 and 2 would not be expected to result in discernable impacts on populations of aquatic organisms inhabiting the Crystal Bay and Withlacoochee Bay areas of the Gulf of Mexico. The review team is aware that the possibility exists that CREC Units 1 and 2 (fossil-fuel plants) which contribute significantly to the overall impingement and entrainment of aquatic organisms at CREC, would be decommissioned once LNP Units 1 and 2 begin operation. This significant reduction in intake withdrawal volume (greater than 48 percent) at CREC would reduce the cumulative impact on impingement and entrainment of aquatic organisms in the Gulf of Mexico, and may result in a net positive impact on local fisheries (see Table 4-1). Therefore, any cumulative impingement or entrainment impacts would be considered minor.

The review team also considered the potential cumulative impacts of thermal discharges on threatened and endangered species. The operation of all five units at CREC with the uprate of CREC Unit 3 and without the LNP Units 1 and 2 discharge would result in no thermal increase with the operation of a new south cooling tower to augment the current modular helper cooling towers (Golder Associates 2008). The review team is aware that the possibility exists that CREC Units 1 and 2 (fossil-fuel plants), which contribute to the discharge flow, would be decommissioned once LNP Units 1 and 2 begin operation. The review team conducted a thermal analysis of two cases involving the discharge from CREC.

The first case evaluated the thermal discharge from all five units at CREC, the power uprate from CREC Unit 3, and the blowdown from LNP 1 and 2. A second analysis involved CREC Units 3 through 5, the Unit 3 power uprate, and blowdown from LNP 1 and 2. The thermal analyses for these two cases are presented in EIS Section 7.2.2.1. The first scenario concludes that resulting changes in discharges at CREC would be minimal for thermal and chemical impacts with a slight increase in discharge plume size. The addition of LNP Units 1 and 2 discharge would result in an increased discharge volume of 87.93 Mgd, but with no significant increase in thermal plume temperature or salinity over current conditions as discussed in EIS Section 5.3.2.1.

The second scenario, with the absence of CREC Units 1 and 2, would result in a discharge plume much decreased in size when compared to the first scenario. CREC Units 1 and 2 currently contribute 918 Mgd total discharge to the Gulf of Mexico during summer operations. This accounts for greater than 45 percent of the total discharge (PEF 2009a). The predicted thermal plume would decrease during both summer and winter conditions as a result from the decreased discharge plume. Salinity increases would occur under both summer and winter conditions due to increased cycles of concentration with CREC Units 1 and 2 non-operational, but are less than 1.0 psu. The overall impact on aquatic resources is expected to be minimal.

The review team considered the potential cumulative impacts on threatened and endangered aquatic species from chemical releases, including increases in total dissolved solids in the combined CREC and LNP discharge. CREC Units 1 through 5 are in compliance with the Clean Water Act Section 316(a) (thermal discharges) impacts from cooling-water systems. Chemical releases from the existing unit(s) currently comply with the FDEP NPDES permit requirements and comply with the Unit 3 uprate, and decommissioning of CREC Units 1 and 2 is expected to continue and would be monitored in the future. The FDEP would take cumulative chemical releases from the existing and proposed unit(s), as well as from other industrial sites discharging to the Gulf of Mexico, into consideration before approving a NPDES permit for the proposed unit(s). Given the lack of other discharges into the immediate area of the CREC discharge, it is likely that the cumulative impacts from LNP discharge combined with the discharge from CREC Units 1 through 5 with and without operation of CREC Units 1 and 2 would be minimal.

The review team also considered the cumulative impacts to Florida manatees due to increased recreational boating and fishing resulting from the construction of a boat ramp associated with the LNP barge slip. Increased recreational boating could results in collisions with manatees in the CFBC and OWR.

Anthropogenic activities, such as residential or industrial development near the vicinity of the nuclear facility, can present additional constraints on aquatic resources. Future activities may include shoreline development such as the proposed Port District, for commercial, industrial, and residential waterfront development along the CFBC to the west of US-19 (Citrus County 2009), increased water needs, and increased discharge of effluents into the Gulf of Mexico or the CFBC.

In addition to direct anthropogenic activities, physical disturbance and climatic events may impose external stressors on aquatic communities (GCRP 2009). Aquatic ecosystem responses to these events are difficult to predict. The level of impact resulting from these activities or events would depend on the intensity of the perturbation and the recovery of the different threatened and endangered aquatic species populations.

Cumulative impacts on Federally listed threatened and endangered species are estimated based on the information provided by PEF and the review team's independent review. Based on the above analysis, the review team concludes that cumulative impacts on threatened and endangered aquatic species related to proposed LNP Units 1 and 2 would be minor.

8.0 Conclusions

The potential impacts to protected species from building and operating the proposed LNP Units 1 and 2 at the LNP site plus the associated offsite facilities and transmission lines on the species listed in Table 1-1 are listed in Table 8-1. The known distributions and records of these species, the potential ecological impacts of the construction and operation to the species, their habitat, and their prey have been considered in making a determination of likely impacts in this BA.

Table 8-1. Species Potentially Affected by Construction and Operation of Proposed LNP Units 1 and 2

Common Name	Scientific Name	Status	Determination
Mammals			
Florida salt marsh vole	*Microtis pennsylvanicus dukecampbelli*	E	May affect, not likely to adversely affect
Florida panther	*Felis concolor*	E	May affect, not likely to adversely affect
Florida manatee	*Trichechus manatus latirostris*	E	May affect, not likely to adversely affect
Birds			
Florida grasshopper sparrow	*Ammodramus savannarum floridanus*	E	No effect
Audubon's crested caracara	*Polyborus plancus audubonii*	T	May affect, not likely to adversely affect
Everglade snail kite	*Rostrhamus sociabilis plumbeus*	E	May affect, not likely to adversely affect
Piping plover	*Charadrius melodus*	T	May affect, not likely to adversely affect
Red-cockaded woodpecker	*Picoides borealis*	E	May affect, likely to adversely affect
Florida scrub jay	*Aphelocoma coerulescens*	T	May affect, likely to adversely affect

Table 8-1. (contd)

Common Name	Scientific Name	Status	Determination
			adversely impact.
Wood Stork	*Mycteria Americana*	E	May affect, likely to adversely impact
Reptiles			
American alligator	*Alligator mississippiensis*	T	No effect
Eastern indigo snake	*Drymarchon couperi*	T	May affect, likely to adversely affect
Sand skink	*Neoseps reynoldsi*	T	May affect, not likely to adversely affect
Fishes			
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	T	May affect, not likely to adversely affect
Plants			
Florida bonamia	*Bonamia grandiflora*	T	May affect, likely to adversely affect
Brooksville bellflower	*Campanula robinsiae*	E	May affect, likely to adversely affect
Pygmy fringe tree	*Chionanthus pygmaeus*	E	May affect, not likely to adversely affect
Florida goldenaster	*Chrysopsis floridana*	E	May affect, likely to adversely affect
Longspurred mint	*Dicerandra cornutissima*	E	May affect, likely to adversely affect
Scrub buckwheat	*Eriogonum longifolium* var. *gnaphalifolium*	T	May affect, likely to adversely affect
Cooley's water-willow	*Justicia cooleyi*	E	May affect, likely to adversely affect
Britton's beargrass	*Nolina brittoniana*	E	May affect, likely to adversely affect
Lewton's polygala	*Polygala lewtonii*	E	May affect, likely to adversely affect
Sandlace or Small's jointweed	*Polygonella myriophylla*	E	May affect, likely to adversely affect
Scrub plum	*Prunus geniculata*	E	May affect, likely to adversely affect
Wideleaf warea	*Warea amplexifolia*	E	May affect, not likely to adversely affect
Carter's mustard	*Warea carteri*	E	May affect, not likely to adversely affect

E= Endangered, T=Threatened

9.0 References

10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 52. Code of Federal Regulations, Title 10, *Energy*, Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants."

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Appendix G

Supporting Socioeconomic Documentation

Appendix G

Supporting Socioeconomic Documentation

Transient population numbers and projections in Table G-1 and Table G-2, which apply to a 10-mi radius around the proposed site include people who work for major employers (more than 100 employees) within 10 mi of the proposed LNP site; migrant workers; guests in hotels, motels, or bed-and-breakfast establishments; people who have seasonal residences; visitors to recreation areas; and “special populations” – residents of schools, in-patients at hospitals and nursing homes, and inmates in correctional facilities. Transient population numbers in Table G-3 and Table G-4, which apply to the population between 10 and 50 mi around the proposed site, do not include workers for major employers because the region is presumed large enough so the number of people who commute in is balanced by those who commute out, nor “special populations” because it is presumed that the U.S. Census Bureau tabulates long-term residents of these facilities, while short-term residents generally live within the 50-mi region.

1 **Table G-1**. Population Distribution Among Sectors Within 10 mi of the LNP Site for the Year
2 2000

km mi	0-1.6 0-1	1.6-3.2 1-2	3.2-4.8 2-3	4.8-6.4 3-4	6.4-8.1 4-5	8.1-16.1 5-10	Total for Sector
North-residential	0	5	35	67	18	11	136
North-transient	3	12	11	16	20	168	230
North-northeast-residential	0	4	14	14	8	270	310
North-northeast-transient	3	7	11	16	20	168	225
Northeast-residential	1	1	6	10	5	806	829
Northeast-transient	3	7	11	16	20	137	194
East-northeast-residential	1	0	0	0	4	1066	1071
East-northeast-transient	3	7	11	16	20	126	183
East-residential	1	2	2	0	11	2300	2316
East-transient	3	7	11	16	20	1234	1291
East-southeast-residential	2	7	11	45	90	2725	2880
East-southeast-transient	3	7	11	16	22	281	340
Southeast-residential	2	7	31	322	294	1582	2238
Southeast-transient	3	7	11	16	40	1187	1264
South-southeast-residential	2	7	27	48	277	2474	2835
South-southeast-transient	3	7	11	22	36	309	388
South-residential	2	7	13	16	44	1455	1537
South-transient	3	7	11	16	34	1004	1075
South-southwest-residential	2	5	49	419	33	102	610
South-southwest-transient	3	7	11	18	37	305	381
Southwest-residential	2	8	55	499	599	210	1373
Southwest-transient	3	7	11	16	30	1009	1076
West-southwest-residential	2	11	26	142	239	736	1156
West-southwest-transient	3	7	11	16	20	479	536
West-residential	1	5	3	7	22	8	46
West-transient	3	7	11	16	20	421	478
West-northwest-residential	0	2	4	4	1	6	17
West-northwest-transient	3	7	11	16	20	168	225
Northwest-residential	0	2	4	5	5	3	19
Northwest-transient	3	7	11	16	20	168	225
North-northwest-residential	0	2	22	18	35	7	84
North-northwest-transient	3	7	11	16	20	168	225
Residential total	18	75	302	1616	1685	13,761	17,457
Cumulative total (residential plus transient)	66	192	478	1880	2084	21,093	25,793

Source: PEF 2009
To account for the difference in distance between each LNP unit and the LNP centerpoint, 0.16 km (0.1 mi) was added to each radial distance to conservatively adjust the population data. The totals are subject to rounding differences.

Table G-2. Population Distribution Among Sectors Within 10 mi of the LNP Site Projected Through 2080

	0- 1.6 km (0-1 mi)	1.6- 3.2 km (1-2 mi)	3.2- 4.8 km (2-3 mi)	4.8- 6.4 km (3-4 mi)	6.4- 8.1 km (4-5 mi)	8.1- 16.1 km (5-10 mi)	Total for Sector
			North-Residential				
2005 Population	0	5	39	73	20	11	148
2010 Population	0	6	43	82	22	14	167
2015 Population	0	6	47	90	24	14	181
2020 Population	0	7	51	97	26	17	198
2030 Population	0	8	58	111	29	20	226
2040 Population	0	9	69	130	34	23	265
2050 Population	0	10	82	153	40	26	311
2060 Population	0	12	97	181	47	30	367
2070 Population	0	14	115	214	56	36	435
2080 Population	0	16	136	252	66	42	512
			North-Transient				
2005 Population	3	13	12	18	22	185	253
2010 Population	4	15	14	20	25	207	285
2015 Population	4	16	15	22	27	226	310
2020 Population	5	18	17	24	30	245	339
2030 Population	6	20	19	27	34	277	383
2040 Population	7	24	22	32	40	328	453
2050 Population	8	28	26	38	47	388	535
2060 Population	9	33	31	45	56	459	633
2070 Population	11	39	37	53	66	543	749
2080 Population	13	46	44	63	78	642	886
			North-Northeast-Residential				
2005 Population	0	4	15	15	9	297	340
2010 Population	0	5	17	17	9	327	375
2015 Population	0	5	18	18	10	356	407
2020 Population	0	6	20	20	10	384	440
2030 Population	0	7	22	22	11	434	496
2040 Population	0	8	26	26	13	511	584
2050 Population	0	9	30	31	15	600	685
2060 Population	0	11	35	36	17	706	805
2070 Population	0	13	41	42	20	832	948
2080 Population	0	15	48	49	23	979	1114
			North-Northeast-Transient				
2005 Population	3	8	12	18	22	192	255
2010 Population	4	9	14	20	25	217	289
2015 Population	4	10	15	22	27	240	318
2020 Population	5	11	17	24	30	263	350
2030 Population	6	12	19	27	34	301	399
2040 Population	7	14	22	32	40	366	481
2050 Population	8	17	26	38	47	445	581

Table G-2. (contd)

	0- 1.6 km (0-1 mi)	1.6- 3.2 km (1-2 mi)	3.2- 4.8 km (2-3 mi)	4.8- 6.4 km (3-4 mi)	6.4- 8.1 km (4-5 mi)	8.1- 16.1 km (5-10 mi)	Total for Sector
2060 Population	9	20	31	45	56	541	702
2070 Population	11	24	37	53	66	658	849
2080 Population	13	28	44	63	78	800	1026
Northeast-Residential							
2005 Population	1	1	7	11	6	939	965
2010 Population	1	1	7	12	6	1060	1087
2015 Population	1	1	8	13	7	1168	1198
2020 Population	1	1	8	14	7	1304	1335
2030 Population	1	1	9	16	8	1515	1550
2040 Population	1	1	11	19	9	1859	1900
2050 Population	1	1	13	22	11	2292	2340
2060 Population	1	1	15	26	13	2842	2898
2070 Population	1	1	18	31	15	3513	3579
2080 Population	1	1	21	37	18	4345	4423
Northeast-Transient							
2005 Population	3	8	12	18	22	156	219
2010 Population	4	9	14	20	25	177	249
2015 Population	4	10	15	22	27	196	274
2020 Population	5	11	17	24	30	214	301
2030 Population	6	12	19	27	34	245	343
2040 Population	7	14	22	32	40	298	413
2050 Population	8	17	26	38	47	362	498
2060 Population	9	20	31	45	56	440	601
2070 Population	11	24	37	53	66	535	726
2080 Population	13	28	44	63	78	650	876
East-Northeast-Residential							
2005 Population	1	0	0	0	4	1255	1260
2010 Population	1	0	0	0	5	1443	1449
2015 Population	1	0	0	0	5	1609	1615
2020 Population	1	0	0	0	6	1786	1793
2030 Population	1	0	0	0	7	2071	2079
2040 Population	1	0	0	0	8	2576	2585
2050 Population	1	0	0	0	9	3207	3217
2060 Population	1	0	0	0	11	4006	4018
2070 Population	1	0	0	0	13	4999	5013
2080 Population	1	0	0	0	15	6235	6251
East-Northeast-Transient							
2005 Population	3	8	12	18	22	144	207
2010 Population	4	9	14	20	25	163	235
2015 Population	4	10	15	22	27	180	258
2020 Population	5	11	17	24	30	197	284
2030 Population	6	12	19	27	34	225	323
2040 Population	7	14	22	32	40	274	389

Table G-2. (contd)

	0- 1.6 km (0-1 mi)	1.6- 3.2 km (1-2 mi)	3.2- 4.8 km (2-3 mi)	4.8- 6.4 km (3-4 mi)	6.4- 8.1 km (4-5 mi)	8.1- 16.1 km (5-10 mi)	Total for Sector
2050 Population	8	17	26	38	47	333	469
2060 Population	9	20	31	45	56	405	566
2070 Population	11	24	37	53	66	492	683
2080 Population	13	28	44	63	78	598	824
			East-Residential				
2005 Population	1	2	2	0	12	2706	2723
2010 Population	1	2	2	0	13	3111	3129
2015 Population	1	2	2	0	14	3472	3491
2020 Population	1	2	2	0	15	3845	3865
2030 Population	1	2	2	0	17	4446	4468
2040 Population	1	2	2	0	20	5537	5562
2050 Population	1	2	2	0	23	6909	6937
2060 Population	1	2	2	0	27	8617	8649
2070 Population	1	2	2	0	32	10,749	10,786
2080 Population	1	2	2	0	38	13,411	13,454
			East-Transient				
2005 Population	3	8	12	18	22	1400	1463
2010 Population	4	9	14	20	25	1577	1649
2015 Population	4	10	15	22	27	1734	1812
2020 Population	5	11	17	24	30	1891	1978
2030 Population	6	12	19	27	34	2151	2249
2040 Population	7	14	22	32	40	2592	2707
2050 Population	8	17	26	38	47	3123	3259
2060 Population	9	20	31	45	56	3763	3924
2070 Population	11	24	37	53	66	4534	4725
2080 Population	13	28	44	63	78	5463	5689
			East-Southeast-Residential				
2005 Population	2	8	12	50	99	3045	3216
2010 Population	2	9	14	55	111	3396	3587
2015 Population	2	10	15	60	121	3692	3900
2020 Population	2	11	17	65	132	4005	4232
2030 Population	2	12	19	73	150	4505	4761
2040 Population	2	14	22	86	177	5324	5625
2050 Population	2	17	26	102	209	6302	6658
2060 Population	2	20	31	120	246	7466	7885
2070 Population	2	24	37	143	291	8870	9367
2080 Population	2	28	44	168	344	10,514	11,100
			East-Southeast-Transient				
2005 Population	3	8	12	18	24	319	384
2010 Population	4	9	14	20	27	359	433
2015 Population	4	10	15	22	29	395	475
2020 Population	5	11	17	24	32	430	519
2030 Population	6	12	19	27	36	489	589
2040 Population	7	14	22	32	43	589	707

Table G-2. (contd)

	0- 1.6 km (0-1 mi)	1.6- 3.2 km (1-2 mi)	3.2- 4.8 km (2-3 mi)	4.8- 6.4 km (3-4 mi)	6.4- 8.1 km (4-5 mi)	8.1- 16.1 km (5-10 mi)	Total for Sector
2050 Population	8	17	26	38	51	710	850
2060 Population	9	20	31	45	60	855	1020
2070 Population	11	24	37	53	71	1030	1226
2080 Population	13	28	44	63	84	1241	1473
Southeast-Residential							
2005 Population	2	8	34	356	331	1759	2490
2010 Population	2	9	38	395	367	1964	2775
2015 Population	2	10	41	432	399	2126	3010
2020 Population	2	11	45	468	431	2315	3272
2030 Population	2	12	52	529	484	2604	3683
2040 Population	2	14	61	622	573	3062	4334
2050 Population	2	17	71	734	678	3609	5111
2060 Population	2	20	84	867	802	4260	6035
2070 Population	2	24	99	1023	949	5039	7136
2080 Population	2	28	117	1208	1123	5944	8422
Southeast-Transient							
2005 Population	3	8	12	18	45	1333	1419
2010 Population	4	9	14	20	50	1482	1579
2015 Population	4	10	15	22	55	1613	1719
2020 Population	5	11	17	24	59	1745	1861
2030 Population	6	12	19	27	67	1961	2092
2040 Population	7	14	22	32	79	2320	2474
2050 Population	8	17	26	38	93	2745	2927
2060 Population	9	20	31	45	110	3248	3463
2070 Population	11	24	37	53	130	3843	4098
2080 Population	13	28	44	63	154	4547	4849
Southeast-Residential							
2005 Population	2	8	30	53	311	2766	3170
2010 Population	2	9	32	59	345	3082	3529
2015 Population	2	10	35	64	376	3352	3839
2020 Population	2	11	37	69	406	3628	4153
2030 Population	2	12	42	77	455	4078	4666
2040 Population	2	14	50	90	538	4815	5509
2050 Population	2	17	58	106	638	5691	6512
2060 Population	2	20	68	125	755	6728	7698
2070 Population	2	24	81	147	893	7964	9111
2080 Population	2	28	95	173	1056	9411	10,765
South-Southeast-Transient							
2005 Population	3	8	12	24	40	347	434
2010 Population	4	9	14	27	45	386	485
2015 Population	4	10	15	29	49	420	527
2020 Population	5	11	17	32	53	454	572
2030 Population	6	12	19	36	60	510	643
2040 Population	7	14	22	43	71	603	760

Table G-2. (contd)

	0- 1.6 km (0-1 mi)	1.6- 3.2 km (1-2 mi)	3.2- 4.8 km (2-3 mi)	4.8- 6.4 km (3-4 mi)	6.4- 8.1 km (4-5 mi)	8.1- 16.1 km (5-10 mi)	Total for Sector
2050 Population	8	17	26	51	84	713	899
2060 Population	9	20	31	60	99	844	1063
2070 Population	11	24	37	71	117	999	1259
2080 Population	13	28	44	84	138	1182	1489
South-Residential							
2005 Population	2	8	14	17	49	1627	1717
2010 Population	2	9	16	19	53	1807	1906
2015 Population	2	10	17	20	57	1966	2072
2020 Population	2	11	19	22	62	2126	2242
2030 Population	2	12	22	25	69	2388	2518
2040 Population	2	14	26	29	81	2817	2969
2050 Population	2	17	30	33	95	3327	3504
2060 Population	2	20	35	39	110	3928	4134
2070 Population	2	24	42	46	129	4648	4891
2080 Population	2	28	50	53	152	5492	5777
South-Transient							
2005 Population	3	8	12	18	38	1128	1207
2010 Population	4	9	14	20	42	1254	1343
2015 Population	4	10	15	22	46	1365	1462
2020 Population	5	11	17	24	50	1476	1583
2030 Population	6	12	19	27	56	1658	1778
2040 Population	7	14	22	32	66	1962	2103
2050 Population	8	17	26	38	78	2321	2488
2060 Population	9	20	31	45	92	2746	2943
2070 Population	11	24	37	53	109	3249	3483
2080 Population	13	28	44	63	129	3844	4121
South-Southwest-Residential							
2005 Population	2	6	53	460	36	112	669
2010 Population	2	6	61	515	39	124	747
2015 Population	2	7	66	561	42	134	812
2020 Population	2	7	73	610	45	145	882
2030 Population	2	8	83	690	50	164	997
2040 Population	2	9	98	816	57	192	1174
2050 Population	2	11	115	965	66	224	1383
2060 Population	2	13	135	1138	77	261	1626
2070 Population	2	15	160	1345	90	310	1922
2080 Population	2	18	189	1587	105	362	2263
South-Southwest-Transient							
2005 Population	3	8	12	20	41	343	427
2010 Population	4	9	14	22	46	381	476
2015 Population	4	10	15	24	50	415	518
2020 Population	5	11	17	26	54	449	562
2030 Population	6	12	19	29	61	505	632
2040 Population	7	14	22	34	72	597	746

Table G-2. (contd)

	0- 1.6 km (0-1 mi)	1.6- 3.2 km (1-2 mi)	3.2- 4.8 km (2-3 mi)	4.8- 6.4 km (3-4 mi)	6.4- 8.1 km (4-5 mi)	8.1- 16.1 km (5-10 mi)	Total for Sector
2050 Population	8	17	26	40	85	706	882
2060 Population	9	20	31	47	101	835	1043
2070 Population	11	24	37	56	119	988	1235
2080 Population	13	28	44	66	141	1169	1461
Southwest-Residential							
2005 Population	2	9	60	551	661	236	1519
2010 Population	2	10	67	615	737	263	1694
2015 Population	2	11	72	670	803	287	1845
2020 Population	2	12	79	731	869	309	2002
2030 Population	2	14	89	826	983	347	2261
2040 Population	2	17	105	973	1160	410	2667
2050 Population	2	20	123	1148	1368	484	3145
2060 Population	2	24	145	1359	1614	573	3717
2070 Population	2	28	170	1605	1906	679	4390
2080 Population	2	33	199	1895	2251	803	5183
Southwest-Transient							
2005 Population	3	8	12	18	33	1133	1207
2010 Population	4	9	14	20	37	1260	1344
2015 Population	4	10	15	22	40	1372	1463
2020 Population	5	11	17	24	44	1483	1584
2030 Population	6	12	19	27	50	1666	1780
2040 Population	7	14	22	32	59	1971	2105
2050 Population	8	17	26	38	70	2332	2491
2060 Population	9	20	31	45	83	2759	2947
2070 Population	11	24	37	53	98	3264	3487
2080 Population	13	28	44	63	116	3862	4126
West-Southwest-Residential							
2005 Population	2	13	29	155	264	811	1274
2010 Population	2	13	32	174	296	907	1424
2015 Population	2	15	35	189	323	986	1550
2020 Population	2	15	38	206	353	1074	1688
2030 Population	2	17	43	233	401	1211	1907
2040 Population	2	20	51	275	473	1428	2249
2050 Population	2	24	60	325	557	1686	2654
2060 Population	2	28	71	382	660	1991	3134
2070 Population	2	33	84	451	780	2355	3705
2080 Population	2	39	99	532	918	2780	4370
West-Southwest-Transient							
2005 Population	3	8	12	18	22	533	596
2010 Population	4	9	14	20	25	594	666
2015 Population	4	10	15	22	27	648	726
2020 Population	5	11	17	24	30	702	789
2030 Population	6	12	19	27	34	791	889
2040 Population	7	14	22	32	40	936	1051

Table G-2. (contd)

	0- 1.6 km (0-1 mi)	1.6- 3.2 km (1-2 mi)	3.2- 4.8 km (2-3 mi)	4.8- 6.4 km (3-4 mi)	6.4- 8.1 km (4-5 mi)	8.1- 16.1 km (5-10 mi)	Total for Sector
2050 Population	8	17	26	38	47	1107	1243
2060 Population	9	20	31	45	56	1309	1470
2070 Population	11	24	37	53	66	1548	1739
2080 Population	13	28	44	63	78	1831	2057
West-Residential							
2005 Population	1	5	3	7	25	9	50
2010 Population	1	6	3	8	27	9	54
2015 Population	1	6	3	8	30	10	58
2020 Population	1	7	3	9	32	10	62
2030 Population	1	8	3	10	36	11	69
2040 Population	1	9	3	11	41	12	77
2050 Population	1	10	3	12	49	14	89
2060 Population	1	12	3	13	57	16	102
2070 Population	1	14	3	15	67	18	118
2080 Population	1	16	3	17	79	21	137
West-Transient							
2005 Population	3	8	12	18	22	464	527
2010 Population	4	9	14	20	25	518	590
2015 Population	4	10	15	22	27	566	644
2020 Population	5	11	17	24	30	614	701
2030 Population	6	12	19	27	34	694	792
2040 Population	7	14	22	32	40	821	936
2050 Population	8	17	26	38	47	971	1107
2060 Population	9	20	31	45	56	1148	1309
2070 Population	11	24	37	53	66	1358	1549
2080 Population	13	28	44	63	78	1606	1832
West-Northwest-Residential							
2005 Population	0	2	4	4	1	7	18
2010 Population	0	2	5	4	1	7	19
2015 Population	0	2	5	4	1	8	20
2020 Population	0	2	6	4	1	8	21
2030 Population	0	2	7	4	1	9	23
2040 Population	0	2	8	4	1	11	26
2050 Population	0	2	9	4	1	13	29
2060 Population	0	2	11	4	1	15	33
2070 Population	0	2	13	4	1	18	38
2080 Population	0	2	15	4	1	21	43
West-Northwest-Transient							
2005 Population	3	8	12	18	22	185	248
2010 Population	4	9	14	20	25	207	279
2015 Population	4	10	15	22	27	226	304
2020 Population	5	11	17	24	30	245	332
2030 Population	6	12	19	27	34	277	375
2040 Population	7	14	22	32	40	328	443

Table G-2. (contd)

	0- 1.6 km (0-1 mi)	1.6- 3.2 km (1-2 mi)	3.2- 4.8 km (2-3 mi)	4.8- 6.4 km (3-4 mi)	6.4- 8.1 km (4-5 mi)	8.1- 16.1 km (5-10 mi)	Total for Sector
2050 Population	8	17	26	38	47	388	524
2060 Population	9	20	31	45	56	459	620
2070 Population	11	24	37	53	66	543	734
2080 Population	13	28	44	63	78	642	868
Northwest-Residential							
2005 Population	0	2	4	6	6	3	21
2010 Population	0	2	5	6	6	3	22
2015 Population	0	2	5	7	7	3	24
2020 Population	0	2	6	7	7	3	25
2030 Population	0	2	7	8	8	3	28
2040 Population	0	2	8	9	9	3	31
2050 Population	0	2	9	11	11	3	36
2060 Population	0	2	10	13	13	3	41
2070 Population	0	2	12	15	15	3	47
2080 Population	0	2	14	18	18	3	55
Northwest-Transient							
2005 Population	3	8	12	18	22	185	248
2010 Population	4	9	14	20	25	207	279
2015 Population	4	10	15	22	27	226	304
2020 Population	5	11	17	24	30	245	332
2030 Population	6	12	19	27	34	277	375
2040 Population	7	14	22	32	40	328	443
2050 Population	8	17	26	38	47	388	524
2060 Population	9	20	31	45	56	459	620
2070 Population	11	24	37	53	66	543	734
2080 Population	13	28	44	63	78	642	868
North-Northwest-Residential							
2005 Population	0	2	24	20	39	8	93
2010 Population	0	2	27	22	43	8	102
2015 Population	0	2	29	24	47	9	111
2020 Population	0	2	32	26	51	9	120
2030 Population	0	2	36	30	58	10	136
2040 Population	0	2	42	35	69	11	159
2050 Population	0	2	49	41	81	13	186
2060 Population	0	2	58	49	96	15	220
2070 Population	0	2	68	58	113	17	258
2080 Population	0	2	80	68	133	20	303
North-Northwest-Transient							
2005 Population	3	8	12	18	22	185	248
2010 Population	4	9	14	20	25	207	279
2015 Population	4	10	15	22	27	226	304
2020 Population	5	11	17	24	30	245	332
2030 Population	6	12	19	27	34	277	375
2040 Population	7	14	22	32	40	328	443

Table G-2. (contd)

	0- 1.6 km (0-1 mi)	1.6- 3.2 km (1-2 mi)	3.2- 4.8 km (2-3 mi)	4.8- 6.4 km (3-4 mi)	6.4- 8.1 km (4-5 mi)	8.1- 16.1 km (5-10 mi)	Total for Sector
2050 Population	8	17	26	38	47	388	524
2060 Population	9	20	31	45	56	459	620
2070 Population	11	24	37	53	66	543	734
2080 Population	13	28	44	63	78	642	868
			2005 Population				
Residential Total	18	63	330	1778	1873	15,591	19,673
Cumulative Total (Residential plus transient)	66	216	522	2074	2314	23,823	29,015
			2010 Population				
Residential Total	18	91	369	1983	2080	17,525	22,066
Cumulative Total (Residential plus transient)	82	241	593	2312	2577	26,721	32,526
			2015 Population				
Residential Total	18	99	398	2160	2266	19,192	24,133
Cumulative Total (Residential plus transient)	82	273	676	2702	2993	30,756	37,482
			2020 Population				
Residential Total	18	107	436	2348	2453	20,968	26,330
Cumulative Total (Residential plus transient)	98	290	708	2742	3045	31,866	38,749
			2030 Population				
Residential Total	18	119	494	2654	2767	23,816	29,868
Cumulative Total (Residential plus transient)	114	319	798	3097	3437	36,120	43,885
			2040 Population				
Residential Total	18	137	582	3125	3263	28,591	35,716
Cumulative Total (Residential plus transient)	130	371	934	3650	4053	43,232	52,370
			2050 Population				
Residential Total	18	161	680	3687	3851	34,400	42,797
Cumulative Total (Residential plus transient)	146	444	1096	4310	4782	51,820	62,598
			2060 Population				
Residential Total	18	189	800	4352	4546	41,457	51,362
Cumulative Total (Residential plus transient)	162	522	1296	5089	5651	62,186	74,906

Table G-2. (contd)

	0- 1.6 km (0-1 mi)	1.6- 3.2 km (1-2 mi)	3.2- 4.8 km (2-3 mi)	4.8- 6.4 km (3-4 mi)	6.4- 8.1 km (4-5 mi)	8.1- 16.1 km (5-10 mi)	Total for Sector
2070 Population							
Residential Total	18	222	945	5139	5370	50,050	61,744
Cumulative Total (Residential plus transient)	194	621	1537	6008	6674	74,720	89,754
2080 Population							
Residential Total	18	258	1112	6061	6340	60,383	74,172
Cumulative Total (Residential plus transient)	226	724	1816	7093	7882	89,744	107,485

Source: PEF 2009

To account for the difference in distance between each LNP unit and the LNP centerpoint, 0.16 km (0.1 mi) was added to each radial distance to conservatively adjust the population data. The totals are subject to rounding differences.

Table G-3. Population Distribution Among Sectors Between 10 and 50 mi of the LNP Site for the Year 2000

	16-32 km (10-20 mi)	32-48 km (20-30 mi)	48-64 km (30-40 mi)	64-80 km (40-50 mi)	Total for Sector
North-residential	637	5551	8364	11,512	26,064
North-transient	141	267	303	845	1556
North-northeast-residential	2646	77541	21,826	156,599	188,825
North-northeast-transient	146	323	3560	3251	7280
Northeast-residential	2242	3503	11,136	6797	23,678
Northeast-transient	306	748	986	706	2746
East-northeast-residential	7762	32,043	58,111	6919	104,835
East-northeast-transient	473	1716	3219	1384	6792
East-residential	5920	34,574	65,253	17,122	122,869
East-transient	2383	771	1242	1451	5847
East-southeast-residential	6607	5148	22,170	60,649	94,574
East-southeast-transient	975	1239	1701	4065	7980
Southeast-residential	24,287	28,151	11,061	17,376	80,875
Southeast-transient	1333	3370	2159	3959	10,821
South-southeast-residential	17,636	11,629	25,828	18,790	73,883
South-southeast-transient	3082	1978	2650	5179	12,889
South-residential	10,602	4087	31,161	90,824	136,674
South-transient	8684	1567	1708	1174	13,133
South-southwest-residential	199	0	0	0	199
South-southwest-transient	330	27	0	0	357
Southwest-residential	0	0	0	0	0
Southwest-transient	3	0	0	0	3
West-southwest-residential	0	0	0	0	0
West-southwest-transient	0	0	0	0	0
West-residential	0	510	0	0	510
West-transient	7	233	0	0	240
West-northwest-residential	2	1093	476	238	1809
West-northwest-transient	74	1453	380	101	2008
Northwest-residential	62	726	1202	5258	7248
Northwest-transient	141	234	4152	3168	7695
North-northwest-residential	453	907	11,875	8811	22,046
North-northwest-transient	141	234	1841	1394	3610
Residential total	79,055	135,676	268,463	400,895	884,089
Cumulative total (residential plus transient)	97,274	149,836	292,364	427,572	967,046

Source: PEF 2009
To account for the difference in distance between each LNP unit and the LNP centerpoint, 0.16 km (0.1 mi.) was added to each radial distance to conservatively adjust the population data. The totals are subject to rounding differences.

Table G-4. Population Distribution Among Sectors Between 10 and 50 mi of the LNP Site Projected Through 2080

	16-32 km (10-20 mi)	32-48 km (20-30 mi)	48-64 km (30-40 mi)	64-80 km (40-50 mi)	Total for Sector
North-Residential					
2005 Population	696	6109	9260	12,757	28,822
2010 Population	778	6805	10,173	13,966	31,722
2015 Population	844	7414	10,945	15,017	34,220
2020 Population	918	8049	11,758	16,050	36,775
2030 Population	1038	9096	13,018	17,691	40,843
2040 Population	1219	10,713	15,105	20,465	47,502
2050 Population	1430	12,620	17,534	23,699	55,283
2060 Population	1685	14,873	20,402	27,469	64,429
2070 Population	1989	17,558	23,755	31,863	75,165
2080 Population	2343	20,697	27,702	37,001	87,743
North-Transient					
2005 Population	155	295	336	941	1727
2010 Population	174	324	375	1049	1922
2015 Population	190	350	409	1142	2091
2020 Population	206	375	443	1235	2259
2030 Population	233	416	498	1386	2533
2040 Population	276	483	588	1636	2983
2050 Population	326	561	695	1931	3513
2060 Population	385	651	821	2280	4137
2070 Population	455	756	970	2691	4872
2080 Population	538	877	1146	3177	5738
North-Northeast-Residential					
2005 Population	2907	8580	24,118	172,975	208,580
2010 Population	3251	9586	26,129	187,350	226,316
2015 Population	3530	10,474	27,859	199,699	241,562
2020 Population	3850	11,387	29,588	212,061	256,886
2030 Population	4355	12,883	32,213	230,725	280,176
2040 Population	5133	15,253	36,690	262,668	319,744
2050 Population	6042	18,080	41,795	299,001	364,918
2060 Population	7123	21,425	47,622	340,460	416,630
2070 Population	8425	25,413	54,270	387,657	475,765
2080 Population	9936	30,128	61,850	441,450	543,364

Table G-4. (contd)

	16-32 km (10-20 mi)	32-48 km (20-30 mi)	48-64 km (30-40 mi)	64-80 km (40-50 mi)	Total for Sector
North-Northeast-Transient					
2005 Population	166	364	4017	3591	8138
2010 Population	189	407	4489	3889	8974
2015 Population	209	444	4901	4145	9699
2020 Population	229	482	5314	4402	10,427
2030 Population	262	542	5981	4789	11,574
2040 Population	319	645	7118	5453	13,535
2050 Population	388	768	8471	6209	15,836
2060 Population	472	914	10,081	7070	18,537
2070 Population	574	1088	11,997	8051	21,710
2080 Population	698	1295	14,277	9168	25,438
Northeast-Residential					
2005 Population	2532	4119	13,003	7531	27,185
2010 Population	2859	4740	14,828	8225	30,652
2015 Population	3144	5291	16,445	8821	33,701
2020 Population	3444	5847	18,120	9438	36,849
2030 Population	3937	6766	20,829	10,392	41,924
2040 Population	4756	8443	25,723	12,019	50,941
2050 Population	5745	10,535	31,812	13,945	62,037
2060 Population	6962	13,147	39,387	16,226	75,722
2070 Population	8437	16,408	48,790	18,919	92,554
2080 Population	10,225	20,483	60,488	22,127	113,323
Northeast-Transient					
2005 Population	349	853	1125	784	3111
2010 Population	396	967	1258	858	3479
2015 Population	438	1068	1373	921	3800
2020 Population	479	1170	1488	984	4121
2030 Population	548	1339	1671	1084	4642
2040 Population	666	1628	1995	1251	5540
2050 Population	810	1979	2382	1444	6615
2060 Population	985	2406	2844	1667	7902
2070 Population	1197	2925	3395	1925	9442
2080 Population	1455	3556	4053	2222	11,286

Table G-4. (contd)

	16-32 km (10-20 mi)	32-48 km (20-30 mi)	48-64 km (30-40 mi)	64-80 km (40-50 mi)	Total for Sector
			East-Northeast-Residential		
2005 Population	9139	37,729	68,427	8144	123,439
2010 Population	10,515	43,428	78,736	9372	142,051
2015 Population	11,732	48,506	87,958	10,461	158,657
2020 Population	12,998	53,635	97,213	11,572	175,418
2030 Population	15,045	62,086	112,532	13,397	203,060
2040 Population	18,741	77,482	140,456	16,713	253,392
2050 Population	23,383	96,733	175,374	20,865	316,355
2060 Population	29,195	120,782	219,002	26,060	395,039
2070 Population	36,436	150,808	273,471	32,537	493,252
2080 Population	45,490	188,343	341,558	40,628	616,019
			East-Northeast-Transient		
2005 Population	557	2021	3791	1630	7999
2010 Population	641	2326	4363	1876	9206
2015 Population	716	2598	4874	2096	10,284
2020 Population	791	2871	5384	2315	11,361
2030 Population	915	3323	6231	2679	13,148
2040 Population	1143	4150	7782	3346	16,421
2050 Population	1428	5183	9719	4179	20,509
2060 Population	1783	6473	12,138	5219	25,613
2070 Population	2227	8084	15,160	6518	31,989
2080 Population	2781	10,096	18,934	8141	39,952
			East-Residential		
2005 Population	6969	40,704	76,846	20,245	144,764
2010 Population	8016	46,848	88,407	23,363	166,634
2015 Population	8930	52,316	98,764	26,154	186,164
2020 Population	9920	57,861	109,196	28,954	205,931
2030 Population	11,502	66,987	126,408	33,592	238,489
2040 Population	14,318	83,611	157,718	42,125	297,772
2050 Population	17,856	104,384	196,898	52,874	372,012
2060 Population	22,303	130,355	245,866	66,396	464,920
2070 Population	27,834	162,766	306,976	83,374	580,950
2080 Population	34,755	203,267	383,384	104,772	726,178

Table G-4. (contd)

	16-32 km (10-20 mi)	32-48 km (20-30 mi)	48-64 km (30-40 mi)	64-80 km (40-50 mi)	Total for Sector
		East-Transient			
2005 Population	2806	908	1463	1845	7022
2010 Population	3230	1045	1683	2211	8169
2015 Population	3608	1167	1880	2537	9192
2020 Population	3986	1290	2077	2863	10,216
2030 Population	4613	1493	2404	3411	11,921
2040 Population	5761	1865	3002	4559	15,187
2050 Population	7195	2329	3749	6094	19,367
2060 Population	8986	2909	4682	8146	24,723
2070 Population	11,223	3633	5848	10,889	31,593
2080 Population	14,017	4537	7304	14,555	40,413
		East-Southeast-Residential			
2005 Population	7417	6044	30,162	77,446	121,069
2010 Population	8240	6907	37,235	93,326	145,708
2015 Population	8985	7692	43,698	107,638	168,013
2020 Population	9725	8503	50,197	121,952	190,377
2030 Population	10,948	9832	61,330	146,236	228,346
2040 Population	12,968	12,226	87,177	197,776	310,147
2050 Population	15,370	15,272	124,127	267,851	422,620
2060 Population	18,228	19,165	176,938	363,253	577,584
2070 Population	21,672	24,087	252,557	493,502	791,818
2080 Population	25,729	30,373	360,879	671,463	1,088,444
		East-Southeast-Transient			
2005 Population	1122	1524	2092	5170	9908
2010 Population	1269	1789	2457	6194	11,709
2015 Population	1400	2019	2773	7107	13,299
2020 Population	1530	2250	3090	8020	14,890
2030 Population	1745	2632	3614	9556	17,547
2040 Population	2122	3396	4664	12,774	22,956
2050 Population	2580	4382	6019	17,075	30,056
2060 Population	3137	5655	7767	22,824	39,383
2070 Population	3815	7297	10,023	30,509	51,644
2080 Population	4639	9416	12,934	40,781	67,770

Table G-4. (contd)

	16-32 km (10-20 mi)	32-48 km (20-30 mi)	48-64 km (30-40 mi)	64-80 km (40-50 mi)	Total for Sector
Southeast-Residential					
2005 Population	27,227	31,575	14,057	23,351	96,210
2010 Population	30,230	35,046	16,755	28,631	110,662
2015 Population	32,895	38,145	19,220	33,461	123,721
2020 Population	35,570	41,256	21,687	38,329	136,842
2030 Population	39,943	46,325	25,894	46,649	158,811
2040 Population	47,205	54,781	35,184	65,801	202,971
2050 Population	55,815	64,795	48,181	93,089	261,880
2060 Population	65,976	76,599	66,413	132,007	340,995
2070 Population	78,078	90,668	92,129	187,654	448,529
2080 Population	92,322	107,229	128,494	267,238	595,283
Southeast-Transient					
2005 Population	1497	3785	2637	4920	12,839
2010 Population	1664	4208	3078	5800	14,750
2015 Population	1812	4581	3458	6580	16,431
2020 Population	1959	4954	3838	7359	18,110
2030 Population	2201	5567	4465	8655	20,888
2040 Population	2604	6587	5709	11,280	26,180
2050 Population	3081	7794	7300	14,701	32,876
2060 Population	3645	9222	9334	19,160	41,361
2070 Population	4313	10,911	11,935	24,972	52,131
2080 Population	5103	12,910	15,260	32,546	65,819
South-Southeast-Residential					
2005 Population	19,789	13,060	29,743	21,737	84,329
2010 Population	21,986	14,517	33,501	24,551	94,555
2015 Population	23,922	15,806	36,884	27,085	103,697
2020 Population	25,890	17,101	40,267	29,613	112,871
2030 Population	29,091	19,220	45,838	33,764	127,913
2040 Population	34,403	22,743	55,568	41,102	153,816
2050 Population	40,687	26,917	67,368	50,040	185,012
2060 Population	48,121	31,856	81,674	60,924	222,575
2070 Population	56,946	37,724	99,063	74,205	267,938
2080 Population	67,351	44,652	120,152	90,388	322,543

Table G-4. (contd)

	16-32 km (10-20 mi)	32-48 km (20-30 mi)	48-64 km (30-40 mi)	64-80 km (40-50 mi)	Total for Sector
			South-Southeast-Transient		
2005 Population	3462	2251	3016	6041	14,770
2010 Population	3848	2520	3376	6847	16,591
2015 Population	4189	2759	3697	7574	18,219
2020 Population	4530	2999	4017	8301	19,847
2030 Population	5090	3392	4543	9493	22,518
2040 Population	6022	4065	5444	11,639	27,170
2050 Population	7125	4871	6524	14,270	32,790
2060 Population	8430	5837	7818	17,496	39,581
2070 Population	9974	6995	9368	21,451	47,788
2080 Population	11,801	8382	11,226	26,300	57,709
			South-Residential		
2005 Population	11,888	4582	35,916	105,711	158,097
2010 Population	13,188	5095	40,462	119,626	178,371
2015 Population	14,369	5545	44,592	132,217	196,723
2020 Population	15,521	6006	48,655	144,817	214,999
2030 Population	17,430	6754	55,404	165,460	245,048
2040 Population	20,597	7985	67,206	202,504	298,292
2050 Population	24,352	9441	81,528	247,823	363,144
2060 Population	28,775	11,175	98,894	303,355	442,199
2070 Population	34,057	13,242	120,027	371,408	538,734
2080 Population	40,260	15,679	145,678	454,841	656,458
			South-Transient		
2005 Population	9754	1783	1969	1369	14,875
2010 Population	10,843	1996	2220	1552	16,611
2015 Population	11,804	2186	2445	1717	18,152
2020 Population	12,765	2375	2670	1882	19,692
2030 Population	14,343	2686	3039	2152	22,220
2040 Population	16,970	3219	3688	2638	26,515
2050 Population	20,078	3857	4475	3234	31,644
2060 Population	23,756	4622	5430	3965	37,773
2070 Population	28,107	5539	6589	4861	45,096
2080 Population	33,255	6638	7996	5960	53,849

Table G-4. (contd)

	16-32 km (10-20 mi)	32-48 km (20-30 mi)	48-64 km (30-40 mi)	64-80 km (40-50 mi)	Total for Sector
South-Southwest-Residential					
2005 Population	222	0	0	0	222
2010 Population	246	0	0	0	246
2015 Population	267	0	0	0	267
2020 Population	288	0	0	0	288
2030 Population	323	0	0	0	323
2040 Population	380	0	0	0	380
2050 Population	447	0	0	0	447
2060 Population	527	0	0	0	527
2070 Population	622	0	0	0	622
2080 Population	734	0	0	0	734
South-Southwest-Transient					
2005 Population	371	30	0	0	401
2010 Population	412	34	0	0	446
2015 Population	449	37	0	0	486
2020 Population	485	40	0	0	525
2030 Population	545	45	0	0	590
2040 Population	645	53	0	0	698
2050 Population	763	63	0	0	826
2060 Population	903	75	0	0	978
2070 Population	1068	89	0	0	1157
2080 Population	1264	105	0	0	1369
Southwest-Residential					
2005 Population	0	0	0	0	0
2010 Population	0	0	0	0	0
2015 Population	0	0	0	0	0
2020 Population	0	0	0	0	0
2030 Population	0	0	0	0	0
2040 Population	0	0	0	0	0
2050 Population	0	0	0	0	0
2060 Population	0	0	0	0	0
2070 Population	0	0	0	0	0
2080 Population	0	0	0	0	0

Table G-4. (contd)

	16-32 km (10-20 mi)	32-48 km (20-30 mi)	48-64 km (30-40 mi)	64-80 km (40-50 mi)	Total for Sector
		Southwest-Transient			
2005 Population	3	0	0	0	3
2010 Population	4	0	0	0	4
2015 Population	4	0	0	0	4
2020 Population	5	0	0	0	5
2030 Population	6	0	0	0	6
2040 Population	7	0	0	0	7
2050 Population	8	0	0	0	8
2060 Population	9	0	0	0	9
2070 Population	11	0	0	0	11
2080 Population	13	0	0	0	13
		West-Southwest-Residential			
2005 Population	0	0	0	0	0
2010 Population	0	0	0	0	0
2015 Population	0	0	0	0	0
2020 Population	0	0	0	0	0
2030 Population	0	0	0	0	0
2040 Population	0	0	0	0	0
2050 Population	0	0	0	0	0
2060 Population	0	0	0	0	0
2070 Population	0	0	0	0	0
2080 Population	0	0	0	0	0
		West-Southwest-Transient			
2005 Population	0	0	0	0	0
2010 Population	0	0	0	0	0
2015 Population	0	0	0	0	0
2020 Population	0	0	0	0	0
2030 Population	0	0	0	0	0
2040 Population	0	0	0	0	0
2050 Population	0	0	0	0	0
2060 Population	0	0	0	0	0
2070 Population	0	0	0	0	0
2080 Population	0	0	0	0	0

Table G-4. (contd)

	16-32 km (10-20 mi)	32-48 km (20-30 mi)	48-64 km (30-40 mi)	64-80 km (40-50 mi)	Total for Sector
		West-Residential			
2005 Population	0	561	0	0	561
2010 Population	0	625	0	0	625
2015 Population	0	681	0	0	681
2020 Population	0	740	0	0	740
2030 Population	0	836	0	0	836
2040 Population	0	982	0	0	982
2050 Population	0	1158	0	0	1158
2060 Population	0	1365	0	0	1365
2070 Population	0	1608	0	0	1608
2080 Population	0	1893	0	0	1893
		West-Transient			
2005 Population	8	257	0	0	265
2010 Population	9	287	0	0	296
2015 Population	10	314	0	0	324
2020 Population	11	340	0	0	351
2030 Population	12	385	0	0	397
2040 Population	14	455	0	0	469
2050 Population	17	538	0	0	555
2060 Population	20	636	0	0	656
2070 Population	24	752	0	0	776
2080 Population	28	889	0	0	917
		West-Northwest-Residential			
2005 Population	2	1206	528	261	1997
2010 Population	2	1340	582	291	2215
2015 Population	2	1461	630	313	2406
2020 Population	2	1584	684	344	2614
2030 Population	2	1793	763	384	2942
2040 Population	2	2116	892	446	3456
2050 Population	2	2493	1039	517	4051
2060 Population	2	2943	1219	608	4772
2070 Population	2	3474	1423	709	5608
2080 Population	2	4096	1664	826	6588

Table G-4. (contd)

	16-32 km (10-20 mi)	32-48 km (20-30 mi)	48-64 km (30-40 mi)	64-80 km (40-50 mi)	Total for Sector
West-Northwest-Transient					
2005 Population	82	1602	421	112	2217
2010 Population	91	1789	467	124	2471
2015 Population	99	1955	508	134	2696
2020 Population	108	2121	549	145	2923
2030 Population	122	2399	618	162	3301
2040 Population	144	2837	727	190	3898
2050 Population	170	3355	856	223	4604
2060 Population	201	3967	1007	261	5436
2070 Population	238	4691	1185	306	6420
2080 Population	281	5547	1395	358	7581
Northwest-Residential					
2005 Population	67	801	1321	5843	8032
2010 Population	75	892	1476	6451	8894
2015 Population	82	973	1608	6994	9657
2020 Population	88	1058	1746	7540	10,432
2030 Population	101	1197	1970	8435	11,703
2040 Population	117	1414	2323	9871	13,725
2050 Population	137	1668	2735	11,551	16,091
2060 Population	162	1970	3222	13,531	18,885
2070 Population	191	2329	3802	15,839	22,161
2080 Population	224	2752	4479	18,542	25,997
Northwest-Transient					
2005 Population	155	258	4598	3523	8534
2010 Population	174	288	5104	3889	9455
2015 Population	190	315	5555	4215	10,275
2020 Population	206	341	6005	4541	11,093
2030 Population	233	386	6755	5080	12,454
2040 Population	276	456	7950	5950	14,632
2050 Population	326	539	9357	6969	17,191
2060 Population	385	637	11,012	8163	20,197
2070 Population	455	753	12,960	9562	23,730
2080 Population	538	890	15,253	11,200	27,881

Table G-4. (contd)

	16-32 km (10-20 mi)	32-48 km (20-30 mi)	48-64 km (30-40 mi)	64-80 km (40-50 mi)	Total for Sector
		North-Northwest-Residential			
2005 Population	501	998	13,160	9828	24,487
2010 Population	556	1115	14,811	11,031	27,513
2015 Population	606	1217	16,248	12,078	30,149
2020 Population	659	1323	17,729	13,144	32,855
2030 Population	745	1496	20,175	14,914	37,330
2040 Population	877	1767	24,076	17,804	44,524
2050 Population	1034	2084	28,734	21,248	53,100
2060 Population	1217	2463	34,322	25,379	63,381
2070 Population	1441	2911	41,008	30,318	75,678
2080 Population	1695	3438	48,992	36,241	90,366
		North-Northwest-Transient			
2005 Population	155	258	2049	1551	4013
2010 Population	174	288	2299	1741	4502
2015 Population	190	315	2520	1908	4933
2020 Population	206	341	2741	2076	5364
2030 Population	233	386	3112	2357	6088
2040 Population	276	456	3710	2810	7252
2050 Population	326	539	4422	3350	8637
2060 Population	385	637	5271	3993	10,286
2070 Population	455	753	6283	4760	12,251
2080 Population	538	890	7490	5674	14,592
		2005 Population			
Residential Total	89,356	156,068	316,541	465,829	1,027,794
Cumulative Total (Residential plus transient)	109,998	172,257	344,055	497,306	1,123,616
		2010 Population			
Residential Total	99,942	176,944	363,095	526,183	1,166,164
Cumulative Total (Residential plus transient)	123,060	195,212	394,264	562,213	1,274,749
		2015 Population			
Residential Total	109,308	195,521	404,851	579,938	1,289,618
Cumulative Total (Residential plus transient)	134,616	215,629	439,244	620,014	1,409,503

Table G-4. (contd)

	16-32 km (10-20 mi)	32-48 km (20-30 mi)	48-64 km (30-40 mi)	64-80 km (40-50 mi)	Total for Sector
		2020 Population			
Residential Total	118,873	214,350	446,840	633,814	1,413,877
Cumulative Total (Residential plus transient)	146,369	236,299	484,456	677,937	1,545,061
		2030 Population			
Residential Total	134,460	245,271	516,374	721,639	1,617,744
Cumulative Total (Residential plus transient)	165,561	270,262	559,305	772,443	1,767,571
		2040 Population			
Residential Total	160,716	299,516	648,118	889,294	1,997,644
Cumulative Total (Residential plus transient)	197,961	329,811	700,495	952,820	2,181,087
		2050 Population			
Residential Total	192,300	366,180	817,125	1,102,503	2,478,108
Cumulative Total (Residential plus transient)	236,921	402,938	881,094	1,182,182	2,703,135
		2060 Population			
Residential Total	230,276	448,118	1,034,961	1,375,668	3,089,023
Cumulative Total (Residential plus transient)	283,758	492,759	1,113,166	1,475,912	3,365,595
		2070 Population			
Residential Total	276,130	548,996	1,317,271	1,727,985	3,870,382
Cumulative Total (Residential plus transient)	340,266	603,262	1,412,984	1,854,480	4,210,992
		2080 Population			
Residential Total	331,066	673,030	1,685,320	2,185,517	4,874,933
Cumulative Total (Residential plus transient)	408,015	739,058	1,802,588	2,345,599	5,295,260

Source: PEF 2009
To account for the difference in distance between each LNP unit and the LNP centerpoint, 0.16 km (0.1 mi) was added to each radial distance to conservatively adjust the population data. The totals are subject to rounding differences.

Table G-5. Regional Employment and Earnings by Industry

	Region[a]								
	1990[b]			2000[b]			2005[c]		
Industry	Number of Jobs	Percent of Total	Total Earnings, $[d]	Number of Jobs	Percent of Total	Total Earnings, $[d]	Number of Jobs	Percent of Total	Total Earnings, $[d]
Farming	7728	2.8	86,101	8842	2.3	113,952	8304	1.9	105,201
Agricultural services, forestry, fishing	4967	1.8	67,699	5635	1.5	130,179	3637	0.8	110,094
Mining	947	0.3	19,680	663	0.2	23,355	873	0.2	37,083
Construction	18,589	6.6	410,574	24,185	6.4	622,438	39,022	8.9	1,255,192
Manufacturing	19,140	6.8	484,215	23,419	6.2	859,613	19,150	4.4	892,384
Transportation and public utilities	9153	3.3	289,191	13,053	3.5	557,050	6947	1.6	372,452
Wholesale trade	9008	3.2	220,159	9930	2.6	344,654	10,634	2.4	463,248
Retail trade	54,459	19.5	675,486	72,599	19.2	1,210,890	56,352	12.8	1,340,936
Finance, insurance, and real estate	19,294	6.9	239,869	26,870	7.1	766,545	35,878	8.2	871,835
Services	73,755	26.3	1,427,258	114,319	30.3	2,871,800	170,304	38.8	4,794,559
Government and government enterprises	61,725	22.1	1,687,955	75,286	19.9	2,782,314	77,017	17.5	3,788,924
Regional Total	279,701		5,618,630	377,752		10,309,374	439,252		14,295,215

Table G-5. (contd)

Industry	Region[(a)] 1990[(b)] Number of Jobs	Percent of Total	Total Earnings, $[(d)]	2000[(b)] Number of Jobs	Percent of Total	Total Earnings, $[(d)]	2005[(c)] Number of Jobs	Percent of Total	Total Earnings, $[(d)]
Levy County									
Farming	741	8.9	12,945	1003	8.5	24,204	855	6.0	24,294
Agricultural services, forestry, fishing	NA	NA	6384	585	5.0	12,488	NA	NA	20,985
Mining	NA	NA	77	NA	NA	139	NA	NA	NA
Construction	672	8.0	12,319	1168	9.9	28,437	1393	9.8	36,329
Manufacturing	444	5.3	7965	432	3.7	11,430	839	5.9	29,938
Transportation and public utilities	282	3.4	7326	519	4.4	17,436	NA	NA	10,549
Wholesale trade	186	2.2	3980	NA	NA	NA	364	2.6	10,292
Retail trade	1701	20.3	19,814	2368	20.1	33,813	1766	12.4	38,880
Finance, insurance, and real estate	623	7.4	5198	744	6.3	12,440	1087	7.7	17,617
Services	1583	18.9	19,075	2488	21.1	41,560	3857	27.2	82,105
Government and government enterprises	1555	18.6	38,061	2032	17.2	67,412	2172	15.3	87,421
Levy County Total	8368		137,911	11,802		261,921	14,185		370,863
Citrus County									
Farming	358	1.2	90	404	1.0	2189	403	0.8	2303
Agricultural services, forestry, fishing	585	1.9	5941	668	1.6	10,721	365	0.7	4338
Mining	86	0.3	1576	77	0.2	1889	88	0.2	2296
Construction	3045	10.1	64,428	3718	8.9	95,653	5872	11.9	170,098

Table G-5. (contd)

	Region[a]								
	1990[b]			2000[b]			2005[c]		
Industry	**Number of Jobs**	**Percent of Total**	**Total Earnings, $[d]**	**Number of Jobs**	**Percent of Total**	**Total Earnings, $[d]**	**Number of Jobs**	**Percent of Total**	**Total Earnings, $[d]**
Manufacturing	985	3.3	18,696	1685	4.0	49,598	910	1.8	25,312
Transportation and public utilities	2477	8.2	106,516	2603	6.2	164,728	NA	NA	14,225
Wholesale trade	492	1.6	8568	771	1.8	20,392	910	1.8	30,648
Retail trade	6872	22.8	81,982	8449	20.3	126,601	7217	14.6	166,682
Finance, insurance, and real estate	2491	8.2	18,483	3773	9.1	77,103	5061	10.2	82,545
Services	8966	29.7	160,981	15,160	36.4	331,517	21,803	44.1	569,403
Government and government enterprises	3846	12.7	93,350	4382	10.5	151,349	4807	9.7	205,174
Citrus County Total	30,203		560,611	41,690		1,031,740	49,471		1,408,781
Marion County									
Farming	2966	3.6	32,675	3183	2.8	40,187	2880	2.1	33,743
Agricultural services, forestry, fishing	2116	2.6	27,810	3210	2.8	60,396	2541	1.9	58,580
Mining	197	0.2	4953	206	0.2	6193	288	0.2	11,226
Construction	6131	7.4	144,175	8151	7.2	215,114	12,987	9.6	439,855
Manufacturing	10,289	12.5	250,068	12,054	10.6	441,145	10,080	7.5	486,880

Table G-5. (contd)

	Region[a]								
	1990[b]			2000[b]			2005[c]		
Industry	**Number of Jobs**	**Percent of Total**	**Total Earnings, $[d]**	**Number of Jobs**	**Percent of Total**	**Total Earnings, $[d]**	**Number of Jobs**	**Percent of Total**	**Total Earnings, $[d]**
Transportation and public utilities	2368	2.9	61,550	4303	3.8	152,508	3646	2.7	143,895
Wholesale trade	4587	5.6	119,555	4205	3.7	147,606	4512	3.3	196,915
Retail trade	16,881	20.5	221,878	23,082	20.4	416,595	19,619	14.5	498,141
Finance, insurance, and real estate	5807	7.0	75,601	8603	7.6	249,745	12,212	9.0	312,175
Services	19,190	23.3	358,774	30,581	27.0	770,045	49,614	36.7	1,388,613
Government and government enterprises	11,958	14.5	299,781	15,697	13.9	562,047	16,675	12.3	707,111
Marion County Total	82,490		1,596,820	113,275		3,055,581	135,054		4,277,134

Source: PEF 2009 using data from Bureau of Economic Analysis, U.S. Department of Commerce.

(a) Although the 50 mi region includes Pasco, Lake, and Putnam counties, these counties were not included in these data because only very small portions of these counties fall within the region.

(b) Employment estimates and earnings are based on the 1987 Standard Industrial Classification (SIC) system.

(c) Employment estimates and earnings are based on the 2002 North American Industry Classification System (NAICS). These industry classifications vary slightly from the SIC system, and therefore have been regrouped into the SIC system. Affected classifications for the 2005 employment and earnings estimates include the following: the transportation and public utilities classification includes the NAICS warehousing classification; the services classification includes the NAICS Information, professional and technical services, management of companies and enterprises, administrative and waste services, educational services, health care and social assistance, arts, entertainment, and recreation, accommodation and food services, and other services, except public administration, classifications.

(d) Estimated earnings are in thousands of dollars.

Some employment and earnings estimates for individual industry classifications may not represent accurate totals because some industry estimates include confidential (unreported) numbers, and industries with less than 10 jobs or $50,000 in earnings were not reported in individual industry estimates; however, the all-industry total number of jobs and all-industry total earnings include these estimates.

NA = Data not available.

1 **Table G-6**. Citrus, Levy, and Marion County Expenditures and Revenues by Category

Citrus County	2006, $[(a)]	2007, $[(b)]	2008, $[(b)]
County Revenues by Category			
Ad valorem taxes	67,624,568	82,903,323	82,249,144
Other taxes	7,964,164	9,435,671	8,424,261
Licenses and permits	4,235,986	3,988,937	2,862,016
Intergovernmental revenue	22,968,183	14,862,007	13,872,288
Charges for services	27,968,379	22,964,235	30,619,269
Fines and forfeitures	127,468	72,400	169,124
Miscellaneous revenues	28,252,575	20,036,354	20,122,903
Other non operating revenue	5,149,840	2,040,000	1,660,000
Statutory revenues	--	(7,716,222)	(7,971,867)
Sub-total	164,291,163	148,586,705	152,007,138
Cash carry forward	--	60,919,219	107,254,576
Interfund transfers	16,543,309	15,390,656	18,884,533
Total	180,834,472	224,896,580	278,146,247
County Expenditures by Category			
Personal services	57,364,498	63,283,860	66,877,252
Operating expenses	51,430,335	49,681,825	56,406,659
Capital outlay	29,317,996	37,606,541	64,683,646
Grants in aid	2,113,818	2,089,167	2,263,589
Debt service	4,850,730	7,740,652	15,018,529
Sub-total	145,077,377	160,402,045	205,249,675
Budgeted reserves	--	45,453,302	49,752,180
Interfund transfers	16,637,778	19,041,233	23,144,392
Total	161,715,155	224,896,580	278,146,247
Levy County		**2006, $**	
Total County Revenues by Category			
Taxes		18,227,533	
Licenses and permits		383,737	
Intergovernmental revenues		9,778,043	
Charges for services		5,534,382	
Fines and forfeitures		331,477	
Miscellaneous revenues		4,627,448	
Total revenues		38,882,620	
Total County Expenditures by Category			
General government		7,364,869	
Public safety		15,825,754	
Physical education		484,352	

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Table G-6. (contd)

Levy County	2006, $
Transportation	5,745,654
Economic environment	643,891
Human services	1,384,155
Culture/recreation	1,167,066
Court related	1,333,507
Capital outlay	506,306
Debt service	
Principal	484,155
Interest	317,063
Total Expenditures	35,056,772
Marion County	**2007-2008, $**
Total County Revenues by Type	
Property taxes	130,386,669
Other taxes	17,309,507
Licenses and permits	5,531,850
Inter-governmental revenues	48,208,397
Charges for services	61,062,195
Fines and forfeitures	1,274,235
Miscellaneous revenues	18,326,534
Impact fees	31,885,770
Special assessments	39,454,674
Administrative transfers	898,416
Debt proceeds	15,899,867
Balances forward	196,347,010
Total Budgeted Revenues	566,585,124
Total County Expenditures by Function	
General government	118,803,705
Debt service	7,546,745
Public safety	154,023,361
Physical environment	66,469,111
Human services	22,878,263
Transportation	100,196,518
Culture/recreation	21,888,857
Court related expenditures	24,142,293
Reserves	50,636,271
Total Budgeted Expenditures	566,585,124

Source: PEF 2009, based on data from Levy County Clerk of Court, Citrus County Board of Commissioners, and Marion County Budget

(a) Actual budget for fiscal year (FY) 2006.

(b) Adopted budget for FY 2007 and FY 2008.

G.1 References

Progress Energy Florida, Inc. (PEF). 2009. Levy Nuclear Plant Units 1 and 2 COL Application, Part 3, Applicant's Environmental Report – Combined License Stage. Revision 1, St. Petersburg, Florida. Accession No. ML092860995.

Appendix H

Authorizations, Permits, and Certifications

Appendix H

Authorizations, Permits, and Certifications

This appendix contains a list of environmental-related authorizations, permits, and certifications potentially required by Progress Energy Florida, Inc. (PEF) from Federal, State, regional, local, and affected Native American Tribal agencies related to the combined construction permits and operating licenses (COLs) for the proposed new nuclear Units 1 and 2 at the Levy Nuclear Plant (LNP) site in Levy County, Florida. The table is based on Table 1.2-1 of the Environmental Report (ER), Revision 1, submitted on October 2, 2009 by PEF to the U.S. Nuclear Regulatory Commission (NRC).

Table H-1. Federal, State, and Local Environmental Permits and Authorizations

Issuing Agency	Activity	Permit/Authorization	License Number	Expiration Date	Authority
		Federal			
NRC	Construction and safety review of the site.	Combined License	--[a]	--[a]	10 CFR 52.97
NRC	Approval for construction of nuclear power plant.	Combined License	--[a]	--[a]	10 CFR 50.10
NRC	Possession of source material.	Source Material License	--[a]	--[a]	10 CFR 40.3
NRC	Possession of Special Nuclear Material.	Special Nuclear Material License	--[a]	--[a]	10 CFR 70.3
NRC	Possession of fuel.	By-Product License	--[a]	--[a]	10 CFR 30.3
NRC	Operation of units.	License to Operate	--[a]	--[a]	10 CFR 52
U.S. Army Corps of Engineers, Jacksonville District (Corps)	Activities involving the discharge of dredged or fill material into waters of the United States.	Section 404 Permit[c]	--[a]	--[a]	CWA 33 CFR 320.1
Corps	Activities involving work in navigable waters.	Section 10 – Rivers and Harbors Act Permit	--[a]	--[a]	33 USC 403
U.S. Department of Transportation	Hazardous materials shipments.	USDOT Registration	--[a]	--[a]	49 USC 5108
U. S. Environmental Protection Agency (EPA)	Requires SPCC Plan outlining containment and countermeasures for oil storage. May require Facility Response Plan.	Oil Terminal Facility Registration	--[a]	--[a]	40 CFR 112
EPA	Aggregate oil storage in aboveground tanks >1320 gallons or any single tank >660 gallons.	SPCC Plan	--[a]	--[a]	40 CFR 112
Federal Aviation Administration (FAA)[b]	Construction of structures affecting air navigation.	Construction Notice	--[a]	--[a]	49 USC 44718

Table H-1. (contd)

Issuing Agency	Activity	Permit/Authorization	License Number	Expiration Date	Authority
FAA, Southeast Region, Atlanta, Georgia; other regions as appropriate. Coordinate with Florida Department of Transportation (FDOT).	Stack construction within airspace for approach to airport.	FAA Stack Height Waiver	--[(a)]	--[(a)]	14 CFR 77.21, FS §333.025
U.S. Fish and Wildlife Service (FWS)	Construction in areas where threatened and endangered species or critical habitat could be impacted as a result of the construction and/or operation of the proposed facility.	Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act	--[(a)]	--[(a)]	16 USC 703-712, 16 USC 668a-d
FWS	Incidental taking of a protected species.	Incidental Take Permit	--[(a)]	--[(a)]	50 CFR 17.21
National Marine Fisheries Service	Provides for the protection of fishery resources and essential fish habitat.	Magnuson-Stevens Act/Fisheries Management Plan	--[(a)]	--[(a)]	16 USC 1851
State					
All State, regional, and local permits (except certain local zoning/building permits) are covered under the Power Plant Siting Act (PPSA) Certification. It is not necessary to apply for most of these permits individually, but they are listed below for informational purposes. Those Federal permit program requirements that are delegated to the State and require individual permit applications to be submitted as part of the Site Certification Application (SCA) are shown in bold italics. The issuing agency remains the applicable State agency, although the delegating Federal agency is noted in the Issuing Agency column of the table.					
Levy County	Above-grade fills within the 100-year floodplain.	Floodplain Construction Compliance	--[(a)]	--[(a)]	Levy County Code of Ordinances – Chapter 50 Article VI

Table H-1. (contd)

Issuing Agency	Activity	Permit/Authorization	License Number	Expiration Date	Authority
Florida Department of Environmental Protection (FDEP)	Above-grade fills within the 100-year floodplain.	Floodplain Construction Compliance	--[(a)]	--[(a)]	Chapter 40B-4 FAC
NRC	Above-grade fills within the 100-year floodplain.	Floodplain Construction Compliance	--[(a)]	--[(a)]	Executive Order 11988
Federal Emergency Management Agency	Post-construction Flood Insurance Rate Map flood map change.	Letter of Map Revision	--[(a)]	--[(a)]	44 CFR 65.5(a)
Florida Historical Commission	Construction in an area where historic or archeological resources may be affected.	Compliance with the National Historic Preservation Act	--[(a)]	--[(a)]	Chapter 267, FAC
FDEP	Construction of a power plant with more than 75 MW of steam generated power and associated facilities.	Power Plant Certification	--[(a)]	--[(a)]	FS § 403.519
FDEP	Required for projects on sovereign submerged lands.	Sovereign Submerged Lands Lease	--[(a)]	--[(a)]	Chapter 18-21, FAC
FDEP	Required for projects that affect surface waters, wetlands, or sovereign submerged lands. FDEP coordinates review with other State agencies to address natural resource and cultural resource issues.	ERP	--[(a)]	--[(a)]	Chapter 40D-4, FAC
FDEP, EPA Region IV review	Required for all generators, transporters, as well as the disposal of hazardous waste.	Florida Notification of Regulated Waste Activity/Regulation Standards	--[(a)]	--[(a)]	Chapter 62-730, FAC
FDEP	Construction and operation of facilities generating air emissions.	State Construction Permit for Air Emission Facilities	--[(a)]	--[(a)]	Chapter 62-4.210, FAC

Table H-1. (contd)

Issuing Agency	Activity	Permit/Authorization	License Number	Expiration Date	Authority
FDEP, EPA Region IV review	Construction and operation of facilities generating air emissions.	Prevention of Significant Deterioration Construction Permit	--[a]	--[a]	Chapter 62-212, FAC
FDEP, EPA Region IV review	Operation of facilities generating air emissions.	Title V Operating Permit	--[a]	--[a]	Chapter 62-213, FAC
FDEP, EPA Region IV review	Not Applicable	Phase II Acid Rain Permit/Acid Rain Compliance Plan	--[a]	--[a]	Chapter 62-214, FAC
FDEP	Projects with potential to impact waters of the state.	Section 401 Water Quality Certification (CWA)	--[a]	--[a]	Chapter 62-4, FAC
FDEP	Projects requiring Section 404/10 permitting. Conducted in conjunction with ERP process.	Compliance with Fish and Wildlife Coordination Act	--[a]	--[a]	FS § 373.4144
FDEP, EPA Region IV review	Discharge of wastewater, cooling water, etc. to surface waters.	NPDES Permit for wastewater discharge. Compliance with CWA Section 316a	FL0633275-001-IW1S/NP	--[a]	FS § 403.0885
FDEP, EPA Region IV review	Intake of makeup water, addresses the impingement and entrainment impacts of cooling water intakes on biological populations.	NPDES Permit, Compliance with 316b	--[a]	--[a]	40 CFR 125, Subpart I
FDEP	Construction of any facility that disturbs 1 acre or more.	NPDES Construction Stormwater Permit; requires Surface Water Management and Sediment Control Plans	Generic	--[a]	Chapters 62-25, 62-40 FAC
FDEP, EPA Region IV review	Operation of an industrial facility.	NPDES Operating Stormwater Permit for Industrial Activities	FL0633275-001-IW1S/NP	--[a]	Chapter 62-621, FAC

Table H-1. (contd)

Issuing Agency	Activity	Permit/Authorization	License Number	Expiration Date	Authority
FDEP	Under the CWA, industrial facilities have to prepare an SWP3 as part of the stormwater NPDES permit.	SWP3	--[a]	--[a]	Chapter 62-330.200, FAC
FDEP, Water Management District	Consumptive withdrawal of surface or groundwater.	Water Use Permit	--[a]	--[a]	40B-2, FAC
FDEP, Water Management District	Required if dewatering is required for construction.	Dewatering Permit	--[a]	--[a]	40B-2, FAC
FDEP, Water Management District	Construction of water wells.	Well Construction Permit	--[a]	--[a]	40B-3, FAC
FDEP	Management of onsite stormwater.	Surface Water Management/Erosion and Sediment Control Plan required	--[a]	--[a]	Chapter 62.40, FAC
FDEP- Local Branch	Construction of any facility that disturbs 5 acres or more.	Erosion & Sedimentation Control Plan	--[a]	--[a]	Chapter 62.40, FAC
FDEP	Construction of transmission lines and substation.	Electric and Magnetic Fields Standards	--[a]	--[a]	FS § 403.521, et seq. Chapter 62-814, FAC
FDEP	Approval for construction and operation in State parks and other lands owned and/or managed by the State.	State Lands Use	--[a]	--[a]	FS § 253.77, et seq.
FDEP	Aboveground oil storage tanks.	Aboveground Storage Tank Registration	--[a]	--[a]	FS § 376.323

Table H-1. (contd)

Issuing Agency	Activity	Permit/Authorization	License Number	Expiration Date	Authority
Florida Game and Freshwater Fish Conservation Commission	Incidental taking of a protected species.	Incidental Take Permit	--[a]	--[a]	Chapter 68A-27, FAC
Florida Public Service Commission	Reviews the appropriateness of the proposed project and issues a “determination of need.”	Electrical Transmission Line (as Associated Facility under PPSA)	--[a]	--[a]	FS § 350.001 et seq.
Florida Department of Community Affairs	Determines project consistency with coastal zone management plan.	Coastal Zone Consistency Determination	--[a]	--[a]	FS § 380.23
Local					
All State, regional, and local permits (except certain local zoning/building permits) are covered under the PPSA Certification. It may be necessary to apply for these permits individually as required by the government agency.					
City, County, or Municipal District	New water and sewer connections (if available).	Water and Sewer Connection	--[a,d]	--[a,d]	TBD[d]
City, County, or Municipal District	Required if land is not zoned appropriately for project or to address local zoning requirements that apply specifically to this type of facility.	Zoning/Land Use Compliance	--[a,d]	--[a,d]	TBD
County	Required for connection of driveway to public roads.	Driveway Permit	--[a,d]	--[a,d]	TBD
Local County Department of Community Development	Required for removal of on-site vegetation.	Vegetation Removal	--[a,d]	--[a,d]	TBD

Table H-1. (contd)

Issuing Agency	Activity	Permit/Authorization	License Number	Expiration Date	Authority
Local County Health Department	Required for construction and operation of a new septic system, if sewage service not available in the area. One copy of the survey and one copy of construction plans must bear original Health Department approval.	Health Department Septic Permit and Operating Permit	--[a,d]	--[a,d]	TBD
City, County, or Municipal District	Construction of new buildings and facilities.	Building Permit; Plumbing Permit; HVAC Permit; Contractors License, etc.	--[a,d]	--[a,d]	TBD
		Other Permits/Approvals			
FDOT	Crossing of highways by railroad.	Railroad Grade Crossing Program	--[a]	--[a]	FDOT
U.S. Department of Interior	Prevention of "taking" of Bald Eagle nests, eggs, or birds.	Migratory Bird Treaty Act of 1918; authorization for "taking" of Bald Eagle nest would be required per 50 CFR 21.	--[a]	--[a]	16 USC 703-712

(a) Data not available.
(b) Initial consultation with Agency occurs prior to combined license application submittal.
(c) Applications for permits will be made during the pre-construction phase.
(d) Issuing authority. License numbers and expiration dates will be included in the table when known.

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Appendix I

Carbon Dioxide Footprint Estimates for a Model 1000-MW(e) Light Water Reactor (LWR)

Appendix I

Carbon Dioxide Footprint Estimates for a Model 1000-MW(e) Light Water Reactor (LWR)

The review team has estimated the carbon dioxide (CO_2) footprint of various activities associated with nuclear power plants. These activities include building, operating, and decommissioning the plant. The estimates include direct emissions from the nuclear facility and indirect emissions from workforce transportation and the uranium fuel cycle.

Construction equipment estimates listed in Table I-1 are based on hours of equipment use estimated for a single nuclear power plant at a site requiring a moderate amount of terrain modification. Equipment usage for a multiple unit facility would be larger, but it is likely that it would not be a factor of 2 larger. A reasonable set of emissions factors used to convert the hours of equipment use to CO_2 emissions are based on carbon monoxide (CO) emissions (UniStar 2007) scaled to CO_2 using a scaling factor of 165 tons of CO_2 per ton of CO. This factor is based on emissions factors in Table 3.3-1 of AP-42 (EPA 1995). Equipment emissions estimated for decommissioning are one-half of those for construction.

Table I-1. Construction Equipment CO_2 Emissions (metric tons equivalent)

Equipment	Construction Total[a]	Decommissioning Total[b]
Earthwork and Dewatering	1.1×10^4	5.4×10^3
Batch Plant Operations	3.3×10^3	1.6×10^3
Concrete	4.0×10^3	2.0×10^3
Lifting and Rigging	5.4×10^3	2.7×10^3
Shop Fabrication	9.2×10^2	4.6×10^2
Warehouse Operations	1.4×10^3	6.8×10^2
Equipment Maintenance	9.6×10^3	4.8×10^3
TOTAL[c]	3.5×10^4	1.8×10^4

(a) Based on hours of equipment usage over 7-year period.
(b) Based on equipment usage over 10-year period.
(c) Total not equal to the sum due to rounding.

Workforce estimates are typical workforce numbers for new plant construction and operation based on estimates in various applications for combined construction permits and operating licenses (COLs), and decommissioning workforce emissions estimates are based on decommissioning workforce estimates in NUREG-0586 S1, *Generic Environmental Impact*

Statement on Decommissioning of Nuclear Facilities, Supplement 1 Regarding the Decommissioning of Nuclear Power Reactors (NRC 2002). A typical construction workforce averages about 2500 for a 7-year period with a peak workforce of about 4000. A typical operations workforce for the 40-year life of the plant is assumed to be about 400, and the decommissioning workforce during a decontamination and dismantling period of 10 years is assumed to be 200 to 400. In all cases, the daily commute is assumed to involve a 100-mi roundtrip with two individuals per vehicle. Considering shifts, holidays, and vacations, 1250 roundtrips per day are assumed each day of the year during construction, 200 roundtrips per day are assumed each day during operations, and 150 roundtrips per day are assumed 250 days per year for the decontamination and dismantling portion of decommissioning. If the SAFSTOR decommissioning option is included in decommissioning, 20 roundtrips each day of the year are assumed for the caretaker workforce.

Table I-2 lists the review team's estimates of the CO_2 equivalent emissions associated with workforce transport. The table lists the assumptions used to estimate total miles traveled by each workforce; the factors used to convert total miles to metric tons CO_2 equivalent; and CO_2 equivalent accounts for other greenhouse gases, such as methane and nitrous oxide, emitted by internal combustion engines. The workers are assumed to travel in gasoline-powered passenger vehicles (cars, trucks, vans, and sports utility vehicles) that average 19.7 mpg of gas (FHWA 2006). Conversion from gallons of gasoline burned to CO_2 equivalent is based on U.S. Environmental Protection Agency (EPA) emissions factors (EPA 2007a, b).

Table I-2. Workforce CO_2 Footprint Estimates

	Construction Workforce	**Operational Workforce**	**Decommissioning Workforce**	**SAFSTOR Workforce**
Roundtrips per day	1250	200	150	20
Miles per roundtrip	100	100	100	100
Days per year	365	365	250	365
Years	7	40	10	40
Miles traveled	3.2×10^8	2.9×10^8	3.8×10^7	2.92×10^7
Miles per gallon[(a)]	19.7	19.7	19.7	19.7
Gallons fuel burned	1.6×10^7	1.5×10^7	1.9×10^6	1.58×10^6
Metric tons CO_2 per gallon[(b)]	8.81×10^{-3}	8.81×10^{-3}	8.81×10^{-3}	8.81×10^{-3}
Metric tons CO_2	1.4×10^5	1.3×10^5	1.7×10^4	1.3×10^4
CO_2 equivalent factor[(c)]	0.971	0.971	0.971	0.971
Metric tons CO_2 equivalent	1.5×10^5	1.3×10^5	1.7×10^4	1.3×10^4

Sources:
(a) FHWA 2006
(b) EPA 2007b
(c) EPA 2007a.

Published estimates of uranium fuel cycle CO_2 emissions required to support a nuclear power plant range from about 1 percent to nearly 5 percent of the CO_2 emissions from a comparably sized coal-fired plant (Sovacool 2008). A coal-fired power plant emits about 1 metric ton (MT) of CO_2 for each megawatt hour (MWh) generated (Miller and Van Atten 2004). Therefore, for consistency with Table S-3 of 10 CFR 51.51, the NRC staff estimated the uranium fuel cycle CO_2 emissions as 0.05 MT of CO_2 per MWh generated and assumed an 80 percent capacity factor. Finally, the review team estimated the CO_2 emissions directly related to plant operations from the typical use of various diesel generators on site using EPA emissions factors (EPA 1995). The review team assumed an average of 600 hours of emergency diesel generator operation per year (total for 4 generators) and 200 hours of station blackout diesel generator operation per year (total for 2 generators).

Given the various sources of CO_2 emissions, the review team estimates the total life CO_2 footprint for a reference 1000-MW(e) nuclear power plant to be about 18 million MT. The components of the footprint are summarized in Table I-3. The uranium fuel cycle component of the footprint dominates all other components. It is directly related to power generated. As a result, it is reasonable to use reactor power to scale the footprint to larger reactors.

Table I-3. Reference Reactor Lifetime Carbon Dioxide Footprint

Source	Activity Duration (year)	Total Emissions (metric tons)
Construction Equipment	7	3.5×10^4
Construction Workforce	7	1.5×10^5
Plant Operations	40	1.9×10^5
Operations Workforce	40	1.3×10^5
Uranium Fuel Cycle	40	1.7×10^7
Decommissioning Equipment	10	1.8×10^4
Decommissioning Workforce	10	1.7×10^4
SAFSTOR Workforce	40	1.3×10^4
Total		1.8×10^7

In closing, the review team considers the footprint estimated in Table I-3 to be appropriately conservative. The CO_2 emissions estimates for the dominant component (uranium fuel cycle) are based on 30-year-old enrichment technology, assuming the energy required for enrichment is provided by coal-fired generation. Different assumptions related to the source of energy used for enrichment or the enrichment technology that would be just as reasonable could lead to a significantly reduced footprint.

Emissions estimates presented in the body of this EIS have been scaled to values that are appropriate for the proposed project. The uranium fuel cycle emissions have been scaled by reactor power using the scaling factor determined in Chapter 6 and by the number of reactors to be built. Plant operations emissions have been adjusted to represent the number of large CO_2 emissions sources (diesel generators, boilers, etc.) associated with the project. The workforce emissions estimates have been scaled to account for differences in workforce numbers and commuting distance. Finally, equipment emissions estimates have been scaled by estimated equipment usage. As shown in Table I-3, only the scaling of the uranium fuel cycle emissions estimates makes a significant difference in the total carbon footprint of the project.

I.1 References

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Appendix J

Supporting Documentation on Radiological Dose Assessment

Appendix J

Supporting Documentation on Radiological Dose Assessment

The U.S. Nuclear Regulatory Commission (NRC) staff performed an independent dose assessment of the radiological impacts resulting from normal operation of the proposed new nuclear Units 1 and 2 at the Progress Energy Florida, Inc. (PEF) Levy County site, approximately 9.4 mi north of the Crystal River Energy Complex (CREC) Unit 3 nuclear power station. The results of the assessment are presented in this appendix and are compared to the results from PEF's Environmental Report (ER) (PEF 2009a) found in EIS Section 5.9, "Radiological Impacts of Normal Operations." Appendix G is divided into three sections: (1) dose estimates to the public from liquid effluents, (2) dose estimates to the public from gaseous effluents, and (3) cumulative dose estimates.

J.1 Dose Estimates to the Public from Liquid Effluents

The NRC staff used the dose-assessment approach specified in Regulatory Guide 1.109 (NRC 1977) and the LADTAP II computer code (Strenge et al. 1986) to estimate doses to the maximally exposed individual (MEI) and population from the liquid effluent pathway of the proposed Levy Nuclear Plant (LNP) Units 1 and 2.

J.1.1 Scope

Doses from the LNP Units 1 and 2 to the MEI were calculated and compared with regulatory criteria for the following:

- Total Body – Dose was the total for all pathways (i.e., fish consumption, shoreline usage, swimming exposure, and boating) with the highest value for either the adult, teen, child, or infant compared to the 3-mrem/yr per reactor dose design objective in Title 10 of the Code of Federal Regulations (CFR) Part 50, Appendix I.

- Organ – Dose was the total for each organ for all pathways (i.e., fish consumption, shoreline usage, swimming exposure, and boating) with the highest value for either the adult, teen, child, or infant compared to the 10-mrem/yr per reactor dose design objective specified in 10 CFR Part 50, Appendix I.

The NRC staff reviewed the assumed exposure pathways and input parameters and values used by PEF in ER Section 5.4 (PEF 2009a) for appropriateness, including references made to the Westinghouse Advanced Passive 1000 (AP1000) Design Control Document (DCD) Revision 17 (Westinghouse 2008). Default values from Regulatory Guide 1.109 (NRC 1977) were used when site-specific input parameters were not available. The staff concluded that the assumed exposure pathways were reasonable and the input parameters and values used by PEF were appropriate.

J.1.2 Resources Used

To calculate doses to the public from liquid effluents, the NRC staff used a personal-computer (PC) version of the LADTAP II code entitled, NRCDOSE, Version 2.3.10 (Chesapeake Nuclear Services, Inc. 2006), obtained through the Oak Ridge Radiation Safety Information Computational Center (RSICC).

J.1.3 Input Parameters

Table J-1 lists the major parameters used by PEF and NRC staff in calculating dose to the public from liquid effluent releases during normal operation. For population dose assessment, PEF used the population projections for the year 2020 (5 years from the time of licensing action), which is consistent with the guidance in Section 5.4.1 of the *Environmental Standard Review Plan* (NRC 2000). These population projections are presented in ER Tables 2.5-1 through 2.5-5 (PEF 2009a).

When site-specific information was not available for its LADTAP II calculations, PEF chose to use the Regulatory Guide 1.109 default assumptions. These assumptions generally will lead to an overestimation of doses from the liquid pathway to the MEI, the population, and biota. The staff concludes this approach is bounding.

J.1.4 Comparison of Results

Table J-2 compares doses to the public calculated by PEF for liquid effluent releases for one unit with dose estimates determined by the NRC staff. NRC staff doses calculated were identical to the doses calculated by PEF.

Table J-1. LADTAP Parameters and Selected Inputs

Parameter	Staff Value		Comments
Radionuclide source-term file created from: LNP one unit liquid effluent source term (Ci/yr).	H-3	1.01×10^{3}	Releases to Discharge Canal (Ci/yr). Values from Westinghouse AP1000 DCD Table 11.2-7, Rev 17 (Westinghouse 2008).
	Na-24	1.63×10^{-3}	
	Cr-51	1.85×10^{-3}	
	Mn-54	1.30×10^{-3}	
	Fe-55	1.00×10^{-3}	
Only radionuclides included in Regulatory Guide 1.109 are considered (NRC 1977).	Fe-59	2.00×10^{-4}	
	Co-58	3.36×10^{-3}	
	Co-60	4.40×10^{-4}	
	Zn-65	4.10×10^{-4}	
	Br-84	2.00×10^{-5}	
	Rb-88	2.70×10^{-4}	
	Sr-89	1.00×10^{-4}	
	Sr-90	1.00×10^{-5}	
	Sr-91	2.00×10^{-5}	
	Y-91m	1.00×10^{-5}	
	Y-93	9.00×10^{-5}	
	Zr-95	2.30×10^{-4}	
	Nb-95	2.10×10^{-4}	
	Mo-99	5.70×10^{-4}	
	Tc-99m	5.50×10^{-4}	
	Ru-103	4.93×10^{-3}	
	Ru-106	7.352×10^{-2}	
	Rh-106	7.352×10^{-2}	
	Ag-110m	1.05×10^{-3}	
	Ag-110	1.40×10^{-4}	
	Te-129m	1.20×10^{-4}	
	Te-129	1.50×10^{-4}	
	Te-131m	9.00×10^{-5}	
	Te-131	3.00×10^{-5}	
	Te-132	2.40×10^{-4}	
	I-131	1.413×10^{-2}	
	I-132	1.64×10^{-3}	
	I-133	6.70×10^{-3}	
	I-134	8.10×10^{-4}	
	I-135	4.97×10^{-3}	
	Cs-134	9.93×10^{-3}	
	Cs-136	6.30×10^{-4}	
	Cs-137	1.332×10^{-2}	
	Ba-137m	1.245×10^{-2}	
	Ba-140	5.52×10^{-3}	
	La-140	7.43×10^{-3}	
	Ce-141	9.00×10^{-5}	
	Ce-143	1.90×10^{-4}	
	Ce-144	3.16×10^{-3}	
	Pr-143	1.30×10^{-4}	
	Pr-144	3.16×10^{-3}	
	W-187	1.30×10^{-4}	
	Np-239	2.40×10^{-4}	
	All others	2.00×10^{-5}	
Discharge flow rate	63 cfs one unit.		
Source-term multiplier selected	1.0 for one unit.		

Table J-1. (contd)

Parameter	Staff Value	Comments
Population fractions modify defaults	NO	
Site type	Saltwater selected.	
Dose contributions print by radionuclide	YES	
Reconcentration model	NONE selected	
ALARA Max. Individual: shore – width actor	1.0 (tidal basin),	
Dilution factor	LNP FSAR table 11.2-201 Rev 0	
Dilution factors for all pathways	21	
Transit time	0.00	
ALARA max. individual shore – width values:	discharge canal bank 0.1	
River shoreline	0.2	
Lake shore	0.3	
Nominal ocean site	0.5	
Tidal basin	1.0	
Additional usage	NONE	

	Fish	Invertebrate	Shoreline	Swimming	Boating
	Consumption, kg/yr		Usage, hr/yr		
Adult	21	5	12	12	100
Teen	16	3.8	67	67	67
Child	6.9	1.7	14	14	14
Infant	None	None	None	None	None

Sport fish harvest	210,246 kg/yr	dilution factor – 21	transit time – 0
Sport invertebrate harvest	142,438 kg/yr	dilution factor – 21	transit time – 0
Commercial fishing	734,960 kg/yr	dilution factor – 21	transit time – 0
Commercial invertebrate	1,424,384 kg/yr	dilution factor – 21	transit time – 0
Population usage all checked:		drinking water, shoreline, boating, swimming	
Drinking water	None	None	None
Shoreline: width factor 1.0	32,541,940 per-hr/yr	dilution factor – 21	transit time – 0
Boating	32,071,440 per-hr/yr	dilution factor – 21	transit time – 0
Swimming	32,541,940 per-hr/yr	dilution factor – 21	transit time – 0
Irrigation food data: none		pathway and water usage locations	
Biota exposures		None	
Block data: change block data		NO	

Table J-2. Comparison of Doses to the Public from Liquid Effluent Releases for One Unit

Type of Dose	PEF [(a) (b) (c)]	Staff Calculation	Percent Difference
Total body (mrem/yr)	0.0052 (teen)	0.0052 (teen)	0
Organ dose (mrem/yr)	0.071 (adult GI tract)	0.071 (adult GI tract)	0
Thyroid (mrem/yr)	0.0127 (teen)	0.0127 (teen)	0
Population dose from liquid pathway (person-rem/yr)	1.13	1.13	0
Population maximum organ dose from liquid pathway (person-rem/yr)	2.89	2.89	0

(a) LADTAP II Output File (PEF 2009b).
(b) MEI results from PEF ER Tables 5.4-6 (PEF 2009a).
(c) Population results from PEF ER Table 5.4-11 (PEF 2009a).

J.2 Dose Estimates to the Public from Gaseous Effluents

The NRC staff used the dose-assessment approach specified in Regulatory Guide 1.109 (NRC 1977) and the GASPAR II computer code (Strenge et al. 1987) to estimate doses to the MEI from the gaseous effluent pathway and to the population within the 50-mi radius of the LNP site from the gaseous effluent pathway for proposed Units 1 and 2.

J.2.1 Scope

The NRC staff and PEF independently calculated the maximum gamma air dose, beta air dose, total body dose, maximum organ dose (bone), and thyroid dose and skin dose to receptors located at the maximum exposure for each pathway discussed in Section 5.9. The maximum atmospheric dispersion factor and the maximum ground deposition occurs in the west-southwest (WSW) direction. The MEI is assumed to be located at 0.83 mi WSW in Section 5.4 of the ER (PEF 2009a). Dose to the MEI was calculated for the following exposure pathways: plume immersion, direct shine from deposited radionuclides, inhalation, ingestion of local farm or garden vegetables, and ingestion of locally produced beef and goat milk.

The NRC staff reviewed the input parameters and values used by PEF for appropriateness, including references made to the AP1000 DCD Rev 17(Westinghouse 2008). When site-specific input parameters were not available, default values from Regulatory Guide 1.109 (NRC 1977) were used. The staff concluded the assumed exposure pathways, input parameters, and values used by PEF were appropriate. The NRC staff used these pathways and parameters in its independent calculations using GASPAR II.

Joint frequency-distribution data of wind speed and wind direction by atmospheric-stability class for the LNP site (PEF 2009a) were used as input to the XOQDOQ code (Sagendorf et al. 1982) to calculate long-term average atmospheric dispersion factor (χ/Q) and atmospheric deposition factor (D/Q) values for routine releases. Based on 2 years of meteorological data, the staff's independent results are similar as those reported by PEF in ER Tables 2.7-58 through and 2.7-61 Rev 1 (PEF 2009a).

Population doses were calculated for all types of releases (i.e., noble gases, iodines and particulates, ^{3}H, and ^{14}C) using the GASPAR II code for the following exposure pathways: plume immersion, direct shine from deposited radionuclides, ingestion of vegetables, and ingestion of cow and goat milk, and meat.

J.2.2 Resources Used

To calculate doses to the public from gaseous effluents, the staff used a PC version of the XOQDOQ and GASPAR II codes entitled, NRCDOSE Version 2.3.10 (Chesapeake Nuclear Services, Inc. 2006), obtained through the Oak Ridge RSICC.

J.2.3 Input Parameters

Table J-3 lists the major parameters used in calculating dose to the public from gaseous effluent releases during normal operation.

J.2.4 Comparison of Doses to the Public from Gaseous Effluent Releases

Table J-3 presents dose estimates to the MEI for each gaseous pathway as calculated by PEF and the NRC staff. The doses provided by PEF in its ER Rev 1 and those calculated by NRC are similar, as shown in Table J-4.

J.2.5 Comparison of Liquid and Gaseous Doses with 10 CFR Part 50 Appendix I

Table J-5 presents noble gas, radioiodine, and particulate matter dose estimates for the MEI as calculated by both PEF and the NRC staff along with dose design objectives of 10 CRF Part 50, Appendix I.

Table J-3. GASPAR Parameters and Selected Inputs

Parameter	Staff Value		Comments
New unit gaseous effluent source term (Ci/yr)	Ar-41	3.4×10^{1}	Values from Westinghouse AP1000 DCD Table 11.3-3 for a single unit (Westinghouse 2008). Except for rounding differences, these values are the same as those reported in ER Table 3.5-2 (PEF 2009a).
	Kr-85m	3.6×10^{1}	
	Kr-85	4.093×10^{3}	
	Kr-87	1.5×10^{1}	
	Kr-88	4.6×10^{1}	
	Xe-131m	1.776×10^{3}	
	Xe-133m	8.7×10^{1}	
	Xe-133	4.642×10^{3}	
	Xe-135m	7.0×10^{0}	
	Xe-135	3.34×10^{2}	
	Xe-138	6.0×10^{0}	
	I-131	1.168×10^{-1}	
	I-133	4.017×10^{-1}	
	H-3	3.5×10^{2}	
	C-14	7.3×10^{0}	
	Cr-51	6.06×10^{-4}	
	Mn-54	4.331×10^{-4}	
	Co-57	8.2×10^{-6}	
	Co-58	2.316×10^{-2}	
	Co-60	8.75×10^{-3}	
	Fe-59	7.88×10^{-5}	
	Sr-89	3.024×10^{-3}	
	Sr-90	1.159×10^{-3}	
	Zr-95	1.008×10^{-3}	
	Nb-95	2.452×10^{-3}	
	Ru-103	8.02×10^{-5}	
	Ru-106	7.77×10^{-5}	
	Sb-125	6.09×10^{-5}	
	Cs-134	2.298×10^{-3}	
	Cs-136	8.53×10^{-5}	
	Cs-137	3.552×10^{-3}	
	Ba-140	4.23×10^{-4}	
	Ce-141	4.164×10^{-4}	
	Tritium	3.50×10^{4}	

1 **Table J-3**. (contd)

GASPAR code entry, Site Specifics	Input value	Reference
Source terms: annual average gaseous release		DCD Table 11.3-3 Rev 17
Source multiplication factor	1.0	
Release time for purges	0.0 hr	
Milk production data, meat production data, and vegetable production data		ER Table 5.4-5 Agricultural Statistics rounded to three significant figures by sector and distance
Population control		Population Data refer to ER Table 2.5-4 2020 population residential
Distance from site to northeast corner of United States (mi)	1680	
Fraction of the year that leafy vegetables are grown	0.92	ER Table 5.4-3
Fraction of the year milk cows are on pasture	0.92	
Fraction of maximum individual vegetable intake from own garden	1.00	ER Table 5.4-3
Fraction of milk-cow feed from pasture	1.00	
Fraction of the year goats on pasture	1.00	ER Table 5.4-3
Fraction of the year goats feed from pasture while on pasture	1.00	ER Table 5.4-3
Fraction of the year beef cattle are on pasture	0.92	ER Table 5.4-3
Fraction of beef cattle feed from pasture while on pasture	1.00	ER Table 5.4-3

Sources: PEF 2009a; Westinghouse 2008.

Table J-4. Comparison PEF and Staff Results Annual Individual Doses to the Maximally Exposed Individual from Gaseous Effluents for One Unit

Pathway	Age Group	PEF Total Body Dose[(a)] (mrem/yr)	Staff Total Body Dose[(b)] (mrem/yr)	PEF Max Organ (Bone)[(a)] (mrem/yr)	Staff Max Organ (Bone)[(b)] (mrem/yr)	PEF & Staff Skin Dose[(c)] (mrem/yr)	PEF Thyroid Dose[(a)] (mrem/yr)	Staff Thyroid Dose[(b)] (mrem/yr)
Plume (0.83 mi WSW)	All	0.985	0.985	0.985	0.985	6.32	0.985	0.985
Ground (0.83 mi WSW)	All	0.114	0.114	0.114	0.114	0.133	0.114	0.114
Goat Milk (2.4 mi NNW)	Adult	0.0253	0.0253	0.0770	0.0770	N/A	0.155	0.155
	Teen	0.0404	0.0404	0.141	0.141	N/A	0.246	0.246
	Child	0.0867	0.0867	0.347	0.347	N/A	0.497	0.497
	Infant	0.170	0.170	0.673	0.673	N/A	1.17	1.17
Inhalation (0.83 mi WSW)	Adult	0.0598	0.156	0.00863	0.0243	N/A	0.521	1.39
	Teen	0.0605	0.158	0.0104	0.0294	N/A	0.649	1.73
	Child	0.0536	0.140	0.0127	0.0356	N/A	0.753	2.01
	Infant[(d)]	0.0309	0.0806	0.00637	0.0178	N/A	0.673	1.80
Vegetable (1.7 mi WSW)	Adult	0.530	0.530	2.08	2.08	N/A	1.43	1.43
	Teen	0.804	0.804	3.40	3.40	N/A	1.98	1.98
	Child	1.80	1.80	8.16	8.16	N/A	4.05	4.05
Meat (2.8 mi SSW)[(e)]	Adult	0.0128	0.0231	0.0564	0.102	N/A	0.0180	0.0287
	Teen	0.0104	0.0188	0.0476	0.0857	N/A	0.0142	0.0229
	Child	0.0189	0.0341	0.08741	0.161	N/A	0.0246	0.0403

(a) PEF 2009a; See PEF ER Table 5.4-7 Gaseous Pathways – Dose Summary Maximum Exposed Individuals for one AP1000 Unit .
(b) Staff estimates.
(c) Skin dose is applicable for plume and ground, not for inhalation, vegetable, milk, and meat pathways. PEF and NRC staff estimates had the same results.
(d) Infant doses are not calculated for the vegetable or meat pathways because the doses that infants receive from this diet would be bounded by the dose calculated for the child.
(e) The NRC staff selected a more conservative meat location (2.2 mi NW) than the PEF-reported meat location (2.8 mi SSW).

Table J-5. Comparisons of MEI Dose Estimates from Liquid and Gaseous Effluents to 10 CFR Part 50, Appendix I Design Objectives[(a)]

Radionuclide Releases/Dose	PEF Assessment[(b)]	NRC Staff Assessment	Appendix I Design Objectives
Gaseous Effluents (noble gases only)			
Beta air dose	9.9 mrad	9.35 mrad	20 mrad
Gamma air dose	1.7 mrad	1.67 mrad	10 mrad
Whole body dose	3.1 mrem	3.16 mrem (Child – whole body)	5 mrem
Skin dose	6.3 mrem	6.45 mrem	15 mrem
Gaseous Effluents (radioiodine and particulate matter)			
Critical organ dose from all pathways	9.7 mrem (Child – bone)	9.80 mrem (Child – bone)	15 mrem
Liquid Effluents			
Total body dose from all pathways	0.0052 mrem (Teen – all pathways)	0.0052 mrem (Teen – all pathways)	3 mrem
Critical organ dose from all pathways	0.071mrem (Adult – GI-LLI)	0.0714 mrem (Adult – GI-LLI)	10 mrem

(a) All doses are for one AP1000 unit.
(b) Calculated doses presented in PEF ER Tables 5.4-6 and 5.4-8 (PEF 2009a).

J.2.6 Comparison of Population Dose from Liquid and Gaseous Exposures

Table J-6 presents person-rem dose estimates to individuals living within the 50-mi radius of LNP calculated by PEF and the staff. The population doses from gaseous effluents to individuals living within the 50-mi radius of LNP were calculated. For these doses, the population data were projected to the year 2020. The population doses for the various pathways (immersion, inhalation, ingestion, and ground deposition) are presented.

Population doses resulting from natural background radiation to individuals living within the 50-mi radius of LNP are presented in Table J-7. Table J-7 shows that the calculated person-rem/yr exposure from the LNP Units 1 and 2 would be much less than the estimated person-rem/yr exposure from natural radiation.

Table J-6. Calculated Doses to the Population within 50 mi of the Proposed LNP Site from Gaseous and Liquid Pathways (Two AP1000 Units) (person-rem/yr-unit)

Pathway	Whole Body	
	PEF Rev 1 Estimate[(a)]	Staff Estimate
Gaseous		
Plume	1.02	1.19
Ground	0.10	0.10
Inhalation	0.37	0.36
Vegetable ingestion	3.10	3.03
Cow milk ingestion	0.28	0.24
Meat ingestion	0.88	0.87
Total gaseous	5.74	5.79
Liquid		
Sport fish	0.027	0.0272
Commercial fish	0.001	0.0012
Sport invertebrate	0.042	0.0422
Commercial invertebrate	0.001	0.0013
Shoreline	1.050	1.050
Swimming	0.005	0.005
Boating	0.003	0.00252
Total liquid	1.13	1.15

(a) PEF 2009a

Table J-7. Natural Background – Estimated Whole Body Dose to the Population Within 50 mi of the LNP Site

Source	Annual Individual Dose Source (mrem/yr)	Annual Population Dose[(a)] (person-rem/yr)
PEF Estimate	360[(b)]	$5.2\times10^{+5}$[(c)]
Staff Estimate	311[(d)]	$4.5\times10^{+5}$

(a) Annual population dose based on projected residential population of 1,440,207 in year 2020 (from PEF ER Tables 2.5-2 and 2.5-4) (PEF 2009a).
(b) 360 mrem/yr taken from NRC Fact Sheet, “Biological Effects of Radiation.”
(c) Taken from PEF ER Table 5.4-12 Rev 1 (PEF 2009a).
(d) NCRP 2009.

J.3 Cumulative Dose Estimates

Table J-8 presents the comparison of doses for LNP Units 1 and 2 with the dose standards of 40 CFR Part 190. The table shows the NRC staff's assessment of total doses to the MEI from LNP liquid and gaseous effluents. The assessment of doses includes releases of radiation from CREC Unit 3 because LNP shares a common discharge point for liquid releases with the CREC Unit 3. In additional, although the LNP and CREC sites are separated by nearly 10 mi, the staff adopted PEF's approach and added the gaseous effluent doses for CREC to the gaseous effluent doses for LNP to provide a bounding assessment for LNP. As stated in Section 5.9.1, the direct radiation doses from LNP Units 1 and 2 at the site boundary would be negligible. The assessment shows that the 40 CFR Part 190 standards would be met.

Table J-8. Cumulative Site Dose to MEI from LNP Units 1 and 2 Combined with CREC-3

Type Dose (mrem/yr)	CREC-3 Liquid & Gaseous[(a)]	LNP Unit 1 & 2 Liquid Dose (Teen)[(b)]	LNP Unit 1 & 2 Gaseous Dose (Child)[(b)]	Combined Max Individual Dose	40 CFR 190 Dose Standards
T-Body	8E-05	0.0104	2.96	2.97	25
Thyroid	0.002	0.0254	10.9	10.9	75
Bone	0.002	0.0113	14.5	14.5	25
GI-LLI[(c)]	0.002	0.286 (Adult)	3.6	3.9	25
Skin	0.002	0.00506	5.59	5.6	25
Other (worse case)	0.002	0.286	14.5	14.8	25

(a) CREC-3 operational data PEF ER Table 5.4-10 (PEF 2009a). NRC Staff notes that a 20-percent power uprate is planned at CREC Unit 3 in 2009–2011. NRC staff concluded that any potential increases in radiation exposure associated with this uprate would not change the combined maximum individual doses.
(b) NRC staff-calculated values.
(c) GI-LLI = gastrointestinal.

J.4 References

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Appendix K

Wildlife Species Observed During Pedestrian Surveys, 2006 – 2008

Appendix K

Wildlife Species Observed During Pedestrian Surveys, 2006 – 2008

Tables K-1 through K-3 list species observed during pedestrian surveys completed for the Levy Nuclear Plant (LNP) site by Progress Energy Florida, Inc. (PEF) between October 2006 and November 2008.

Table K-1. Mammalian Species Likely to Occur on the LNP Site and Blowdown Pipeline Corridor Sites

Common Name	Scientific Name	Observed Onsite[(a)]	Season Observed[(b,c)]
Bobcat	*Lynx rufus*	LNP Blowdown Pipeline Corridor	F, W, Sp W
Cotton mouse	*Peromyscus gossypinus*	NA LNP	NA F, W, Sp
Cottontail rabbit	*Sylvilagus floridanus*	Blowdown Pipeline Corridor	W
Coyote	*Canis latrans*	LNP LNP	F, W, Sp, S F, W, Sp
Eastern gray squirrel	*Sciurus carolinensus*	Blowdown Pipeline Corridor	W
Eastern mole	*Scalopus aquaticus*	NA LNP	NA F, W, Sp
Feral hog	*Sus scrofa*	Blowdown Pipeline Corridor	W
Southern flying squirrel	*Glaucomys volans*	NA LNP	NA F, W, Sp
Gray fox	*Urocyon cineroargentus*	Blowdown Pipeline Corridor LNP	W F, W, Sp
Hispid cotton rat	*Sigmodon hispidus*	Blowdown Pipeline Corridor	W
Marsh rabbit	*Sylvilagus palustris*	NA	NA
Mink	*Nustela vison*	NA LNP	NA F, W, Sp
Nine-branded armadillo	*Dasypus novemcinctus*	Blowdown Pipeline Corridor LNP	W F, W, Sp

Table K-1. (contd)

Common Name	Scientific Name	Observed Onsite[a]	Season Observed[b,c]
Raccoon	*Procyon lotor*	Blowdown Pipeline Corridor	W
River otter	*Lutra canadensis*	Blowdown Pipeline Corridor	W
Striped skunk	*Mephitis mephitis*	NA LNP	NA F, W, Sp
Virginia opossum	*Didelphis virginiana*	Blowdown Pipeline Corridor LNP	W F, W, Sp, S
White-tailed deer	*Odocoileus virginianus*	Blowdown Pipeline Corridor	W

Source: PEF 2009a
Notes:
South Site = the PEF-owned parcel immediately south of the LNP site
NA = Not directly observed.
(a) The species not directly observed were based on the Florida Natural Areas Inventory and Department of Natural Resources "Guide to the Natural Communities of Florida," February 1990 (PEF 2009b).
(b) F = Fall, W = Winter, Sp = Spring, S = Summer
(c) Observations along the blowdown pipeline corridor are based on winter survey only.

Table K-2. Bird Species Likely to Occur on the LNP Site and Blowdown Pipeline Corridor Sites

Common Name	Scientific Name	Observed Onsite[a]	Season Observed [b,c]
Acadian flycatcher	*Empidonax virescens*	NA	NA
American kestrel	*Falco sparverius*	LNP	F, W, Sp, S
		Blowdown Pipeline Corridor	W
Anhinga	*Anhinga anhinga*	LNP → flyover	F, W, Sp, S
		Blowdown Pipeline Corridor	W
Bachman's sparrow	*Aimophila aestivalis*	NA	NA
Bald eagle	*Haliaeetus leucocephalus*	LNP	F, W, Sp, S
Barn swallow	*Hirundo rustica*	LNP	W
Barred owl	*Strix varia*	LNP	F, W, Sp, S
		Blowdown Pipeline Corridor	W
Black vulture	*Coragyps atratus*	LNP	F, W, Sp, S
		Blowdown Pipeline Corridor	W
Blue-gray gnatcatcher	*Polioptila caerulea*	LNP	F, W, Sp
		Blowdown Pipeline Corridor	W
Blue jay	*Cyanocitta cristata*	LNP	F, W, Sp, S
		Blowdown Pipeline Corridor	W
Brown-headed nuthatch	*Sitta pusilla*	LNP	F, W, Sp
Brown pelican	*Pelecanus occidentalis*	NA	NA
Brown thrasher	*Toxastoma rufa*	Blowdown Pipeline Corridor	W
Carolina chickadee	*Parus carolinensis*	LNP	F, W, Sp
Carolina wren	*Thryothorus ludovicianus*	LNP	F, W, Sp, S
		Blowdown Pipeline Corridor	W
Catbird	*Dumetella carolinensis*	LNP	F, W, Sp, S
		Blowdown Pipeline Corridor	W
Cattle egret	*Bubulcus ibis*	Blowdown Pipeline Corridor	W
Cedar waxwing	*Bombycilla cedrorum*	NA	NA
Common crow	*Corvus brachyrhynchos*	LNP	F, W, Sp
Common nighthawk	*Chordeiles minor*	LNP	Sp

1 **Table K-2.** (contd)

Common Name	Scientific Name	Observed Onsite[a]	Season Observed [b,c]
Cooper's hawk	*Accipiter cooperii*	LNP	F, W, Sp, S
		Blowdown Pipeline Corridor	W
Double-crested cormorant	*Phalacrocorax auritus*	LNP	F, W, Sp, S
		Blowdown Pipeline Corridor	W
Downy woodpecker	*Picoides pubescens*	LNP	F, W, Sp
		Blowdown Pipeline Corridor	W
Eastern bluebird	*Sialia sialis*	LNP	F, W, Sp, S
		Blowdown Pipeline Corridor	W
Eastern kingbird	*Tyrannus tyrannus*	LNP	Sp
Eastern meadowlark	*Sturnella magna*	LNP	F, W, Sp, S
Eastern phoebe	*Sayornis phoebe*	LNP	F, W, Sp
		Blowdown Pipeline Corridor	W
Eastern screech owl	*Otus asio*	LNP	W
Fish crow	*Corvus ossifragus*	LNP	F, W, Sp, S
		Blowdown Pipeline Corridor	W
Great blue heron	*Ardea herodias*	Blowdown Pipeline Corridor	W
		Blowdown Pipeline Corridor	W
Great-crested flycatcher	*Miarchus crinitus*	LNP	Sp
Great egret	*Ardea alba*	Blowdown Pipeline Corridor	W
Great-horned owl	*Bubo virginianus*	NA	NA
Green heron	*Butorides virescens*	Blowdown Pipeline Corridor	W
Hermit thrush	*Catharus guttatus*	LNP	W
House wren	*Troglodytes aedon*	LNP	W
		Blowdown Pipeline Corridor	W
Indigo bunting	*Passerina cyanea*	LNP	Sp
Little blue heron	*Egretta caerulea*	Blowdown Pipeline Corridor	W

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1 **Table K-2.** (contd)

Common Name	Scientific Name	Observed Onsite[(a)]	Season Observed [(b,c)]
Marsh wren	*Cistothorus palustris*	LNP	W
		Blowdown Pipeline Corridor	W
Mourning dove	*Zenada macrona*	LNP	F, W, Sp, S
		Blowdown Pipeline Corridor	W
Northern bobwhite	*Colinus virginianus*	LNP	F, W, Sp
Northern cardinal	*Cardinalis cardinalis*	LNP	F, W, Sp, S
		Blowdown Pipeline Corridor	W
Northern mockingbird	*Mimus polyglottos*	LNP	F, W, Sp, S
		Blowdown Pipeline Corridor	W
Osprey	*Pandion haliaetus*	LNP	F, W, Sp, S
		Blowdown Pipeline Corridor	W
Palm warbler	*Dendroica palmarum*	LNP	F, W, Sp
		Blowdown Pipeline Corridor	W
Pileated woodpecker	*Dryocopus pileatus*	LNP	F, W, Sp
		Blowdown Pipeline Corridor	W
Pine warbler	*Dendroica pinus*	LNP	F, W, Sp
Red-bellied woodpecker	*Melanerpes carolinus*	LNP	F, W, Sp
		Blowdown Pipeline Corridor	W
Red-eyed vireo	*Vireo olivaceus*	LNP	Sp
Red-headed woodpecker	*Melanerpes erythrocephalus*	LNP	F, W, Sp
Red-shouldered hawk	*Buteo lineatus*	LNP	F, W, Sp, S
		Blowdown Pipeline Corridor	W
Red-tailed hawk	*Buteo jamaicensis*	LNP	F, W, Sp
		Blowdown Pipeline Corridor	W
Redwinged blackbird	*Agelaius phoeniceus*	LNP	F, W, Sp
Ring-billed gull	*Larus delawarensis*	LNP – flyover Blowdown Pipeline Corridor	F, W, Sp W

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1 **Table K-2.** (contd)

Common Name	Scientific Name	Observed Onsite[(a)]	Season Observed [(b,c)]
American robin	*Turdus migratorius*	LNP Blowdown Pipeline Corridor	F, W, Sp W
Ruby-crowned kinglet	*Regulus calendula*	LNP Blowdown Pipeline Corridor	F, W, Sp W
Ruby-throated hummingbird	*Archilochus colubris*	NA	NA
Rufous-sided towhee	*Pipilo erythrophthalmus*	LNP Blowdown Pipeline Corridor	F, W, Sp W
Sandhill crane	*Grus canadensis*	LNP	F, W, Sp
Sharp-shinned hawk	*Accipiter striatus*	LNP Blowdown Pipeline Corridor	W W
Snowy egret	*Egretta thula*	Blowdown Pipeline Corridor	W
Solitary vireo	*Vireo solitarius*	LNP Blowdown Pipeline Corridor	W W
Southeastern American kestrel	*Falco sparverius paulus*	NA	NA
Summer tanager	*Piranga rubra*	LNP	Sp
Swallow-tailed kite	*Elanoides forficatus*	LNP	Sp
Tree swallow	*Tachycineta bicolor*	LNP Blowdown Pipeline Corridor	F, W, Sp W
Tri-colored heron	*Egretta tricolor*	Blowdown Pipeline Corridor	W
Tufted titmouse	*Parus bicolor*	LNP Blowdown Pipeline Corridor	F, W, Sp W
Turkey vulture	*Cathartes aura*	LNP Blowdown Pipeline Corridor	F, W, Sp, S W
White-eyed vireo	*Vireo griseus*	LNP Blowdown Pipeline Corridor	F, W, Sp W
White ibis	*Eudocimus albus*	LNP Blowdown Pipeline Corridor	F, W, Sp, S W

2

Table K-2. (contd)

Common Name	Scientific Name	Observed Onsite[(a)]	Season Observed [(b,c)]
White pelican	*Pelecanus erythrorhynchos*	Blowdown Pipeline Corridor	W
Wild turkey	*Meleagris gallopavo*	LNP Blowdown Pipeline Corrdor	F, W, Sp, S W
Wood duck	*Aix sponsa*	LNP	F, W, Sp
Wood stork	*Mycteria americana*	LNP	F, W, Sp
		Blowdown Pipeline Corridor	W
Woodcock	*Scolopax minor*	LNP	W
Yellow-rumped warbler	*Dendroica coronata*	LNP	F, W, Sp
		Blowdown Pipeline Corridor	W
Yellow-throated vireo	*Vireo flavifrons*	LNP	Sp
Yellow-throated warbler	*Dendroica dominica*	NA	NA

Source: PEF 2009a
(a) The species not directly observed were based on the Florida Natural Areas Inventory and Department of Natural Resources "Guide to the Natural Communities of Florida," February 1990 (PEF 2009b).
(b) F = fall, W = winter, Sp = spring, S = summer
(c) Blowdown corridor observations based on winter survey only.
LNP = Levy Nuclear Plant site, including south property down to barge slip.
NA = Not directly observed.

1 **Table K-3**. Reptile and Amphibian Species Likely to Occur on the LNP Site and Blowdown
2 Pipeline Corridor Sites

Common Name	Scientific Name	Observed Onsite[a]	Season Observed[b,c]
Black racer	*Coluber constrictor*	LNP	F, W, Sp
Pygmy rattlesnake	*Sistrurus miliarius*	NA	NA
Eastern cottonmouth	*Agkistrodon piscivorus*	LNP	Sp
Eastern indigo snake	*Drymarchon couperi*	NA	NA
Common garter snake	*Thamnophis sirtalis*	LNP	F, W, Sp
Red rat snake	*Elaphe guttata guttata*	NA	NA
Yellow rat snake	*Elaphe obsoleta quadrivittata*	NA	NA
Ringneck snake	*Diadophis punctatus punctatus*	NA	NA
Scarlet kingsnake	*Lampropeltis triangulum elapsoides*	NA	NA
American alligator	*Alligator mississippiensis*	LNP	Sp
Green anole	*Anolis carolinensis*	LNP	F, W, Sp
		Blowdown Pipeline Corridor	W
Fence lizard	*Sceloporus undulatus*	LNP	F, W, Sp
		Blowdown Pipeline Corridor	W
Oak toad	*Bufo quercicus*	LNP	F, W, Sp
Narrowmouth toad	*Gastrophryne carolinensis*	NA	NA
Southern toad	*Bufo terrestris*	LNP	F, W, Sp
Diamondback rattlesnake	*Crotalus adamanteus*	LNP	Sp
Eastern glass Lizard	*Ophisaurus ventralis*	NA	NA
Peninsula ribbon snake	*Thamnophis sauritus sackenii*	NA	NA
Ground skink	*Scincella lateralis*	LNP	F, W, Sp
		Blowdown Pipeline Corridor	W
Broadhead skink	*Eumeces laticpes*	LNP	F
Five-lined skink	*Eumeces fasciatus*	N/A	N/A
Southeastern five-lined skink	*Eumeces inexpectatus*	N/A	N/A
Florida cooter	*Pseudemys floridana floridana*	LNP	F

Table K-3. (contd)

Common Name	Scientific Name	Observed Onsite[(a)]	Season Observed[(b,c)]
Box turtle	*Terrapene carolina major*	LNP – shells	NA[(d)]
		Blowdown Pipeline Corridor – shells	
Striped mud turtle	*Kinosternon bauri*	NA	NA
Gopher tortoise	*Gopherus polyphemus*	LNP	F, W, Sp
Snapping turtle	*Chelydra serpentine*	LNP	W
Southern leopard frog	*Rana sphenocephala utricularia*	LNP	F, W, Sp
Little grass frog	*Pseudacris ocularis*	LNP	F, W, Sp W
		Blowdown Pipeline Corridor	W
Southern cricket frog	*Acris gryllus*	LNP	F, W, Sp
Southern chorus frog	*Pseudacris nigrita*	LNP	F, W, Sp
Pinewoods treefrog	*Hyla femoralis*	LNP	F, W, Sp
Barking treefrog	*Hyla gratiosa*	NA	–
Squirrel treefrog	*Hyla squirella*	LNP	F, W, Sp
Green treefrog	*Hyla cinerea*	LNP	F, W, Sp
Greenhouse frog	*Eleuthrodactylus planirostris*	LNP	F, W, Sp
		Blowdown Pipeline Corridor	W
Ornate chorus frog	*Pseudacris ornata*	NA	NA
Eastern spadefoot toad	*Scaphiopus holbrooki holbrooki*	NA	NA
Gopher frog	*Rana capito*	NA	

Source: PEF 2009a
LNP = Levy Nuclear Plant site, including south property down to barge slip.
NA = Not directly observed.
(a) The species not directly observed were based on the Florida Natural Areas Inventory and Department of Natural Resources "Guide to the Natural Communities of Florida," February 1990 (PEF 2009b).
(b) F = fall, W = winter, Sp = spring, no survey conducted during summer.
(c) Observations along the Blowdown Corridor based on winter survey only.
(d) Shells would not convey any information about season since they would have been on-site for an indeterminate amount of time, so season was disregarded.

K.1 References

Progress Energy Florida, Inc. (PEF). 2009a. Letter from Garry Miller, PEF, to NRC, dated June 12, 2009, regarding Supplement 1 to Response to Request for Additional Information Regarding the Environmental Review. Accession No. ML091740487.

Progress Energy Florida, Inc. (PEF). 2009b. *Levy Nuclear Plant Units 1 and 2 COL Application, Part 3, Applicant's Environmental Report – Combined License Stage*. Revision 1, St. Petersburg, Florida. Accession No. ML092860995.

NRC FORM 335 (9-2004) NRCMD 3.7 U.S. NUCLEAR REGULATORY COMMISSION **BIBLIOGRAPHIC DATA SHEET** *(See instructions on the reverse)*	1. REPORT NUMBER (Assigned by NRC, Add Vol., Supp., Rev., and Addendum Numbers, if any.) NUREG-1941 Vol. 2
2. TITLE AND SUBTITLE Draft Environmental Impact Statement for Combined Licenses (COLs) for Levy Nuclear Plant Units 1 and 2 Draft Report for Comment	3. DATE REPORT PUBLISHED MONTH: August YEAR: 2010 4. FIN OR GRANT NUMBER
5. AUTHOR(S) See Appendix A	6. TYPE OF REPORT Technical 7. PERIOD COVERED *(Inclusive Dates)*

8. PERFORMING ORGANIZATION - NAME AND ADDRESS *(If NRC, provide Division, Office or Region, U.S. Nuclear Regulatory Commission, and mailing address; if contractor, provide name and mailing address.)*

Division of Site and Environmental Reviews
Office of New Reactors
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

9. SPONSORING ORGANIZATION - NAME AND ADDRESS *(If NRC, type "Same as above"; if contractor, provide NRC Division, Office or Region, U.S. Nuclear Regulatory Commission, and mailing address.)*

Same as above

10. SUPPLEMENTARY NOTES

Docket Nos. 52-029, 52-030

11. ABSTRACT *(200 words or less)*

This environmental impact statement (EIS) has been prepared in response to an application submitted by Progress Energy Florida (PEF) to the U.S. Nuclear Regulatory Commission (NRC) for combined licenses (COLs) for Units 1 and 2 at the proposed Levy Nuclear Plant site in Levy County, Florida. This EIS includes the review team's analysis that considers and weighs the environmental impacts of the proposed action and mitigation measures for reducing and avoiding adverse impacts

The NRC staff's preliminary recommendation to the Commission, considering the environmental aspects of the proposed action, is that the COLs be issued. The recommendation is based on (1) the COL application; (2) consultation with Federal, State, Tribal, and local agencies; (3) the review team's independent review; (4) the consideration of public scoping comments; and (5) the assessments summarized in this EIS, including the potential mitigation measures identified in PEF's Environmental Report and this EIS.

12. KEY WORDS/DESCRIPTORS *(List words or phrases that will assist researchers in locating the report.)*	13. AVAILABILITY STATEMENT
Levy Nuclear Plant, LNP Draft Environmental impact Statement, DEIS, EIS National Environmental Policy Act, NEPA, COL, combines licenses, environmental review	unlimited 14. SECURITY CLASSIFICATION *(This Page)* unclassified *(This Report)* unclassified 15. NUMBER OF PAGES 16. PRICE