# Appendix E

Applicant's Environmental Report

Subsequent Operating License Renewal Stage

St. Lucie Nuclear Plant Units 1 and 2

# Table of Contents

# List of Tables

# List of Figures

# List of Attachments

## Abbreviations, Acronyms, and Symbols

| | |
|---|---|
| § | Section |
| °C | degrees Celsius |
| °F | degrees Fahrenheit |
| AADT | average annual daily traffic |
| AC | alternating current |
| AEC | U.S. Atomic Energy Commission |
| AFWST | auxiliary feedwater storage tank |
| ALARA | as low as reasonably achievable |
| ALWR | advanced light water reactor |
| ANSI | American National Standards Institute |
| APE | area of potential effect |
| AQCR | air quality control region |
| AST | aboveground storage tank |
| AWST | aerated waste storage tank |
| BGEPA | Bald and Golden Eagle Protection Act |
| BGY | billion gallons per year |
| bls | below land surface |
| BMP | best management practice |
| BMS | boron management subsystem |
| BO | biological opinion |
| BPTF | Brazilian peppertree task force |
| BTA | best technology available |
| Btu | British thermal unit |
| C&D | construction and demolition |
| CAA | Clean Air Act |
| CDF | core damage frequency |
| CDP | census-designated place |
| CEA | control element assemblies |
| CFR | Code of Federal Regulations |
| cfs | cubic feet per second |
| CO | carbon monoxide |

| | |
|---|---|
| $CO_2$ | carbon dioxide |
| $CO_2e$ | carbon dioxide equivalent |
| CSA | combined statistical area |
| CST | condensate storage tank |
| CVCS | chemical and volume control system |
| CWA | Clean Water Act (Federal Water Pollution Control Act) |
| CWIS | cooling water intake structures |
| CZMA | Coastal Zone Management Act |
| dB | decibels |
| dBA | A-weighted decibels |
| DBA | design basis accident |
| DCH | designated critical habitat |
| DECON | dismantling and decontamination, one of three NRC decommissioning strategies |
| DOE | U.S. Department of Energy |
| DOT | U. S. Department of Transportation |
| DSM | demand-side management |
| DTA | diesel tank area |
| DW | demineralized water |
| EAB | exclusion area boundary |
| ECMP | engineering control maintenance plan |
| EFH | essential fish habitat |
| ENTOMB | permanent entombment on site, one of three NRC decommissioning strategies |
| EPA | U.S. Environmental Protection Agency |
| FLEPPC | Florida Exotic Pest Plant Council |
| EPRI | Electric Power Research Institute |
| EPU | extended power uprate |
| ER | environmental report |
| ESA | Endangered Species Act |
| EU | emissions unit |
| FAA | Federal Aviation Administration |
| FAC | Florida Administrative Code |

| | |
|---|---|
| FDEP | Florida Department of Environmental Protection |
| FDHR | Florida Division of Historical Resources |
| FDOH | Florida Department of Health |
| FDOT | Florida Department of Transportation |
| FEMA | Federal Emergency Management Agency |
| FERC | Federal Energy Regulatory Commission |
| FES | final environmental statement |
| FFWCC | Florida Fish and Wildlife Conservation Commission |
| FLEPPC | Florida Exotic Pest Plant Council |
| FMSF | Florida Master Site File |
| FNAI | Florida Natural Areas Inventory |
| FPL | Florida Power & Light |
| FPPA | Farmland Protection Policy Act |
| fps | feet per second |
| $ft^3$ | cubic feet |
| FY | fiscal year |
| GEIS | NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* |
| GHG | greenhouse gas |
| GPI | Groundwater Protection Initiative |
| gpd | gallons per day |
| gpm | gallons per minute |
| $gpm_a$ | average gallons per minute for the month |
| gpy | gallons per year |
| GWd/MTU | gigawatt-days per metric ton of uranium |
| GWMS | gaseous waste management system |
| GWPP | Groundwater Protection Program |
| HAP | hazardous air pollutant |
| HAPC | habitat areas of particular concern |
| HDPE | high density polyethylene |
| HEPA | high-efficiency particulate air |
| HIC | high integrity containers |
| HMS | highly migratory species |

| | |
|---|---|
| hp | horsepower |
| HUC | hydrologic unit code |
| I-95 | Interstate 95 |
| ICWS | intake cooling water system |
| IPA | integrated plant assessment |
| IPaC | Information for Planning and Consultation (USFWS) |
| ISFSI | independent spent fuel storage installation |
| ISLOCA | interfacing system loss of coolant accident |
| ITS | incidental take statement |
| IWFP | industrial wastewater facility permit |
| km | kilometer |
| kV | kilovolt |
| Ldn | day-night 24-hour average (noise) |
| Leq | equivalent sound pressure level |
| LERF | large early release frequency |
| LLMW | low-level mixed waste |
| LLRF | large late release frequency |
| LLRW | low-level radioactive waste |
| LOCA | loss of coolant accident |
| LOS | level of service |
| LPG | liquefied petroleum gas |
| LWMS | liquid waste management system |
| LWS | liquid waste subsystem |
| mA | milliamperes |
| MAB | maximum attainable benefit |
| mblq | short-period surface wave |
| MBTA | Migratory Bird Treaty Act |
| MDCT | mechanical draft cooling towers |
| mg/L | milligrams per liter |
| MGD | million gallons per day |
| MGM | million gallons per month |
| MGY | million gallons per year |

| | |
|---|---|
| ml | local magnitude |
| MM | modified Mercalli intensity (seismic intensity scale) |
| MMBtu | million British thermal units |
| MMPA | Marine Mammal Protection Act |
| MOV | motor-operated valves |
| mph | miles per hour |
| mrad | milliradiation |
| mrem | millirem |
| MRLC | Multi-Resolution Land Characteristics Consortium |
| MSA | metropolitan statistical area |
| MSL | mean sea level |
| mSv | millisievert |
| MW | megawatt |
| MWD/MTU | megawatt days per metric ton uranium |
| MWe | megawatts electric |
| MWh | megawatt hour |
| MWt | megawatts thermal |
| NA | not available/not applicable |
| NAAQS | national ambient air quality standards |
| NCEI | National Centers for Environmental Information |
| NCP | normal charging pump |
| NEI | Nuclear Energy Institute |
| NEPA | National Environmental Policy Act |
| NESC | National Electrical Safety Code |
| NFPA | National Fire Protection Association |
| NGCC | natural gas-fired combined-cycle |
| NGVD | National Geodetic Vertical Datum |
| NHPA | National Historic Preservation Act |
| NMFS | National Marine Fisheries Service |
| $NO_2$ | nitrogen dioxide |
| $NO_x$ | nitrogen oxides |
| NOAA | National Oceanic and Atmospheric Administration |

| | |
|---|---|
| NOV | notice of violation |
| NPDES | National Pollutant Discharge Elimination System |
| NRC | U.S. Nuclear Regulatory Commission |
| NRHP | National Register of Historic Places |
| NWI | National Wetlands Inventory |
| NWS | National Weather Service |
| ODCM | offsite dose calculation manual |
| OFW | outstanding Florida waters |
| OL | operating license |
| OSHA | Occupational Safety and Health Administration |
| Pb | lead |
| PCB | polychlorinated biphenyl |
| pCi/l | picoCuries per liter |
| PCP | process control program |
| $PM_{2.5}$ | particulate matter less than 2.5 micrometers in diameter |
| $PM_{10}$ | particulate matter less than 10 micrometers in diameter |
| PMH | probable maximum hurricane |
| PPSA | Power Plant Siting Act |
| ppt | parts per thousand |
| PRA | probabilistic risk assessment |
| PSL | St. Lucie Nuclear Plant |
| PTN | Turkey Point Nuclear Plant |
| PV | photovoltaic |
| PWR | pressurized water reactor |
| PWS | public water systems |
| R/C | residential/conservation (zoning designation) |
| RCRA | Resource Conservation and Recovery Act |
| RCS | reactor coolant system |
| rem | roentgen equivalent man |
| REMP | radiological environmental monitoring program |
| ROW | right-of-way |
| RWT | refueling water tank |

| | |
|---|---|
| SAFSTOR | safe storage, one of three NRC decommissioning strategies |
| SAMA | severe accident mitigation alternative |
| SAS | safety assessment system |
| SCA | site certification application |
| SFWMD | South Florida Water Management District |
| SHPO | state historic preservation officer |
| SLR | subsequent license renewal |
| SLRA | subsequent license renewal application |
| SMITTR | surveillance, monitoring, inspections, testing, trending, and recordkeeping |
| SMR | small modular reactor |
| SNF | spent nuclear fuel |
| $SO_2$ | sulfur dioxide |
| $SO_x$ | sulfur oxides |
| SPCC | spill prevention, control, and countermeasure |
| SPU | stretch power uprate |
| SQG | small quantity generator |
| SR | State Road |
| SRT | spent resin tank |
| SSA | sole source aquifer |
| SSCs | systems, structures, and components |
| STC | source term category |
| SWMS | solid waste management system |
| SWPPP | stormwater pollution prevention plan |
| T/U | transportation/utilities (zoning designation) |
| TEDE | total effective dose equivalent |
| THPO | tribal historic preservation office |
| TLO | turbine lube oil |
| U | utilities (zoning designation) |
| UEC | upper East Coast |
| UFSAR | updated final safety analysis report |
| UHS | ultimate heat sink |

| | |
|---|---|
| US-1 | U.S. Highway 1 |
| USACE | U.S. Army Corps of Engineers |
| USCB | U.S. Census Bureau |
| USDA | U.S. Department of Agriculture |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |
| V/C | volume to service capacity ratio |
| VOC | volatile organic compound |
| WMS | waste management system |

# 1.0 INTRODUCTION

## 1.1 Purpose of and Need for Action

The U.S. Nuclear Regulatory Commission (NRC) licenses the operation of domestic nuclear power plants in accordance with the Atomic Energy Act of 1954, as amended, and NRC implementing regulations. Florida Power & Light Company (FPL) operates St. Lucie Nuclear Plant (PSL) Units 1 and 2 pursuant to NRC operating licenses (OLs) DPR-67 and NPF-16, respectively. The renewed Unit 1 OL shall expire at midnight on March 1, 2036, and the renewed Unit 2 OL shall expire at midnight on April 6, 2043. PSL is located on the east coast of Florida, on Hutchinson Island in St. Lucie County, approximately 8 miles southeast of Fort Pierce, Florida.

FPL has prepared this environmental report (ER) in conjunction with its application to the NRC for a subsequent renewal of the PSL OLs, as provided by the following NRC regulations:

- Title 10, Energy, Code of Federal Regulations (CFR), Part 54, Requirements for Renewal of Operating Licenses for Nuclear Power Plants, Section 54.23, Contents of Application—Environmental Information [10 CFR 54.23], and
- Title 10, Energy, CFR, Part 51, Environmental Protection Requirements for Domestic Licensing and Related Regulatory Functions, Section 51.53, Postconstruction Environmental Reports, Subsection 51.53(c), Operating License Renewal Stage [10 CFR 51.53(c)]

The NRC has defined the purpose and need for the proposed action, renewal of the OLs for nuclear power plants such as PSL, as follows (NRC 2013a):

> *The purpose and need for the proposed action (issuance of a renewed license) is to provide an option that allows for baseload power generation capability beyond the term of the current nuclear power plant operating license to meet future system generating needs. Such needs may be determined by other energy-planning decision-makers, such as State, utility, and, where authorized, Federal agencies (other than the NRC). Unless there are findings in the safety review required by the Atomic Energy Act or the NEPA [National Environmental Policy Act] environmental review that would lead the NRC to reject a license renewal application, the NRC does not have a role in the energy-planning decisions of whether a particular nuclear power plant should continue to operate.*

The renewed OLs would allow an additional 20 years of operation for the PSL units beyond their current licensed operating terms. The subsequent renewed license for PSL Unit 1 would expire at midnight on March 1, 2056, and the subsequent renewed license for PSL Unit 2 would expire at midnight on April 6, 2063.

FPL has prepared Table 1.1-1 to verify conformance with regulatory requirements. Table 1.1-1 indicates the sections in the PSL subsequent license renewal (SLR) ER that respond to each requirement of 10 CFR 51.53(c) and 10 CFR 51.45.

**Table 1.1-1 Environmental Report Compliance with License Renewal Environmental Regulatory Requirements (Sheet 1 of 3)**

| Description | Requirement | ER Section(s) |
|---|---|---|
| ***Environmental Report—General Requirements [10 CFR 51.45]*** | | |
| Description of the proposed action. | 10 CFR 51.45(b) | 2.1 |
| Statement of the purposes of the proposed action. | 10 CFR 51.45(b) | 1.0 |
| Description of the environment affected. | 10 CFR 51.45(b) | 3.0 |
| Impact of the proposed action on the environment. | 10 CFR 51.45(b)(1) | 4.0 |
| Adverse environmental effects which cannot be avoided should the proposal be implemented. | 10 CFR 51.45(b)(2) | 6.3 |
| Alternatives to the proposed action. | 10 CFR 51.45(b)(3) | 2.6, 7.0, 8.0 |
| Relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity. | 10 CFR 51.45(b)(4) | 6.5 |
| Irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented. | 10 CFR 51.45(b)(5) | 6.4 |
| Analysis that considers and balances the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and alternatives available for reducing or avoiding adverse environmental effects. | 10 CFR 51.45(c) | 2.6, 4.0, 7.0, 8.0 |
| Federal permits, licenses, approvals, and other entitlements which must be obtained in connection with the proposed action and description of the status of compliance with these requirements. | 10 CFR 51.45(d) | 9.0 |
| Status of compliance with applicable environmental quality standards and requirements which have been imposed by federal, state, regional, and local agencies having responsibility for environmental protection, including, but not limited to, applicable zoning and land-use regulations, and thermal and other water pollution limitations or requirements. | 10 CFR 51.45(d) | 9.0 |
| Alternatives in the report including a discussion of whether the alternatives will comply with such applicable environmental quality standards and requirements. | 10 CFR 51.45(d) | 9.7 |
| Information submitted pursuant to 10 CFR 51.45(b) through (d) and not confined to information supporting the proposed action but also including adverse information. | 10 CFR 51.45(e) | 4.0, 6.3 |

**Table 1.1-1 Environmental Report Compliance with License Renewal Environmental Regulatory Requirements (Sheet 2 of 3)**

| Description | Requirement | ER Section(s) |
|---|---|---|
| ***Operating License Renewal Stage [10 CFR 51.53(c)]*** | | |
| Description of the proposed action including the applicant's plans to modify the facility or its administrative control procedures as described in accordance with §54.21. The report must describe in detail the affected environment around the plant, the modifications directly affecting the environment or any plant effluents, and any planned refurbishment activities. | 10 CFR 51.53(c)(2) | 2.1, 2.3, 2.4, 3.0, 4.0 |
| Analyses of the environmental impacts of the proposed action, including the impacts of refurbishment activities, if any, associated with license renewal and the impacts of operation during the renewal term, for applicable Category 2 issues, as discussed below. | 10 CFR 51.53(c)(3)(ii) | 2.3, 4.0 |
| ***Surface Water Resources*** | | |
| Surface water use conflicts (plants with cooling ponds or cooling towers using makeup water from a river). | 10 CFR 51.53(c)(3)(ii)(A) | 4.5.1 |
| ***Groundwater Resources*** | | |
| Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river). | 10 CFR 51.53(c)(3)(ii)(A) | 4.5.2 |
| Groundwater use conflicts (plants that withdraw more than 100 gallons per minute [gpm]). | 10 CFR 51.53(c)(3)(ii)(C) | 4.5.3 |
| Groundwater quality degradation (plants with cooling ponds at inland sites). | 10 CFR 51.53(c)(3)(ii)(D) | 4.5.4 |
| Radionuclides released to groundwater. | 10 CFR 51.53(c)(3)(ii)(P) | 4.5.5 |
| ***Aquatic Resources*** | | |
| Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds). | 10 CFR 51.53(c)(3)(ii)(B) | 4.6.1 |
| Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds). | 10 CFR 51.53(c)(3)(ii)(B) | 4.6.2 |
| Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river). | 10 CFR 51.53(c)(3)(ii)(A) | 4.6.3 |

**Table 1.1-1 Environmental Report Compliance with License Renewal Environmental Regulatory Requirements (Sheet 3 of 3)**

| Description | Requirement | ER Section(s) |
|---|---|---|
| ***Terrestrial Resources*** | | |
| Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river). | 10 CFR 51.53(c)(3)(ii)(A) | 4.6.4 |
| Effects on terrestrial resources (non-cooling system impacts). | 10 CFR 51.53(c)(3)(ii)(E) | 4.6.5 |
| ***Special Status Species and Habitats*** | | |
| Threatened, endangered, and protected species and essential fish habitat. | 10 CFR 51.53(c)(3)(ii)(E) | 4.6.6 |
| ***Historic and Cultural Resources*** | | |
| Historic and cultural resources. | 10 CFR 51.53(c)(3)(ii)(K) | 4.7 |
| ***Human Health*** | | |
| Microbiological hazards to the public (plants with cooling ponds or canals or cooling towers that discharge to a river). | 10 CFR 51.53(c)(3)(ii)(G) | 4.9.1 |
| Electric shock hazards. | 10 CFR 51.53(c)(3)(ii)(H) | 4.9.2 |
| ***Environmental Justice*** | | |
| Minority and low-income populations. | 10 CFR 51.53(c)(3)(ii)(N) | 3.11.2, 4.10.1 |
| ***Cumulative Impacts*** | | |
| Cumulative impacts. | 10 CFR 51.53(c)(3)(ii)(O) | 4.12 |
| ***Postulated Accidents*** | | |
| Severe accidents. | 10 CFR 51.53(c)(3)(ii)(L) | 4.15 |
| ***All Plants*** | | |
| Consideration of alternatives for reducing adverse impacts for all Category 2 license renewal issues. | 10 CFR 51.53(c)(3)(iii) | 4.0, 6.2 |
| New and significant information regarding the environmental impacts of license renewal of which the applicant is aware. | 10 CFR 51.53(c)(3)(iv) | 4.0, 5.0 |

## 1.2 Environmental Report Scope and Methodology

NRC regulations for domestic licensing of nuclear power plants require reviews of environmental impacts from renewing an OL. NRC regulation 10 CFR 51.53(c) requires that an applicant for license renewal submit with its application a separate document entitled, "Applicant's Environmental Report—Operating License Renewal Stage." In determining what information to include in the PSL SLR applicant's ER, FPL has relied on NRC regulations and the following supporting documents to provide additional insight in the regulatory requirements:

- NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), Revision 1 (NRC 2013a), and referenced information specific to transportation (NRC 1999)
- NRC supplemental information in the *Federal Register* (78 FR 37282)
- *Regulatory Analysis for Amendments to Regulations for the Environmental Review for the Renewal of Nuclear Power Plant Operating Licenses* (NRC 1996a)
- Regulatory Guide 4.2, Supplement 1, Revision 1, *Preparation of Environmental Reports for Nuclear Power Plant License Renewal Applications* (NRC 2013b)
- NUREG-1555, Revision 1, *Standard Review Plans for Environmental Reviews for Nuclear Power Plants*, Supplement 1: Operating License Renewal

The NRC included in 10 CFR Part 51 the list of 78 National Environmental Policy Act (NEPA) issues for license renewal of nuclear power plants that were identified in the 2013 GEIS (Appendix B to subpart A of 10 CFR Part 51, Table B-1). Attachment A lists the 78 issues from 10 CFR 51, Subpart A, Appendix B, Table B-1 and identifies the section in this ER in which FPL addresses each applicable issue.

## 1.3 St. Lucie Nuclear Plant Licensee and Ownership

FPL is a principal subsidiary of NextEra Energy Inc. (formerly FPL Group, Inc.). FPL is the largest electric utility in the state of Florida and one of the largest electric utilities in the United States. FPL is a Juno Beach, Florida-based utility company serving more than 10 million people through more than five million customer accounts across most of the east and lower west coasts of Florida. PSL is owned and operated by FPL, the licensee and applicant. (NEE 2019)

# 2.0 PROPOSED ACTION AND DESCRIPTION OF ALTERNATIVES

## 2.1 The Proposed Action

In accordance with 10 CFR 51.53(c)(2) a license renewal applicant's ER must contain a description of the proposed action. The proposed action is to renew for a second time, and for an additional 20-year period, the OLs for PSL Units 1 and 2, which would preserve the option for FPL to continue operating PSL and provide reliable baseload power for the proposed SLR operating term. For PSL Unit 1, the proposed action would extend the OL from March 1, 2036, to March 1, 2056. For PSL Unit 2, the proposed action would extend the OL from April 6, 2043, to April 6, 2063.

FPL does not anticipate any SLR-related refurbishment as a result of the technical and aging management program information submitted in accordance with the NRC license renewal process. The relationship of refurbishment to SLR is described in Section 2.3.

Changes to surveillance, monitoring, inspections, testing, trending, and recordkeeping (SMITTR) would be implemented as a result of the 10 CFR Part 54 aging management review for PSL. Potential SMITTR activities are described in Section 2.4. There are no plans associated with SLR to modify the facility or its administrative controls other than the procedures necessary to implement the aging management programs described in the integrated plant assessment.

## 2.2 General Plant Information

The ER must contain a description of the proposed action, including the applicant's plans to modify the facility or its administrative control procedures. This report must describe in detail the affected environment around the plant and the modifications directly affecting the environment or any plant effluents. [10 CFR 51.53(c)(2)]

PSL Units 1 and 2 are located on Hutchinson Island in St. Lucie County, Florida. As listed in Table 3.11-1, the nearest municipalities are Fort Pierce, approximately 8 miles northwest of the plant; Port St. Lucie, approximately 7 miles to the west-southwest; and Stuart, approximately 10 miles to the south. Port St. Lucie is the largest city within 50 miles of PSL Units 1 and 2. (FPL 2001, Section 2.0).

The prominent structures and housed facilities and equipment associated with each of the units include the containment building, which houses the nuclear steam supply system including the reactor, steam generators, reactor coolant pumps, and related equipment; the turbine generator building, where the turbine generator and associated main condensers are located; the auxiliary building, which houses waste management facilities, engineered safety features components, and other facilities; and the fuel-handling building, where the spent fuel storage pool and storage facilities for new fuel are located; and the FLEX equipment storage building, where

FLEX equipment is stored meet FLEX strategies for both units. Prominent features beyond the power block area include the intake canal, discharge canal, intake wells, evaporation and percolation ponds, switchyard, technical and administrative support facilities, firing range, meteorological tower, 230-kilovolt (kV) switchyard, Hutchinson Island substation, and public education facilities. The taller buildings on the site, particularly the containment buildings (approximately 200 feet high) are visible from the mainland. Four evaporation-percolation ponds on the southern portion of the site accommodate stormwater runoff. (NRC 2003, Section 2.1.1)

The turbine building for PSL is oriented parallel to State Road (SR) A1A and the shoreline of the Atlantic Ocean, with the reactor containment structure located on the east, or seaward, side of the turbine building. The reactor auxiliary building is located perpendicular and close to the turbine building, oriented in an east-west direction. The fuel handling building is located next to the reactor containment building and the reactor auxiliary building, oriented in a north-south direction. The service building is located north of the turbine building.

Figure 3.1-1 shows the general features of the facility and the exclusion area boundary (EAB). As discussed in Section 3.1.2, SR A1A traverses FPL property and the EAB in a north-south direction east of the plant restricted area. Formal arrangements are made with the state of Florida to control the traffic and activities of the public on SR A1A and on the state and federal waters and beach adjacent to the property. Recreational facilities for limited use by FPL employees and their families are located within the site boundary.

## 2.2.1 Reactor and Containment Systems

### 2.2.1.1 Reactor System

As shown in Figure 3.1-1, PSL is a two-unit (Units 1 and 2) plant. Unit 1 received an OL in March 1976. Unit 2 received an OL in April 1983. The nuclear power units for PSL Units 1 and 2 are of comparable design, each consisting of a pressurized light-water reactor with two steam generators that produce steam which turns a turbine to generate electricity (FPL 2001, Section 3.1.1). Each unit was initially licensed to operate at an output of at 2,560 megawatts thermal (MWt). FPL received license amendments approving a stretch power uprate (SPU) for PSL Units 1 and 2 in 1981 and 1985, respectively. The SPU allowed operation of the units up from 2,560 MWt to 2,700 MWt, with a corresponding gross electrical output of approximately 890 megawatts electric (MWe).

FLP received license amendments in 2012 approving an extended power uprate (EPU) for PSL, increasing the licensed thermal power level from 2,700 MWt to 3,020 MWt for each unit. This represented an increase of approximately 11.85 percent above the current licensed thermal power. (NRC 2012a; NRC 2012b). The maximum potential cold winter electrical output is approximately 1,052 MWe for Unit 1 and 1,072 MWe for Unit 2 (NRC 2012a, Section 2.3.1). For the EPU, modifications were made to both units' reactor and reactor protection system, accident mitigation systems, spent fuel storage, steam and power conversion system, condensate and feedwater systems, alternating current power block, and environmental qualifications. (NRC 2012a, Section 1.4; NRC 2012b, Section 1.4)

Each reactor is housed in a containment comprising a steel containment vessel surrounded by a reinforced concrete shield building. The dry containment structures are designed to withstand environmental effects and the internal pressure and temperature accompanying a postulated loss-of-coolant accident (LOCA). Together with its engineered safety features, each containment structure is designed to adequately retain fission products that could escape from the reactor coolant system in the event of a LOCA. (NRC 2003, Section 2.1.2)

PSL Units 1 and 2 were originally licensed for uranium-dioxide fuel enriched up to 4.5 percent by weight uranium-235. The EPU increased the maximum fuel enrichment to 4.6 percent by weight uranium-235. (NRC 2011, Section II). PSL has no plans to deviate from the maximum nominal enrichment of 5 percent U-235, as required by 10 CFR 50.68.

The uranium-dioxide fuel is in the form of pellets contained in zircaloy tubes with welded end plugs to confine radionuclides. The tubes are fabricated into assemblies designed for loading into the reactor core. Each reactor core includes 217 fuel assemblies. FPL currently replaces approximately one-third of the fuel assemblies in each reactor at an interval of approximately 18 months. (NRC 2003, Section 2.1.2)

The reactor is of the pressurized water (PWR) type using two reactor coolant loops. The reactor core is composed of 217 fuel assemblies and 87 control element assemblies (CEAs). The fuel assemblies are arranged to approximate a right circular cylinder with an equivalent diameter of 136 inches and an active length of 136.7 inches. The fuel assembly, which provides for 236 fuel rod positions, consists of five zircaloy guide tubes welded to spacer grids and is closed at the top and bottom by end fittings. The guide tubes each displace four fuel rod positions and provide channels that guide the CEAs over their entire length of travel. In selected fuel assemblies, the central guide tube houses in-core instrumentation.

The reactor coolant enters the upper section of the reactor vessel, flows downward between the reactor vessel wall and the core barrel, passes through the flow skirt where the flow distribution is equalized, and into the lower plenum. The coolant then flows upward through the core, removing heat from the fuel rods, exits from the reactor vessel, and passes through the tube side of the vertical U-tube steam generators where heat is transferred to the secondary system. The reactor coolant pumps return the coolant to the reactor vessel.

The reactor internals support and orient the fuel assemblies, control element assemblies, in-core instrumentation, and guide the reactor coolant through the reactor vessel. The reactor internals also absorb static and dynamic loads and transmit the loads to the reactor vessel flange. They will safely perform their functions during normal operating, upset, emergency, and faulted conditions. The internals are designed to safely withstand forces due to dead weight, handling, temperature and pressure differentials, flow impingement, vibration, and seismic acceleration. All reactor components are considered seismic Category I for seismic design.

Reactivity control is provided by two independent systems: the control element drive system and the chemical and volume control system (CVCS). The control element drive system controls short-term reactivity changes and is used for rapid shutdown. The CVCS compensates for long-term reactivity changes and can make the reactor subcritical without the benefit of the control element drive system. Design of the core and the reactor protective system prevents fuel damage limits from being exceeded for any single malfunction in either of the reactivity control systems.

Boric acid dissolved in the coolant is used as a neutron absorber to provide long-term reactivity control. To reduce the boric acid concentration required at beginning-of-life operating conditions, and thus reduce the initial magnitude of the moderator temperature coefficient, burnable poison rods are provided in certain fuel assemblies.

Control element assemblies are moved in groups to satisfy the requirements of shutdown, power level changes, and operational maneuvering. The control system is designed to produce power distributions that are within the acceptable limits of overall nuclear heat flux factor and departure from nucleate boiling ratio. The reactor protective system and administrative controls ensure that these limits are not exceeded.

The reactor core fuel loading and programming is designed to yield an equilibrium cycle (normal cycle) burnup of approximately 49,000 megawatt-days per metric ton of uranium (MWD/MTU) and lead rod average burnup of 62,000 MWD/MTU for an 18-month fuel cycle.

#### 2.2.1.2 Containment System

The containment structure is a steel containment vessel surrounded by a reinforced concrete shield building. The two structures are separated by an annular air space. The containment vessel is a low-leakage cylindrical steel shell with hemispherical dome and ellipsoidal bottom. The vessel is designed to contain the radioactive material that could be released from a loss of integrity of the reactor coolant pressure boundary. The shield building is a medium-leakage concrete structure which protects the containment vessel from external missiles, provides biological shielding, and provides a means of controlling radioactive fission products that leak from the containment should an accident occur.

The containment vessel is a low-leakage steel shell, including all its penetrations, designed to withstand a postulated design basis accident (DBA) and to confine the radioactive materials that could be released by accidental loss of integrity of the reactor coolant pressure boundary. Physically, the containment vessel is a right circular cylinder (2 inches thick), with hemispherical dome (1 inch thick) and ellipsoidal bottom (2 inches thick) which houses the reactor pressure vessel, the reactor coolant piping and pumps, the steam generators, the primary coolant pressurizer and pressurizer quench tank, and other branch connections of the reactor coolant system, including the safety injection tanks. The containment vessel penetrations include a construction hatch, a maintenance hatch, and a personnel air lock, an escape lock and various sized penetration nozzles. The containment vessel is enclosed by the reinforced concrete shield building.

The shield building is a reinforced concrete structure of right cylinder configuration with a shallow dome roof surrounding the containment vessel. An annular space of 4 feet minimum is provided between the containment vessel and the interior face of the concrete shield building to permit construction operations and periodic visual inspection of the steel containment vessel.

The shield building has a height of 230.5 feet measured from the top of foundation base to the top of the dome. The structure consists of a cylinder wall measuring 200 feet from the base to the springline of the dome with an inside diameter of 148 feet. The cylinder wall is 3 feet thick except for two different thickness, i.e., 5 feet and 8 feet, in the area 15 feet from the bottom of the wall. The dome consists of 2.5 feet thick concrete with an inside radius of 112 feet.

### 2.2.2 Maintenance, Inspection, and Refueling Activities

Various programs and activities at the site maintain, inspect, test, and monitor the performance of plant equipment and are detailed throughout the updated final safety analysis reports (UFSARs) for both units. These programs and activities include, but are not limited to, those implemented to achieve the following:

- Meet the requirements of 10 CFR Part 50, Appendix B (Quality Assurance).
- Meet the requirements of 10 CFR 50.55a Codes and Standards, which invoke the American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section XI, In-service Inspection and Testing Requirements.
- Meet the requirements of 10 CFR 50.65, the maintenance rule.
- Maintain water chemistry in accordance with Electric Power Research Institute (EPRI) guidelines.

Additional programs include those implemented to meet technical specification surveillance requirements; those implemented in response to NRC generic communications; and various periodic maintenance, testing, and inspection procedures necessary to manage the effects of aging on structures and components.

Maintenance activities conducted at PSL include inspection, testing, and surveillance to maintain the current licensing basis of the plant and ensure compliance with environmental and safety requirements. Certain activities can be performed while the reactor is operating. Others require that the plant be shut down. Long-term outages are scheduled for refueling and for certain types of repairs or maintenance, such as replacement of a major component. FPL refuels each of the PSL nuclear units on an 18-month schedule, resulting in at least one refueling every year and two refuelings every third year. (NRC 2003, Section 2.1.6)

### 2.2.3 Cooling and Auxiliary Water Systems

PSL Units 1 and 2 use once-through cooling water from the Atlantic Ocean to remove heat from the main (turbine) condensers via the circulating water system, and to remove heat from other auxiliary equipment via the intake cooling water system (i.e., auxiliary cooling water system).

The great majority of this cooling water is used for the circulating water system. (FPL 2001, Section 3.1.3.2)

Heat generated in the reactors is transferred so useful energy is extracted to produce electricity. PSL Units 1 and 2 have a two-loop, three-stage heat transfer design. The primary system circulates reactor coolant (demineralized water treated to control chemistry and corrosion) under high pressure through the reactor and two steam generators. The steam generators, steam turbine, and main turbine condensers are connected in a secondary closed loop containing treated demineralized water. Secondary system water flashes to steam in the steam generators, and the steam turns the turbine to generate electricity. After exiting the turbine, the steam in the secondary system passes through the main condensers, where it is cooled to liquid water before returning to the steam generator to complete the secondary loop. (FPL 2001, Section 3.1.3.2). The typical water balance at PSL is shown in Figure 2.2-1.

#### 2.2.3.1 Circulating Water System

PSL draws water from and discharges to Atlantic Ocean via offshore intake and discharge structures. PSL is also equipped with an emergency cooling water intake that can withdraw water from the Indian River lagoon via Big Mud Creek, but this pathway is closed during normal operation. (FPL 2001, Section 2.2)

The circulating water system is the final (tertiary) stage in this heat-transfer system. The tertiary stage is unconfined. Water is drawn through three offshore ocean intake structures into the intake canal. This water is then pumped from the intake canal at the intake wells through the main condensers to the discharge canal. The heated water is finally discharged back to the Atlantic Ocean through offshore diffusers. Water circulation in the system is provided by eight pumps (four per unit) located at the intake wells. Intake wells are illustrated in Figure 2.2-2. Nominal total capacity of the pumps is 968,000 gpm, though capacity may range from 800,000 gpm to 1,120,000 gpm, depending on condenser cleanliness. When all pumps are operating and both units are operating at 100 percent capacity, temperature rise across the condensers is about 24 degrees Fahrenheit (°F). (FPL 2001, Section 3.1.3.2)

The three cooling water intake structures for PSL Units 1 and 2 are located about 1,200 feet offshore, where the water is approximately 23 feet deep. Two of the structures were installed before the startup of Unit 1 in 1976. The third intake structure is larger than the initial two and was installed in 1983. The designs of the structures are essentially identical, featuring a large concrete base with a vertical cylindrical opening in the center and a concrete velocity cap supported by columns extending about 6 feet from the base. The velocity cap configuration was designed to reduce impingement of marine organisms by converting vertical flow into horizontal flow at the intake. The design takes into account that fish are able to detect and avoid a horizontal velocity, but not a vertical velocity. The location of the velocity caps at mid-depth also helps reduce entrainment, based on data demonstrating that plankton densities are much lower at mid-depth than at the ocean surface. Water withdrawn from the structures is conveyed to the intake canal through separate pipes buried beneath the beach and dune system. The inside diameters of the pipes, which correspond to those of the vertical cylindrical openings in the concrete bases of the structures, are 16 feet for the large intake and 12 feet for the two smaller intakes. (FPL 2001, Section 3.1.3.2)

The intake pipes are buried for the entire length of their runs, with approximately 25 feet of cover under the natural dunes, 12 feet of cover in the surf zone, and at least 5 feet of cover for the remainder of their ocean run. This buried installation prevents interferences with littoral processes. Each pipe has a velocity cap to minimize fish entrapment. There is about 8 feet of water above each cap and the velocity of intake water is about a half foot per second (fps). Flow velocities vary within the intake system.

The intake pipes are located approximately 2,400 feet south of the discharge pipe. They are buried from the intake points for a distance of about 1,600 feet beneath the ocean bottom and under the beach, terminating in a canal on the west side of the sand dunes. After passing through the inlet pipes, the circulating water is conveyed in a canal for approximately 5,000 feet to the plant intake structure.

Two mesh barrier nets, one net of 5-inch mesh and the other of 8-inch mesh, and one rigid barrier located sequentially in the intake canal reduce the potential loss of large marine organisms, primarily sea turtles. Water passes through a trash rack made of 3-inch spaced vertical bars and a 3/8-inch mesh traveling screen, against which marine organisms that have passed through the nets are impinged, and into eight separate intake wells (four per unit), where it is pumped to a circulating-water system and an auxiliary cooling water system at each unit. Marine life that passes through the screens becomes entrained in the water that passes through the plant and is subject to thermal and mechanical stresses. (NRC 2011, Section II)

The intake canal, a 4,920-foot long trapezoidal channel about 180 feet wide and 30 feet deep at normal water levels, conveys cooling water to the intake wells during normal operation (FPL 2001, Section 3.1.3.2). As discussed in Section 3.6.1, PSL personnel assess the need for dredging periodically.

Water is withdrawn from the intake canal at eight separate intake wells (four per unit). Water enters the wells through a series of trash racks (vertical bars spaced 3 inches apart), then through traveling screens (3/8-inch mesh), which are periodically backwashed. The water is then pumped from the wells through the main turbine condensers. Heated water is discharged to the discharge canal. Biofouling of the condenser tubes and other system components is controlled by using plastic foam balls (Taprogge® system) and injecting a biocide solution. The foam balls are injected upstream from the condenser, scrub the condenser tubes as they pass through the tubes, and are collected in ball strainers downstream from the condensers. PSL uses best management practices (BMPs) to minimize ball loss to the environment. Biocide (chlorine) injections are controlled to ensure that free available oxidant is at or below 0.5 milligrams per liter (mg/L) at the condenser outlet and total residual oxidant concentration at the eastern end of the discharge canal is at or below 0.10 mg/L, as required by the industrial wastewater facility permit (IWFP) for PSL Units 1 and 2. (FPL 2001, Section 3.1.3.2)

The four circulating water pumps are each sized to provide 25 percent of the cooling water flow for the turbine condenser. The pumps are sized for the maximum condenser heat load and provide sufficient head to overcome system frictional losses. The dimensions of the intake bays are designed to give a low velocity profile through the traveling screens and to provide sufficient submergence for the pump required net positive suction head. The circulating water, screen, wash, and intake pumps are arranged in each bay to eliminate the adverse effects of vortices and to provide flow path and suction velocities to each pump. Three of the four bays contain intake cooling water pumps and two bays contain screen wash pumps.

The discharge canal is about 2,200 feet long with transverse dimensions similar to those described for the intake canal. The canal transports the heated cooling water to two discharge pipes at its eastern terminus. The pipes transport water beneath the beach and dune system back to the Atlantic Ocean. One pipe, completed in 1975 to serve PSL Unit 1, is 12 feet in diameter, extends about 1,500 feet offshore, and terminates in a two-port "Y" diffuser. The second pipe, installed in 1981 for two-unit operation, is about 16 feet in diameter, extends about 3,400 feet offshore, and features a multiport diffuser. This diffuser consists of 16-inch diameter ports located 24 feet apart on the easternmost 1,400 feet of the pipe. The discharge of heated water through the Y-port and multiport diffusers ensure distribution over a wide area and rapid and efficient mixing with ambient waters. Modeling studies presented by the U.S. Atomic Energy Commission (AEC) and the NRC in the operating stage final environmental statements (FESs) indicate that under typical conditions, the areas of the thermal plumes to the 2°F isotherm (above ambient) from the PSL Units 1 and 2 diffusers would be approximately 180 acres and 75 acres, respectively. (FPL 2001, Section 3.1.3.2)

The biocide solution is mixed with the water coming into the intake structure to control biofouling. The solution in the circulating and intake cooling water systems is added in regulated quantities so the residual oxidant at the terminus of the discharge canal will not exceed the limits as defined in applicable plant permits. As the biocide solution is mixed with the water coming into the intake structure in regulated quantities, adverse corrosive effects are not expected.

The temperature of the discharged cooling water is limited by the IWFP for PSL Units 1 and 2. These limits require that heated water from the diffusers, as measured near the exit from the discharge canal, does not exceed 115°F or 30°F above ambient during normal operations. A maximum temperature of 117°F or 32°F above ambient is permitted during certain maintenance operations, when throttling circulating water pumps to minimize use of chlorine and when cleaning the circulating water system. The discharge of heated water through the diffusers on the discharge pipes ensures distribution over a wide area and rapid and efficient mixing with ocean water. (FPL 2001, Section 3.1.3.2)

The Florida Department of Environmental Protection (FDEP) regulates Florida surface water quality standards through an IWFP, which also establishes the maximum area subject to temperature increase (mixing zone), maximum discharge temperatures, and chemical monitoring requirements. As part of the EPU, the FDEP issued the plant a permit modification to the IWFP for a 2°F temperature increase of the heated water discharge temperature limit—from 113°F before the EPU to the proposed thermal discharge limit of 115°F—to accommodate the 3°F actual discharge temperature increase. PSL conducted a thermal discharge study for the EPU-related increase in discharge water temperature that predicts an increase in the extent of the thermal plume (mixing zone). The ambient water affected by the absolute temperature increase beyond the existing mixing zone would be less than 25 feet vertically or horizontally for the two-port Y diffuser and less than 6 feet in any direction for the multiport diffuser. (NRC 2011, Section II)

The circulating water system is designed to provide a heat sink for the main condenser under normal operating and shutdown conditions. The system serves as the primary source of water for the ultimate heat sink. The plan view of PSL's circulating water system is shown in Figure 2.2-3.

Under emergency conditions (e.g., failure of the intake canal headwall as a result of a design-basis earthquake), water can be withdrawn from Big Mud Creek via the emergency intake canal through two 54-inch pipe assemblies in the barrier wall that separates the creek from the canal. PSL does not use this intake during normal operations, but does test this system semi-annually by exercising the valves in the two pipe inlets. (FPL 2001, Section 3.1.3.2)

### 2.2.3.2 Component Cooling Water System

The component cooling system removes heat from the various auxiliary systems. Corrosion-inhibited demineralized water is circulated by the system through all components of the nuclear steam supply system that require cooling water. During reactor shutdown, component cooling water is also circulated through the shutdown heat exchangers. The component cooling system provides an intermediate barrier between the reactor coolant system and the intake cooling water system.

The component cooling water system is a closed loop cooling water system that utilizes demineralized water and a corrosion inhibitor to cool various components. The component cooling water system consists of two heat exchangers, three pumps, one surge tank, a chemical addition tank, and associated piping, valves, and instrumentation.

The component cooling water system is capable of providing sufficient cooling capacity to cool reactor coolant system and auxiliary systems components with two pumps and one heat exchanger in operation, although during normal operation, flow is established through both heat exchangers. Two pumps and two heat exchangers are used during normal plant shutdown; however, if only one heat exchanger is available, the cooldown rate is decreased, but plant safety is not jeopardized.

### 2.2.3.3 Intake Cooling Water System

The intake cooling water system (ICWS) for PSL Units 1 and 2 is also a once-through cooling system, but uses much less water than the circulating water systems. Up to 58,000 gpm of ocean cooling water is pumped from the intake canal using intake cooling water pumps. This non-contact cooling water is pumped through heat exchangers to provide cooling for a wide variety of plant equipment and is discharged to the discharge canal. Low-level chlorination is used to control biofouling in this system. (FPL 2001, Section 3.1.3.2)

The ICWS consists of three pumps and the associated piping and valves. The system removes heat from the component cooling heat exchangers, the turbine cooling heat exchangers, and the steam generator open blowdown heat exchangers, and discharges it to the condenser discharge canal. Intake cooling water from the intake structure flows through basket strainers located at the inlets of the component cooling, turbine cooling and steam generator open blowdown heat exchangers, passes through the tube side of the exchangers, and flows to the discharge canal.

#### 2.2.3.4 Ultimate Heat Sink

Two independent water sources and their associated canals and conduit comprise the ultimate heat sink (UHS) for the plant. The primary source of water is the Atlantic Ocean, which together with the ocean intake structure, intake canal, and intake structure bay area constitute the primary source of shutdown cooling water. The secondary source of cooling water is Big Mud Creek, which is connected to the Atlantic Ocean through the Indian River. This source utilizes an emergency intake canal connecting Big Mud Creek with the intake bay area in front of the intake structure. Regardless of source, the shutdown cooling water is discharged into the discharge canal just south of the discharge seal well. The water then flows through the discharge canal to the Atlantic Ocean via discharge pipes.

The Indian River is connected via inlets to the ocean at Fort Pierce to the north and at the St. Lucie River to the south. Big Mud Creek is a natural body of water extending easterly from the Indian River just north of the plant site. A 125-foot wide by 12-foot deep channel was dredged during construction from Big Mud Creek across the east side of the Indian River to the channel of the Intracoastal Waterway. The Intracoastal Waterway is a 12-foot deep channel running north-south in the Indian River.

The intake bay in front of the intake structure is separated from Big Mud Creek by a barrier wall which is placed in the UHS canal 200 feet from its intersection with the intake canal. The barrier maintains separation between the primary and secondary sources of UHS cooling water during normal plant operation. Two 54-inch butterfly valves control flow through the UHS barrier. The valves are constructed from aluminum bronze alloy which retards the growth of marine organisms.

PSL withdraws a small amount of water from Indian River lagoon through Big Mud Creek on a quarterly basis when the ultimate heat sink valves are opened during quarterly testing. Yearly total flows are typically less than 500,000 gallons total, which includes four quarterly surveillances of two ultimate heat sink valves. PSL is permitted to withdraw a maximum of 4,000,000 gallons per year from Big Mud Creek (a portion of the Indian River) for testing the alternate cooling systems (Attachment B).

#### 2.2.3.5 Thermal Effluent Dispersion

Subsequent to EPU, FPL modified the National Pollutant Discharge Elimination System (NPDES) permit for PSL to address the increase in maximum heated water temperature at the point of discharge for Outfall D-001 from 113°F to 115°F. The upper 1 percent intake water temperature is estimated to be 86.3°F.

FPL performed a thermal discharge study to study the impact of EPU. The difference in the extent of the thermal plume attributable to the increase in discharge temperature from 113°F to 115° F is relatively small. For the Y-nozzle diffuser, the increase ranges from about 2,000 cubic feet at the highest temperature (111°F) to about 1,000 cubic feet at the lowest temperature (96°F). For the multiport diffuser, the range is on the order of 50 cubic feet at 111°F to 350 cubic feet at 96°F. The heated water exiting the diffusers at 115°F would be cooled down to 96°F within about 12.5 seconds. The potential decrease in dissolved oxygen concentration due to the increase in discharge temperature is on the order of about 0.01 mg/L.

The change in the thermal discharge increased the temperature of a small volume of the Atlantic Ocean water column in the near vicinity of the PSL discharge. The thermal discharge is expected to quickly mix with the ocean waters and is expected to interact with the bottom sediments in a similar manner as the permitted discharge; the heated water will float as it mixes. Fish and other motile marine organisms are able to avoid heated discharges by swimming away from their source. Fish have also been observed to be attracted to heated discharges without measurable harm.

#### 2.2.3.6 Municipal Water Supply System

PSL Units 1 and 2 use a combined total of approximately 4 million gallons per month (MGM) (0.13 million gallons per day [MGD]) of fresh water from the Fort Pierce municipal water supply system (FPL 2001, Section 3.1.3.3). This water is stored in two 500,000 gallons water storage tanks.

This water supply provides the raw water source for the plant water treatment facility, which provides demineralized water for makeup to various plant systems, including the primary and secondary reactor cooling loops and the spent fuel pool. Municipal water also supplies the potable, sanitary, and fire protection systems. (FPL 2001, Section 3.1.3.3)

#### 2.2.3.7 Fire Protection System

The fire protection program is based on NRC requirements, Nuclear Electric Insurance Limited property loss prevention standards, and related industry standards. With regard to NRC criteria, the fire protection program meets the requirements of 10 CFR 50.48(c), which endorses, with exceptions, the National Fire Protection Association's (NFPA's) 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants" – 2001 Edition. PSL has further used the guidance of NEI 04-02, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program under 10 CFR 50.48(c)" as endorsed by

Regulatory Guide 1.205, "Risk-Informed, Performance Fire Protection for Existing Light-Water Nuclear Power Plants."

PSL transitioned the existing fire protection program to a risk-informed, performance-based program based on NFPA 805, in accordance with 10 CFR 50.48(c).

As discussed in Section 2.2.3.6, municipal water from the city of Fort Pierce is utilized for the fire protection system, domestic water system, and the makeup water system.

### 2.2.4 Meteorological Monitoring Program

The onsite meteorological monitoring program was designed to provide a meteorological database for use in safety planning of radioactive effluent releases and as a means of determining the appropriately conservative meteorological variables to be used in estimating the potential consequences of hypothetical accidents. Analysis of collected meteorological data permits an assessment of the diffusion parameters characteristic of the site. The PSL meteorological monitoring system including the instrumentation package meets the criteria of NRC Regulatory Guide 1.23.

A 196-foot (60-meter) framed meteorological tower is located onsite 2,400 feet north of the reactor complex. It is situated in an area of relatively flat terrain characterized by mangrove trees 20 to 25 feet in height. The trees are maintained by a site environmental procedure to negate any possible influence on the lower level sensors of the meteorological tower. The meteorological tower location is illustrated in Figure 3.1-1.

The meteorological variables monitored include wind speed, wind direction, temperature difference with height (Delta-T), ambient temperature, and precipitation. The meteorological variables monitored at the PSL site are listed in Table 2.2-1.

<u>Wind Speed and Direction</u>

Two combination wind speed and direction sensors at 32.8 feet (10 meters) and 190 feet (57.9 meters) are solid-state ultrasonic instruments capable of measuring wind speed and direction in the U and V axes. Sonic pulses are generated at the transducers and received by opposing transducers. Mathematics derived for these sonic pulses provide a wind velocity measurement in each of the corresponding axes. A microprocessor-based, electronic measurement system is used to control the sample rate and compute wind speed and wind direction.

<u>Air Temperature</u>

Air temperature is measured by two resistance temperature detector sensors at 32.8 feet (10 meters) and by two RTD sensors at 190 feet (57.9 meters). An additional sensor at 110.3 feet (33.5 meters) is measured for differential temperature calculations should either the 10-meter or 57.9-meter levels fail. Differential temperature is calculated by subtracting the 10-meter temperature from the 57.9-meter temperature multiplied by 50/47.9 to obtain an accurate 50-meter temperature delta. The ambient air temperature and differential temperature monitoring systems consist of two sets of sensors resulting in a redundant monitoring system, which ensures a high level of data recovery.

Precipitation Gauge

The precipitation sensor is a tipping bucket rain gauge with a 7.9-inch orifice. This type of sensor funnels rain into a small receptacle which tilts when it has received 0.01 inch of rain and activates a reed switch on every tilt. Each switch closure is recorded by the datalogger pulse channel. The sensor includes a siphoning mechanism that allows the rain to flow at a steady rate regardless of rainfall intensity. The siphon reduces typical rain bucket errors and produces accurate measurements over a range of 0 to 27.6 inches per hour.

Data Acquisition

The data acquisition equipment is at the onsite meteorological tower. The data output of the sensing equipment is routed to a local recording station located at the base of the meteorological tower and to the Unit 1 control room via a very high frequency radio.

Equipment in the Unit 1 control room meteorological cabinets processes, displays and records the data, including:

a) Wind direction at the 10- and 57.9-meter levels
b) Wind speed at the 10- and 57.9-meter levels
c) Ambient temperature at the 10- and 57.9-meter levels
d) Ambient air differential temperature between the 10- and 57.9-meter levels

Additional parameters are relayed to and displayed/recorded in the PSL Unit 1 control room meteorological cabinet from the discharge canal site via very high frequency radio, and from the intake canal structure via hardwiring. These parameters are discharge canal water level and temperature and intake canal water temperatures.

There is a fiber optic input from the meteorological cabinet in the PSL Unit 1 control room to the safety assessment system (SAS). The SAS consoles in both Units 1 and 2 displays provide six data points of meteorological information: wind direction, wind speed, and ambient air temperature, all at both the 10- and 57.9-meter levels. This information, as displayed on the Unit 2 SAS console, affords compliance with NRC Regulatory Guide 1.97, and enables the control room operators to estimate atmospheric stability for release assessment.

The six parameters are recorded on a digital recorder. The range for wind speed is 0–111.8 miles per hour (mph). The range for wind direction is 0–540° to eliminate full scale wiping. The differential ambient air temperature recorder has a ± 15°F range. The ambient air temperature recorders are 0–120°F minimum.

Based on the previous 5 years (2015–2019), the meteorological data recovery rate at the PSL has been greater than 90 percent (FPL 2016a; FPL 2017a; FPL 2018a; FPL 2019a; FPL 2020a). Meteorology and air quality at PSL are discussed in detail in Section 3.3.

### 2.2.5 Power Transmission System

#### 2.2.5.1 In-Scope Transmission Lines

As required by 10 CFR Part 51, Table B-1, footnote 4, and NRC Regulatory Guide 4.2 (NRC 2013b, Section 2.2), transmission lines subject to evaluation of environmental impacts for license renewal are those that connect the nuclear power plant to the switchyard where electricity is fed into the regional power distribution system and power lines that feed the plant from the grid during outages.

In-scope transmission lines at PSL are defined as:

- The overhead 230-kV transmission line, which connects the plant (PSL Units 1 and 2 power block main transformers) to the first substation of the regional electric power grid (PSL switchyard).
- The overhead 230-kV transmission line, which provides power from the grid (PSL switchyard) to the plant electrical system to feed the plant during outages (start-up transformers 1A and 2A [Units 1 and 2 "A" train power] and start-up transformers 1B and 2B [Units 1 and 2 "B" train power]).

All in-scope transmission lines are located completely within the PSL site boundary, as shown in Figure 2.2-4.

The in-scope transmission lines from PSL Units 1 and 2 main transformers and Units 1 and 2 start-up transformers to the switchyard operate at a nominal 230 kV. All four of the in-scope transmission lines from the PSL Units 1 and 2 power block start-up transformers to the PSL switchyard (start-up transformer lines "A," start-up transformer lines "B," Unit 1 main transformer lines, and Unit 2 main transformer lines are aboveground (overhead).

A six-bay 230-kV (nominal) switchyard provides switching capability for two main generator outputs, four startup transformers, four outgoing transmission lines, and one distribution substation.

The preferred source of auxiliary alternating current (AC) power for plant startup and shutdown is from the incoming offsite transmission lines, through the plant switchyard and startup transformers. The startup transformers step down the 230-kV incoming line voltage to 6.9 kV and 4.16 kV for auxiliary system use. During plant operation, AC power is provided from the main generator through the unit auxiliary transformers.

Preferred (offsite) power from the start-up transformers, or from the unit auxiliary transformers is distributed by two 6.9-kV buses and by two 4.16-kV buses. The 6.9-kV buses serve only motors rated above 4,000 horsepower (hp); the 4.16-kV buses supply motors rated from 250 to 4,000 hp, as well as all remaining motors and other loads through 4,160 480-volt load centers and motor control centers. Power is also distributed from the two 4.16-kV buses to the safety related 4.16-kV buses, which supply all safety related loads. Transfer of the 6.9-kV or 4.16-kV auxiliary buses between the unit auxiliary and startup transformers is initiated by the operator from the control room.

#### 2.2.5.2 Vegetation Management Practices

The in-scope transmission lines are within PSL site boundary as shown in Figure 2.2-4. The transmission lines cross the PSL industrial area, where vegetation is sparse and need minimal vegetation management.

FPL maintains the transmission right-of-way using a combination of trimming, mowing, and herbicide application. When required, FPL trims trees at a height of 14 feet to maintain clearances below the conductors. Tree trimming is typically needed only at midspan. In open areas, FPL usually follows a 5-year mowing cycle. Herbicides are used both for spot treatment of individual trees and occasionally as broadcast applications to control exotic grasses. FPL uses only non-restricted-use herbicides, which are applied under the supervision of licensed pesticide applicators. (NRC 2003, Section 2.1.7)

#### 2.2.5.3 Avian Protection

Threatened and endangered species potentially occurring near PSL, or within counties occurring in a 6-mile radius of PSL, are described in Section 3.7.7. PSL's interaction with birds is addressed in accordance with the site environmental protection program.

#### 2.2.5.4 Public

All in-scope transmission lines are located completely within FPL owned property. Therefore, the public does not have access to this area and, as a result, no induced shock hazards exist for the public.

#### 2.2.5.5 Plant Workers

The GEIS suggests that occupational safety and health hazard issues are generic to all types of electrical generating stations, including nuclear power plants, and are of small significance if the workers adhere to safety standards and use protective equipment (NRC 2013a, Section 3.9.5.1).

PSL maintains the safety-specific policies for all work conducted at electrical transmission locations. FPL's Rigging and Material Handling Procedure MA-AA-212-1000 addresses the precautions when working around overhead energized lines on the PSL site. PSL Switchyard Access/Work Control Procedure ADM-16.01 controls activities using cranes and vehicle clearances within the switchyard and perimeter.

### 2.2.6 Radioactive Waste Management System

The waste management system (WMS) is designed to collect, monitor, and process all liquid, gaseous and solid radioactive wastes originating from plant operation. The principal design objective is to protect plant personnel, the general public and the environment by assuring that all releases of radioactive materials both in plant and to the environs are in accordance with the regulations of 10 CFR Parts 20 and 50. To best accomplish this objective, functions are divided, with solids, liquids, and gases handled separately. Thus, the WMS consists of three subsystems. The liquid wastes are handled via the liquid waste management system (LWMS), the gaseous wastes are handled via the gaseous waste management system (GWMS), and the solid wastes are handled via the solid waste management system (SWMS).

A general design objective is to provide an ability to monitor, control and treat all potentially radioactive plant liquid and gaseous effluents to assure that their particulate and dissolved content complies not only with federal standards, but also with state and local air and water quality standards where applicable. The WMSs are designed to reduce operator radiation exposure to as low as is reasonably achievable (ALARA).

The offsite dose calculation manual (ODCM) for PSL describes the methods used for calculating the concentration of radioactive material in the environment and the estimated potential offsite doses associated with liquid and gaseous effluents from PSL. The ODCM also specifies controls for release of liquid and gaseous effluents to ensure compliance with the NRC regulations. (NRC 2003, Section 2.1.4). The quantity of liquid and gaseous releases and the amount of solid radioactive waste shipped from PSL are reported in the annual radioactive effluent release report.

Fuel assemblies that have exhausted a certain percentage of their fuel and are removed from the reactor core for disposal contain spent fuel. The spent fuel is currently stored onsite in the spent fuel pool in the fuel handling building or in dry cask storage containers at the onsite independent spent fuel storage installation (ISFSI). (NRC 2003, Section 2.1.4). As noted in Table 9.1-1, the ISFSI is operated under a general license as allowed under 10 CFR Part 72 Subpart K.

FPL's waste management policy is to maintain radioactive waste effluent at the lowest practical level. In keeping with this policy, the radioactive waste disposal system is designed, to the extent possible in accordance with maintenance practices, to maintain releases of radioactive material and radiation exposures to unrestricted areas as far below the limits of 10 CFR Part 20 as is practical. Normally, no radioactive waste stream will be discharged from the station without having first been processed through the waste disposal system.

#### 2.2.6.1 Liquid Waste Processing Systems

Liquid wastes produced in the plant are collected and processed by the LWMS by two major systems: boron management subsystem (BMS) and the liquid waste subsystem (LWS). The liquid waste influents to the LWMS are segregated by chemistry department and/or probable source activity for more efficient processing. LWMS is a shared system (one complete system on each unit which may, under certain conditions, be used by the other unit).

BMS processes water from the reactor coolant system that will be recycled in the plant. LWS processes liquid waste from outside of containment, such as process water from equipment drains, floor drains, laboratory drains, decontamination drains, building sumps, and laundry wastes. (NRC 2003, Section 2.1.4.1)

The reactor coolant wastes, which are of potentially high activity, are collected from the chemical and volume control system and from valve and equipment leakage from containment drains and are placed in holdup tanks. The holdup tanks provide storage until there is an appropriate volume for batch processing. Storage allows for decay of the short-lived radionuclides. Degasification that occurs during storage is monitored by the plant vent monitors. The holdup tanks are sampled and processed until the contents meet the criteria for discharge. Before the controlled discharge of the treated liquid waste, the fluid is analyzed to determine that the activity is acceptably low for discharge. Discharged liquids pass through an effluent radiation monitor that records the release activity level and automatically terminates the release upon high radiation to the circulating water discharge. If the liquid is to be reused in the plant, it is analyzed for acceptability of both chemistry and activity. (NRC 2003, Section 2.1.4.1)

The ODCM provides the control statements, limits, action statements, and surveillance requirements for ensuring that the liquid effluents released to unrestricted areas or the site boundary will be maintained within the requirements of 10 CFR Part 20, 40 CFR Part 190, 10 CFR 50.36(a), and 10 CFR Part 50, Appendix I. The ODCM also contains the calculation of the liquid effluent monitoring alarm/trip setpoints. The alarm/trip setpoint for each liquid effluent monitor is based on the measurements of radioactivity in a batch of liquid to be released or in the continuous liquid discharge. (NRC 2003, Section 2.1.4.1)

Boron Management Subsystem

Those wastes resulting from CVCS operations enter the LWMS via the CVCS letdown line to the holdup tanks. If RCS activity is above a pre-established threshold or if the nitrogen blanket in the holdup tanks is lost, reactor coolant system (RCS) inventory is directed to the flash tank for processing. The flash tank uses a countercurrent flow of nitrogen to remove hydrogen and fission gases from the liquid. The gases are vented to the gaseous waste management system. This precludes the buildup of combustible gases within the flash tank and downstream components. A nitrogen overpressure is maintained within the flash tank, when in use, and the downstream hold up tanks to prevent air in-leakage. Thus, the possibility of forming a potentially explosive mixture within these tanks is precluded. The de-gasified liquid waste is pumped from the flash tank, using the flash tank pumps to the holdup tanks where it is stored prior to further processing. In this way the radioactivity of the stored liquid is significantly reduced by natural decay of the short-lived radionuclides.

Those wastes resulting from valve and equipment leakage and those which enter the various containment drains, are collected in the reactor drain tank. When the liquid in the reactor drain tank reaches a high level, an alarm is annunciated and the reactor drain tank pumps are manually started to transfer the reactor drain tank contents to the holdup tanks, when RCS activity is low. With high RCS activity, reactor drain tank inventory is directed to the flash tank. This waste is handled in a similar fashion to letdown waste. A nitrogen overpressure is maintained in the reactor drain tank.

Liquid wastes stored in the holdup tank are then thoroughly mixed using the holdup tank recirculation loop. The loop consists of the holdup tanks, the holdup recirculation pump, a pre-concentrator filter, and pre-concentrator ion exchangers. Pre-concentrator ion exchangers normally contain mixed bed resin. As permitted by engineering evaluation, pre-concentrator ion exchangers may contain an overlay of specialty resin to target removal of fine particulates and/or specific ionic species. The recirculation loop components remove suspended solids and insure a uniform fluid chemistry within the holdup tank. The holdup tank contents are sampled, to determine what further processing, if any, is required. Depending on the results of the sample analysis, the contents may be transferred to the Unit 1 holdup tanks for discharge or to the refueling water tank (RWT) for reuse. The liquid in the holdup tanks could be used, if available, as flushing water during resin sluicing operations for the pre-concentrator ion exchanger and the spent resin tank. However, primary makeup water is normally used for this operation in accordance with plant procedures.

Liquid Waste Subsystem

Liquid waste from sources outside of containment, usually of low activity and low purity, are collected in either the equipment drain tank, chemical drain tank, or laundry drain tanks. Prior to processing, the contents of these tanks are thoroughly mixed via recirculation, and representative samples are taken. The samples are analyzed to determine what, if any, processing is required for that liquid.

The equipment drain tank receives wastes from the various equipment drains outside containment. When the tank reaches a preset level, it is emptied via the equipment drain pumps. The waste liquid is normally aligned to the Unit 1 aerated waste storage tank (AWST). However, the waste can be manually aligned to the waste condensate tanks.

The chemical drain tank receives liquid waste inputs from the lab drains and decontamination area drains, which are normally high in impurities. The chemical drain tank is emptied upon reaching a preset level, by the chemical drain pump. The waste liquid is normally aligned to the Unit 1 AWST. However, the waste can be manually aligned to the waste condensate tanks.

The laundry drain tanks store the influents from the plant showers, contaminated sinks, laundry operations, and potential inputs from the steam generator blowdown system. When a laundry drain tank reaches a preset level, it is emptied by a laundry drain tank pump, filtered via the laundry filter, and then sent to the Unit 2 AWST for processing.

Piping connections exist for the equipment drain tank, chemical drain tank, and laundry drain tank to release their contents from the plant via the circulating water discharge.

During liquid processing by the BMS and LWS, radioactivity is removed so that the bulk of the liquid is restored to usable quality which is either recycled in the plant or discharged. The radioactivity removed from the liquids is concentrated in filters and ion exchange resin. These concentrated wastes may be shipped to an approved offsite disposal location or released from the site as part of liquid effluent following appropriate dilution. If the water is to be recycled back to the reactor, it must meet the purity requirements for reactor coolant. If the liquid does not meet the reactor coolant purity requirements, it is discharged. The activity of any released effluent must be consistent with the discharge criteria of 10 CFR Part 20 and Appendix I to 10 CFR Part 50. The BMS and WMS are capable of monitoring radioactive liquid discharge from the systems to ensure that activity concentrations do not exceed predetermined limits. The control valves on the discharge lines automatically close to terminate the discharge once the radiation monitor exceeds an acceptable level.

The LWMS components are either vented to the gas collection header or the gas surge header. A nitrogen overpressure is maintained in the reactor drain tank, flash tank, and holdup tanks. This prevents air in-leakage and provides a dilutant for the hydrogen which may diffuse out of the water they contain, thus precluding the formation of potentially explosive gas mixtures.

EPU implementation did not significantly increase the inventory of liquid normally processed by the LWMS. This is because the system functions were not changing, and the volume inputs remain the same. The EPU resulted in an increase in the equilibrium radioactivity in the reactor coolant (12.2 percent), which in turn would impact the concentrations of radioactive nuclides in the waste disposal systems. However, since the composition of the radioactive material in the waste and the volume of radioactive material processed through the LWMS do not significantly change, the current design and operation of the radioactive liquid waste system accommodates the effects of the EPU. Therefore, it was concluded that the impact from the EPU on the management of radioactive liquid effluents is not significant. (NRC 2011, Section II)

PSL does not anticipate any increase in liquid waste releases beyond normal operations, during the proposed SLR operating term.

#### 2.2.6.2 Gaseous Waste Disposal System

The radioactive gaseous system manages radioactive gases generated during the nuclear fission process and is part of the gaseous waste management system. Radioactive gaseous wastes are principally activation gases and fission product radioactive noble gases resulting from process operations, including continuous cleanup of the reactor coolant system, gases used for tank cover gas, and gases collected during venting. (NRC 2011, Section II)

The gaseous waste systems for PSL Units 1 and 2 process the vent gases from equipment located in the CVCS, WMS, and fuel pool system. Gaseous releases come from the reactor auxiliary building ventilation, turbine system leakage, steam jet air ejector operation, gland steam condenser operation, and containment purging in addition to releases from the gas collection header and gas surge header. The GWMS is designed to protect workers and the public as well as meet the requirements in 10 CFR Part 20 and 10 CFR Part 50, Appendix I.

Gases handled by the gaseous waste system may be compressed and stored in the gas decay tanks or may be released to the plant vent if the activity is sufficiently low. After decay, the gas in the waste gas decay tanks is sampled to ensure that the radioactivity levels are within acceptable limits for release. The monitored gaseous release points are the containment building purge, the reactor auxiliary building, the fuel-handling building, and the turbine generator building. (NRC 2003, Section 2.1.4.2)

The gas collection header receives low activity gases containing oxygen from aerated tanks and components. These gases are then directed to the plant vent for monitoring and discharge. The containment vent header collects potentially radioactive waste gases from the reactor drain tank and the quench tank. The gas surge header collects the radioactive gases with negligible oxygen content from the flash tank, the containment vent header, the volume control tank, and both of the gas analyzer discharges.

Gases from the gas header flow into the gas surge tank where they are collected. The gas can remain in the gas surge tank until the pressure builds to a point which actuates a single waste gas compressor or aligned to the plant vent for monitoring and discharge. For waste gas holdup operation, the waste gas compressor feeds a preselected gas decay tank until the pressure in the gas surge tank drops to a point where the waste gas compressor stops. A second waste gas compressor starts if the pressure in the gas surge tank increases above a certain level. This automatic operation of the waste gas compressors continue until a gas decay tank is observed to approach its upper operating pressure. At this point another gas decay tank is manually lined up to receive the waste gas compressor's discharge, and the first tank is isolated. The just-filled gas decay tank is analyzed by the gas analyzer for oxygen content.

The gas analyzer package is provided to monitor oxygen concentrations in various plant components where potentially explosive mixtures could develop. The auto gas analyzer can be aligned to sample and is normally selected to continuously monitor a single sample point. A second continuous oxygen analyzer is incorporated into the GWMS. The continuous oxygen analyzer is located on the gas surge tank influent line. The combination of the auto gas analyzer and the continuous oxygen analyzer provides a degree of redundant monitoring of the GWMS.

EPU implementation did not significantly increase the inventory of carrier gases normally processed by the GWMS. This is because the system functions were not changing, and the volume inputs remain the same. The EPU resulted in an increase (a bounding maximum of 13.2 percent for all noble gases, particulates, radioiodines, and tritium) in the equilibrium radioactivity in the reactor coolant, which in turn would impact the concentrations of radioactive nuclides in the waste disposal systems and radioactive gases released from the plant. However, because the composition of the radioactive material in the waste and the volume of radioactive material processed through the GWMS do not significantly change, the current design and operation of the GWMS accommodates the effects of the EPU. Therefore, the impact from the EPU on the management of radioactive gaseous effluents was not significant. (NRC 2011, Section II)

PSL does not anticipate any increase in gaseous waste releases beyond normal operations during the proposed SLR operating term.

#### 2.2.6.3 Solid Radwaste System

The solid wastes from PSL Units 1 and 2 consist of concentrated liquid sludge, spent resin, spent filter cartridges, solid non-compactible and compactible trash, and miscellaneous materials from station and radwaste facility operation and maintenance. The SWMS collects, controls, processes, packages, and temporarily stores solid radioactive waste and certain liquid radioactive waste generated as a result of normal plant operations. Concentrated liquid sludge is segregated by type, flushed to storage tanks, slurried into an appropriate container, and stored onsite before shipment offsite for disposal. Spent resins are sluiced into the spent resin tank or shipping container and dewatered; filters are moved into shipping containers. Compressible waste is compacted if possible or shipped offsite to a reduction facility for processing. Non-compressible waste is packaged in boxes or bags. All of these wastes are packaged and shipped offsite to an appropriate disposal or processing system. (NRC 2003, Section 2.1.4.3)

Exhausted resins from ion exchangers in the CVCS, the LWMS, and the fuel pool purification system are sluiced to the spent resin tank. After storage for decay, the resins are transferred to a shipping container for dewatering operations by the portable dewatering system.

The PSL plant site process control program (PCP) implements the requirements of 10 CFR 50.36(a) and General Design Criterion 60 of Appendix A to 10 CFR Part 50. Specifically, the PCP applies to waste form classification of radioactive waste destined for land burial in accordance with 10 CFR Part 20, dewatering of bead resins for disposal, and vendor-supplied processes for solidification, encapsulation, or absorption of liquid radioactive waste.

To transport the filled liner to interim storage within the low-level waste storage facility and/or an offsite disposal facility, the containers and the transport vehicle are monitored for loose surface radioactivity and decontaminated as required for offsite shipment. The radioactive content of the containers is determined, and additional packaging used, if necessary, to allow shipment and burial in accordance with 49 CFR Parts 170-179, 10 CFR Part 20, 10 CFR Part 71, and other state regulations.

The SWMS consists of an installed portion and a portable resin dewatering system. The installed system consists of a spent resin tank to receive ion exchanger resins and is provided with pressure and level instrumentation, connections to a shipping container, the vent gas header collection header, primary makeup water system, holdup tanks, and emergency core cooling system sump. Resin from the CVCS, fuel pool, and liquid waste ion exchanger is transferred into this tank for temporary storage prior to dewatering operations by the portable dewatering system from the shipping container.

Portable Shielding

Portable shielding may be used to reduce the radiation exposure to operating and maintenance personnel to ALARA in accordance with 10 CFR Part 20 and NRC Regulatory Guide 8.8. The shields are placed in position with the lifting equipment.

Filter Transfer Cask

A top-loading filter transfer cask is provided to safely transport spent filter elements from the bottom-loaded filter housing to the filter drumming area. The filter transfer cask is mounted on an electric-powered transfer vehicle and is equipped with a movable shield to reduce the radiation exposure to maintenance personnel during filter removal.

Containers for Waste

The containers used for shipment include dry waste containers and disposable liners. If necessary, these containers can be placed in shielded transportation casks for interim storage within the low-level waste storage facility and/or for offsite shipment. The quantity of radioactivity shipped will determine if shielding is required and the strength of the shielding cask or overpack (i.e., low specific activity, Type A, or Type B). The containers used for shipment are in compliance with 49 CFR Parts 170-179, 10 CFR Part 20, 10 CFR Part 71, and other state regulations.

Dry Waste Processing

Dry wastes which become contaminated with radioactivity are collected throughout the plant. The solid disposable wastes are collected, stored in containers, and prepared for interim storage within the low-level waste storage facility and/or for shipment offsite. The containers are stored in the onsite low-level waste storage facility. After sufficient containers have accumulated for a shipment, the containers are shipped offsite to a disposal facility. Spent filter cartridges are transferred to the filter transfer cask.

Handling and packaging of large waste material (e.g., core components, high-efficiency particulate air [HEPA] filters, and activated charcoal or equipment which become activated during reactor operation) will be handled using qualified personnel with appropriate radiation protection measures. Since each such item handled would have unique requirements, the personnel, procedures, and packaging are determined for each case separately.

EPU implementation did not significant affect the volume of radioactive solid waste generated by the primary reactor coolant and secondary side systems, which is normally processed by the SWMS. This is because the system functions did not change and the volume inputs remained the same. Therefore, the impact from the EPU on the management of radioactive solid waste was not significant. (NRC 2011, Section II)

PSL does not anticipate any increase in solid waste releases beyond normal operations during the proposed SLR operating term.

##### *2.2.6.3.1 Spent Resin Handling Operations*

Every effort is made to minimize the amount of spent resin generated. Segregation of lower activity resins from higher activity resins is also performed when possible to reduce the costs of disposal.

Items taken into consideration in the management of spent resins include the following:

- Plant demineralization vessels are not loaded with resin unless the demineralizer is required to be in use.
- Resin beds are completely depleted before being sluiced for disposal.
- When possible, low activity resins are processed for directed release ("Green Is Clean" processing) when applicable.
- When possible, lower activity vendor-supplied waste liquid processing system resins are segregated from spent resin sluice tanks.
- Spent resin from in-plant demineralizer vessels are sluiced to and stored in spent resin tanks (SRTs). The Radiation Protection/Radwaste Department or other designated departments operate the resin transfer system, which moves resins from the SRTs to high integrity containers (HICs) that are shipped for disposal. SRT levels and spent resin inventory are tracked by the Radiation Protection/Radwaste Department for purposes of radwaste accrual.

##### *2.2.6.3.2 Ultimate Disposal Operations*

All packages containing radioactive non-fissionable material, and the procedures used to prepare these for offsite shipment, are in accordance with U. S. Department of Transportation (DOT) regulations. All shipments are made in accordance with state, NRC, and DOT regulations, and appropriate PSL and FPL fleet procedures. The Radiation Protection/Radwaste Department verifies that the receiving facility is authorized to receive radioactive waste and to conduct surveys in support of shipment. As discussed earlier, the quantity of radioactive waste shipped from PSL is reported in the annual monitoring report in accordance with the ODCM.

#### 2.2.6.4 Low-Level Radioactive Waste

Low-level radioactive waste (LLRW) is classified as Class A, Class B, or Class C (minor volumes are classified as greater than Class C). Class A includes both dry active waste and processed waste (e.g., dewatered resins). Classes B and C normally include processed waste and irradiated hardware. PSL ships Class A, Class B, and Class C waste offsite to a licensed disposal facility (Energy Solutions and Waste Control Specialists).

In 2019, low-level Class A waste was shipped to the Energy Solution's facility in Oak Ridge, Tennessee (FPL 2020a, Section 2.6). Currently, PSL has greater than Class C waste (spent filters) stored onsite in low level radwaste storage facility and radiation control area yard. Disposal of greater-than-Class-C waste is the responsibility of the federal government.

#### 2.2.6.5 Low-Level Mixed Waste

Low-level mixed waste (LLMW) is radioactive waste that contains or consists of waste constituents that the U.S. Environmental Protection Agency (EPA) lists as hazardous waste. Therefore, any mixed waste is under regulatory requirements of the NRC and EPA. Every effort is made to minimize or eliminate mixed waste generation through product substitution and process modification, when possible.

PSL does not have any mixed waste in storage and has not generated any mixed waste in the last 10 years.

### 2.2.7 Nonradioactive Waste Management System

The Resource Conservation and Recovery Act (RCRA) governs the disposal of solid waste. Solid and hazardous wastes in Florida are regulated and administered by the FDEP (FDEP 2021a). PSL generates nonradioactive waste as a result of plant maintenance, cleaning, and operational processes that occur at the site. Nonradioactive waste commonly generated at PSL includes used oil, used batteries, spent mercury-containing lightbulbs, hazardous chemicals, oily absorbents, used anti-freeze, used oil filters, spent capacitors, spent light ballasts, spent aerosol cans, and solid and liquid polychlorinated biphenyls (PCBs).

Various nonradioactive wastewater management and disposal activities are conducted at PSL. They include once-through cooling water, steam generator blowdown, liquid radiation waste, intake screen wash wastewater, and stormwater associated with industrial activity. PSL Units 1 and 2 cooling water and auxiliary equipment cooling water is treated by chlorination with biofouling control and by using sodium molybdate, sodium nitrite, and tolytriazole. Equipment area stormwater is routed through an oil/water separator prior to discharge to the stormwater basins and then to the intake canal through the southeast basin. Non-industrial stormwater and intake screen wash water are discharged without treatment. (Attachment B)

After the appropriate treatment processes, wastewater streams are discharged to Atlantic Ocean and monitored and regulated according to NPDES permit. (Attachment B) Permit information is provided in Table 9.1-1.

PSL Units 1 and 2 were originally licensed to use a septic tank and associated leaching fields for treatment and disposal of onsite sewage. The flow of groundwater is predominately to the east towards the Atlantic Ocean. Because of the inherent problems with septic systems, PSL anticipated tying into the municipal sewage facilities when a sewer line was installed on the island. Since September 1997, upon completion of St. Lucie County's South Hutchinson Island water reclamation facility, site sanitary wastewater has been discharged to the St. Lucie County system for treatment. (NRC 2003, Section 2.1.5)

The PSL Hazardous Material and Waste Program provides stepwise guidance for handling, transporting, record-keeping, managing, and reporting of hazardous and non-hazardous waste. This procedure also summarizes the regulatory provisions and BMPs based on current understanding of the applicable laws, regulations, and FPL's current business practices. PSL is classified by the EPA and FDEP as a conditionally exempt small quantity generator (SQG) of hazardous waste . This means that fewer than 2,200 pounds of any type of hazardous waste are accumulated at any time (FDEP 2021a).

PSL maintains a log of approved waste vendors currently used to manage and dispose of hazardous, nonhazardous, and recyclable waste generated at PSL. Triumvirate Environmental Veolia North America, LLC, is utilized for disposal of hazardous and nonhazardous waste; GFL Environmental Inc. is utilized to dispose of hazardous, flammable, corrosive, and toxic chemicals; and Heritage Crystal Clean is utilized for oil, oily absorbents, oil filters, and used anti-freeze. Nonradioactive hazardous and nonhazardous waste type and quantities over the most recent 5 years are provided in Table 2.2-2.

For most hazardous waste records, regulations require that records be retained for at least 3 years from the date the hazardous waste, for which the record pertains, was last shipped offsite.

**Table 2.2-1 Meteorological Parameters Monitored at PSL**

| Parameter (elevation level) | Height |
|---|---|
| Wind Speed | 10 meters, 57.9 meters |
| Wind Direction | 10 meters, 57.9 meters |
| Vertical Temperature Difference | 10 meters, 33.5 meters, 57.9 meters |
| Ambient Air Temperature | 10 meters, 33.5 meters, 57.9 meters |
| Precipitation | Surface |

**Table 2.2-2 Nonradioactive Waste Quantities at PSL**

| Year | Hazardous Waste | Non-Hazardous Waste |
|---|---|---|
| 2015 | 1,250 pounds | 2,716 pounds |
| 2016 | 1,793 pounds | 1,775 pounds |
| 2017 | 400 pounds | 200 pounds |
| 2018 | 1,970 pounds | 4,696 pounds |
| 2019 | 880 pounds | 1,000 pounds |

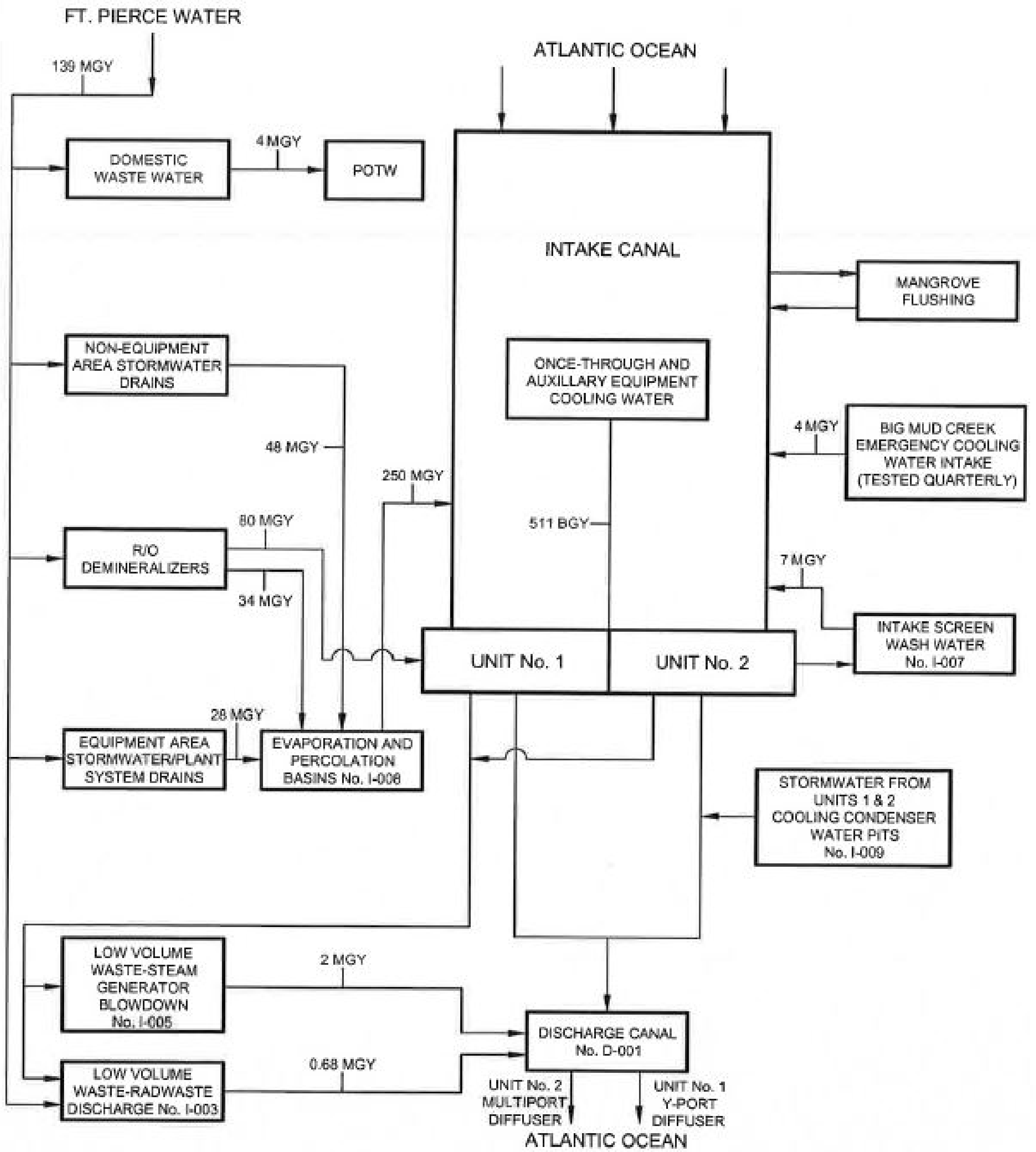



**Figure 2.2-1 PSL Typical Water Balance**

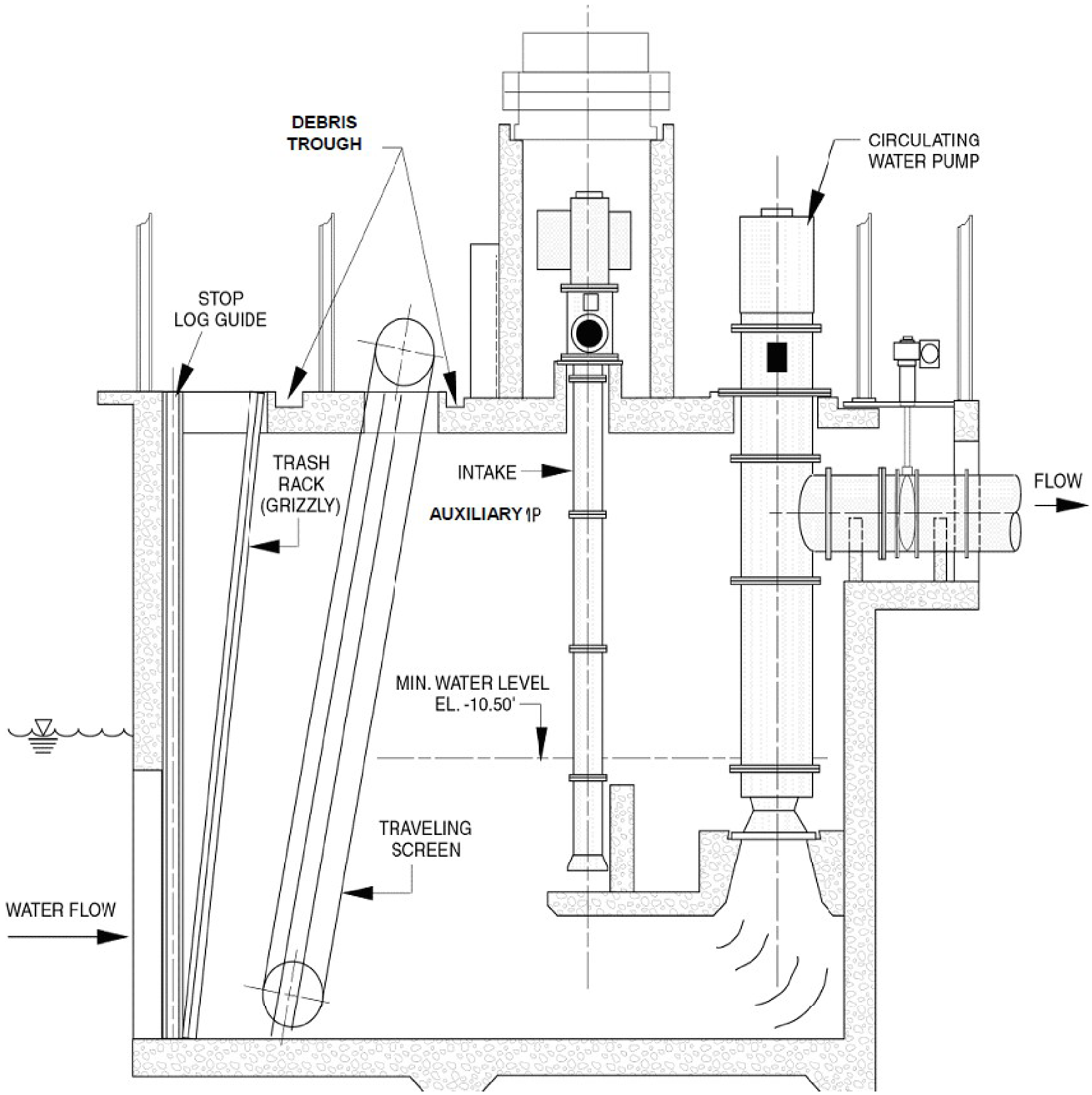



**Figure 2.2-2 PSL Intake Well**

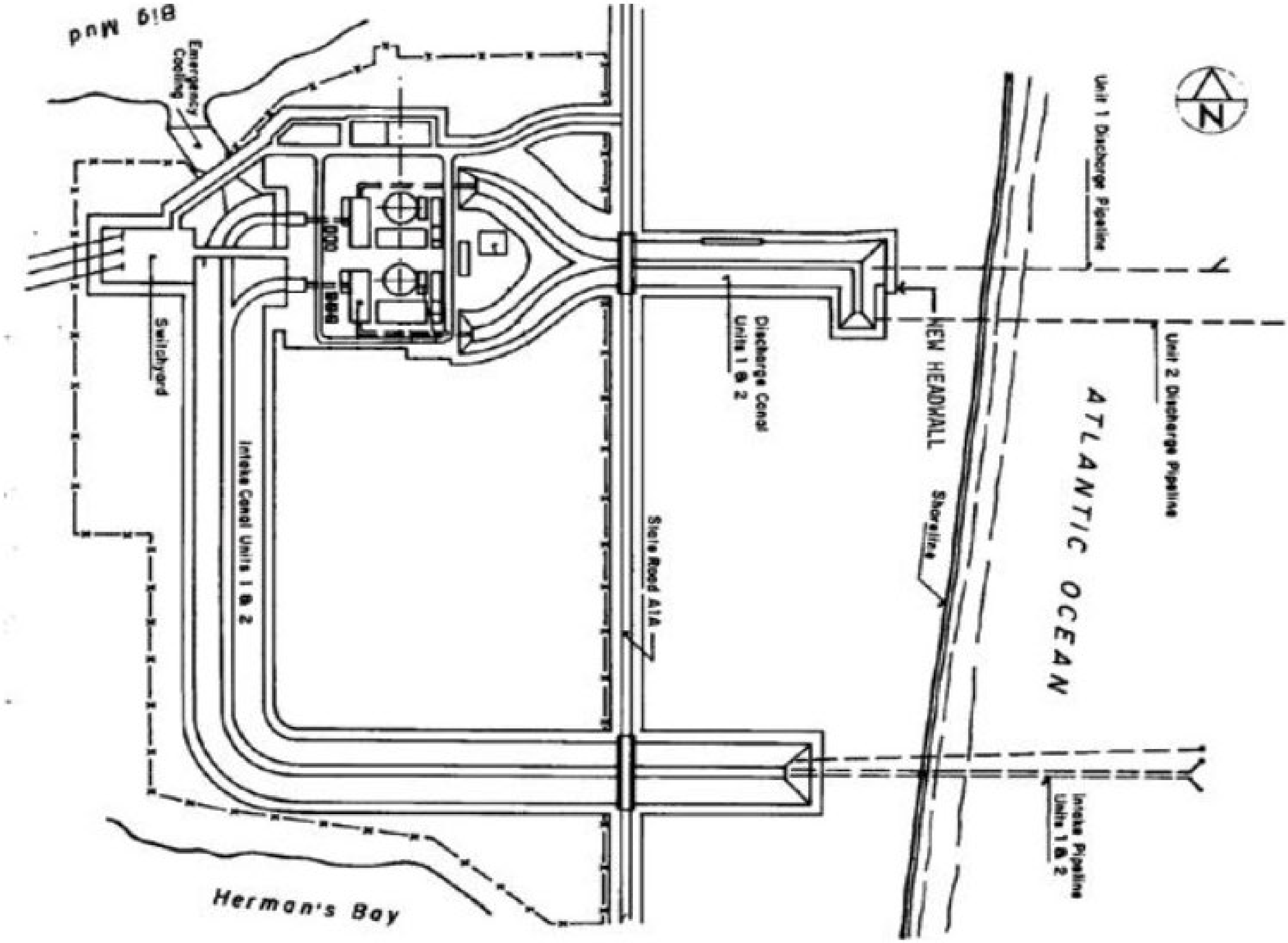



**Figure 2.2-3 PSL Circulating Water System—Plan View**

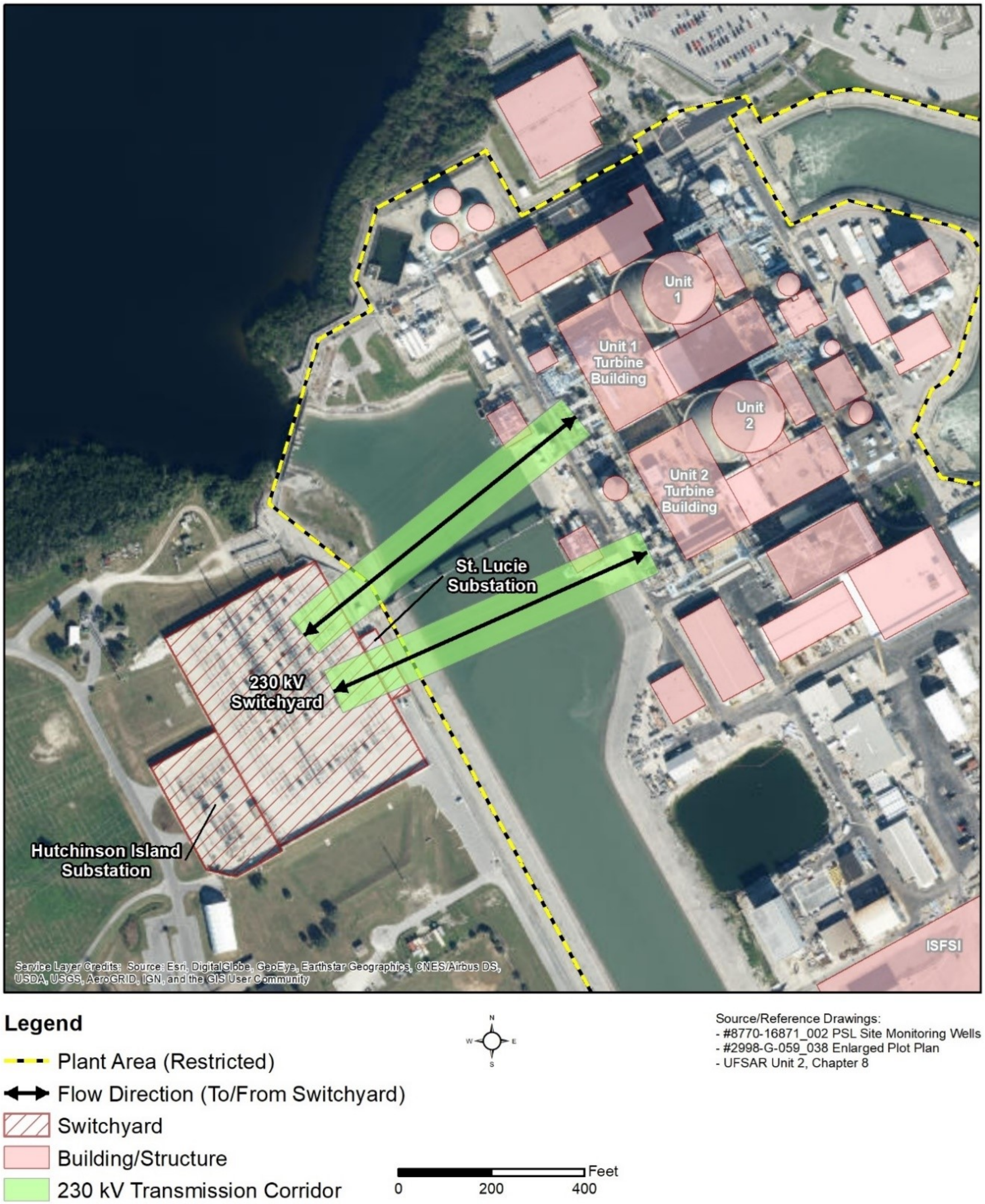



**Figure 2.2-4 In-Scope Transmission Lines**

## 2.3 Refurbishment Activities

In accordance with 10 CFR 51.53(c)(2), a license renewal applicant's ER must contain a description of the applicant's plan to modify the facility or its administrative control procedures as described in accordance with §54.21. If license renewal-related refurbishment is planned at a facility, the applicant's ER would include analysis for environmental impacts of the proposed refurbishment activity. [10 CFR 51.53(c)(3)(ii)].

The incremental aging management activities implemented to allow operation of a nuclear power plant during a renewal term are assumed to fall under one of two broad categories. One of these categories involves refurbishment actions, which usually occur infrequently and possibly only once in the life of the plant for any given item. The other category is SMITTR actions, which by their nature are frequent and repeated at regular intervals and schedules as indicated in plant procedures. (NRC 2013a, Section 2.1.1)

NRC requirements for the renewal of OLs for nuclear power plants include preparation of an integrated plant assessment (IPA) [10 CFR 54.21]. The IPA must identify systems, structures, and components (SSCs) subject to an aging management review. The objective of the IPA is to determine whether the detrimental effects of aging could preclude certain SSCs from performing in accordance with the current licensing basis during the additional 20 years of operation requested in the subsequent license renewal application (SLRA). An example of an SSC subject to aging is the reactor vessel.

The IPA that FPL conducted for PSL under 10 CFR Part 54 is described in the body of the SLRA. FPL identified no SLR-related refurbishment or replacement actions needed to maintain the functionality of SSCs, consistent with the current licensing basis, during the proposed SLR term.

## 2.4 Programs and Activities for Managing the Effects of Aging

In accordance with 10 CFR 51.53(c)(2), a subsequent license renewal applicant's ER must contain a description of the applicant's plans to modify the facility or its administrative control procedures as described in accordance with §54.21.

The programs for managing the effects of aging on certain structures and components within the scope of SLR at the site are described in the body of the SLRA (see Appendix B of the PSL SLRA). The evaluation of structures and components required by 10 CFR 54.21 identified the activities necessary to manage the effects of aging on structures and components during the proposed SLR operating term.

## 2.5 Employment

The non-outage workforce at the PSL site consists of approximately 804 employees, including 508 FPL workers and an additional 296 supplemental staff who support plant operations. Overall plant staffing levels have been reduced over time due to increased efficiencies in PSL operations, including the implementation of an electronic work package and the restructuring and elimination of management and administrative staff. There are no plans to add additional permanent employees to support plant operations during the proposed SLR operating term, and as noted in Section 2.3, no SLR-related refurbishment activities have been identified. Neither are there plans to add additional permanent operational staff to support SMITTR activities during the proposed SLR operating term.

During refueling outages, which usually last approximately 32 days per unit, there are typically an additional 1,500 contract employees onsite. Refueling and maintenance outages for the two PSL units are on an 18-month cycle, with one unit scheduled for the spring and the other for the fall.

**Table 2.5-1 PSL Permanent Employee Residence Information, October 2020 (Sheet 1 of 2)**

| State | County | City/Town | Regular Full-Time Employees |
|---|---|---|---|
| Florida (503) | Brevard (6) | Melbourne | 1 |
| | | Melbourne Beach | 2 |
| | | Palm Bay | 3 |
| | Citrus (1) | Crystal River | 1 |
| | Clay (1) | Green Cove Springs | 1 |
| | Indian River (74) | Fellsmere | 4 |
| | | Sebastian | 10 |
| | | Vero Beach | 60 |
| | Lake (1) | Clermont | 1 |
| | Martin (172) | Hobe Sound | 7 |
| | | Jensen Beach | 67 |
| | | Palm City | 48 |
| | | Port St. Lucie | 13 |
| | | Sewalls Point | 1 |
| | | Stuart | 36 |
| | Miami-Dade (3) | Miami | 2 |
| | | Miami Lakes | 1 |
| | Okeechobee (4) | Okeechobee | 4 |
| | Palm Beach (15) | Jupiter | 8 |
| | | Palm Beach Gardens | 4 |
| | | West Palm Beach | 3 |
| | Pinellas (1) | Dunedin | 1 |
| | Polk (1) | Lakeland | 1 |
| | St. Johns (1) | Saint Augustine | 1 |
| | St. Lucie (223) | Fort Pierce | 62 |
| | | Port St. Lucie | 161 |

**Table 2.5-1 PSL Permanent Employee Residence Information, October 2020 (Sheet 2 of 2)**

| State | County | City/Town | Regular Full-Time Employees |
|---|---|---|---|
| Illinois (1) | Grundy (1) | Morris | 1 |
| Iowa (1) | Linn (1) | Marion | 1 |
| Louisiana (1) | East Baton Rouge (1) | Zachary | 1 |
| North Carolina (1) | Iredell (1) | Mooresville | 1 |
| Tennessee (1) | Putnam (1) | Monterey | 1 |
| | | **Total** | **508** |

Note: PSL employee place of residence information is for FPL permanent staffing and does not included a breakdown for supplemental staff which are comprised of non-outage contract employees, nor temporary refueling outage workers. Settlement patterns for supplemental staff generally follow the county settlement patterns indicated by permanent PSL staff.

## 2.6 Alternatives to the Proposed Action

The proposed action as described in Section 2.1 is for the NRC to subsequently renew the PSL OLs for an additional 20 years. Because the NRC decision is to renew or not renew the existing PSL OLs, the only fundamental alternative to the proposed action is the no-action alternative, which would result in the NRC not renewing the PSL OLs. Because PSL provides a significant block of long-term baseload capacity, it is reasonable to assume that the decision not to renew the PSL licenses would involve replacement of its 1,968 MWe of generation. FPL has considered a range of replacement power alternatives from which to select the alternatives to be further analyzed for replacement of PSL baseload power generation.

### 2.6.1 Alternatives Evaluation Process

FPL developed the following set of evaluation criteria to review PSL replacement alternatives:

- The purpose of the proposed action is to provide an option for the continued generation of 1,968 MWe of baseload power beyond PSL's current license term to meet future system generating needs.
- Alternatives evaluated in this ER would need to provide baseload generation.
- Alternatives considered must be fully operational by 2036 when Unit 1's current license expires, considering development of the technology, permitting, construction of the facilities, and connection to the grid.
- Alternatives must be utility-scale electricity-generating sources that are technically feasible and commercially viable.

### 2.6.2 Alternatives Considered

FPL considered a range of alternatives considered in the GEIS in light of the need to meet the criteria.

The following generation sources were selected as replacement alternatives for consideration based on capability or potential to provide reliable baseload power:

- Nuclear
    - Licensed but not built Turkey Point Units 6 & 7, advanced light water reactors with mechanical draft cooling towers located at the Turkey Point site in Miami-Dade County, Florida.
    - Small modular nuclear reactors with mechanical draft cooling towers located at FPL's existing Martin site in Martin County, Florida.
- Natural Gas-fired
    - Combined cycle units with mechanical draft cooling towers located at FPL's existing Martin site in Martin County, Florida.

- Solar
    - Solar installations with battery storage within the FPL service territory.

The alternatives selected for consideration as replacement baseload generation alternatives are presented in Section 7.2.1.

FPL determined the following alternatives were not considered reasonable replacements in comparison to renewal of the PSL OLs:

- Power purchases
- Plant reactivation or extended service life
- Conservation
- Wind
- Geothermal
- Hydropower
- Biomass
- Fuel cells
- Wave and current energy
- Petroleum-fired plants
- Coal-fired plants

The alternatives not selected as reliable baseload generation for replacing the PSL generation are presented in Section 7.2.2.

# 3.0 AFFECTED ENVIRONMENT

PSL Units 1 and 2 are located on the widest section of Hutchinson Island, in St. Lucie County, Florida. PSL is bordered by the Atlantic Ocean to the east and the Indian River Lagoon, a tidally influenced estuary, to the west. Plant property associated with the site boundary comprises approximately 1,132 acres. (FDEP 2020a; FPL 2007; NRC 2012c)

## 3.1 Location and Features

PSL is located in unincorporated southeast St. Lucie County, Florida. Fort Pierce and Port St. Lucie are the only incorporated municipalities with areas that fall within 5 miles of the plant (FDEP 2020a). The coordinates for PSL Unit 1 are latitude 27° 20' 58" north and longitude 80° 14' 48" west. PSL Unit 2 is located at latitude 27° 20' 55" north and longitude 80° 14' 47" west. Figure 3.1-1 shows the PSL site boundary, facility structures, switchyard, and the EAB. Topographic features adjacent to PSL and within the site boundary are shown in Figure 3.1-2.

### 3.1.1 Vicinity and Region

The vicinity of PSL is defined as the area within a 6-mile radius of a center point established equidistant between the Unit 1 and Unit 2 containment structures. As seen in Figure 3.1-3 and Figure 3.1-5, along with the Atlantic Ocean and Indian River Lagoon, the PSL vicinity primarily falls within coastal St. Lucie County and a small portion of Martin County. Because of population size and interaction between urban areas, Martin County and St. Lucie County have been designated the Port St. Lucie metropolitan statistical area (MSA), which is included in the Miami-Port St. Lucie-Fort Lauderdale combined statistical area (CSA). (USCB 2020a). Within the vicinity of PSL on Hutchinson Island and along the Florida mainland coast (west of Indian River Lagoon and State Road 707), St. Lucie County is a populated mix of residential, commercial, and industrial area developments, interspersed with wetlands, managed preserves, and natural areas dedicated to a variety of purposes (see Section 3.2). In terms of population, Martin County's estimated population in 2019 was 161,000, which is an increase from 146,318 in 2010 and 126,731 in 2000 (see Table 3.11-2). St. Lucie County's population has also increased in size over the same time period, with an estimated 328,297 persons in 2019, an increase from 277,789 in 2010 and 192,695 in 2000. (USCB 2021a).

Table 3.11-1 provides a list of communities located within a 50-mile radius of PSL. Port St. Lucie is the largest populated city in St. Lucie County and the city center is located approximately 7 miles west-southwest of PSL. The city of Port St. Lucie had an estimated population of 189,396 in 2019, an increase from 164,603 persons in 2010 and 88,769 in 2000. The county seat for St. Lucie County is the city of Fort Pierce, located approximately 8 miles northwest of PSL (SLC 2021a; USCB 2021b). In 2019, the estimated population for Fort Pierce was 45,329, which was an increase from 2010 (41,590 persons) and 2000 (37,516 persons). In Martin County, nearby census designated place (CDP) Jensen Beach is 7 miles south of PSL. The Jensen Beach 2019 population was 13,479 persons, which was an increase from 2010

(11,707 persons) and 2000 (11,100 persons). The county seat for Martin County is the city of Stuart, located approximately 10 miles south of PSL. In 2019, the estimated population of Stuart was 16,161, an increase from 15,593 in 2010 and 14,633 in 2000. (MC 2021a; USCB 2021b)

The region of PSL is defined as the area within a 50-mile radius of the established plant center point. According to Section 3.11 demographic analysis, the region is considered highly populated. As seen in Figure 3.1-4 and described in Table 3.11-2, all or parts of nine Florida counties are located within the 50-mile radius of PSL. In the region, coastal counties have large continuous population centers that run north-south parallel to the coastline. The highest populated county in the region is Palm Beach County, with an estimated population of 1,496,770, an increase from 2010 (1,320,134) and 2000 (1,131,184). (USCB 2021a) As of 2019 there are three cities in the 50-mile region with a population of over 100,000 persons, and includes Palm Beach, Port St. Lucie, and West Palm Beach (see Table 3.11-1). Along with the cities of over 100,000 persons, there are ten additional communities with populations of over 25,000, including Fort Pierce, Greenacres, Jupiter, Lake Worth, Palm Beach Gardens, Riviera Beach, Royal Palm Beach, Sebastian, The Acreage, and Wellington. (USCB 2021b)

As seen in Figure 3.1-6, along with the Atlantic Ocean, other prominent natural features within the region include Lake Okeechobee, 30 miles to the west-southwest of PSL, and a portion of the Everglades Headwaters National Wildlife Refuge and Conservation Area, approximately 35 miles west of the site. There is a highly developed transportation network associated with the populated areas along the coastline (Figure 3.1-3 and Figure 3.1-4). Within the region, Interstate 95 (I-95) runs roughly parallel to the east coast of Florida and provides vehicular access through Palm Beach, Martin, St. Lucie, Indian River, and Brevard counties. The Florida Turnpike parallels I-95 for much of its route between south Florida communities and St. Lucie County, then veers northwest on SR 91 through central Florida to the city of Orlando (FTS 2021). Within the PSL vicinity, transportation routes include U.S. Highway 1 (US 1); SR A1A, SR 712, and SR 707; the Florida East Coast Railway; the Atlantic Ocean, and the Intracoastal Waterway located in the Indian River.

The Port of Fort Pierce, FL, is the closest port to PSL. No longer a cargo facility, the port functions as a shipyard for maintenance, refitting, and overhaul of mega-yachts. (FPC 2021) Within the region, access to the nearest Florida Amtrak passenger rail service and stations is in the cities of Okeechobee and West Palm Beach (Amtrak 2021). Expected to be available by 2022, Brightline is actively constructing a new rail line to bring passengers from southern Florida (Miami, Fort Lauderdale, and West Palm Beach) to central Florida (Orlando). The new passenger rail line will parallel the existing Florida East Coast Railway through coastal counties. No station stops have been announced for Martin or St. Lucie counties. (Brightline 2021) Florida shuttle service is available throughout the state connecting major cities, including Fort Pierce, Port St. Lucie, and Stuart (FST 2021). Both Martin and St. Lucie counties have local public bus transit systems (MC 2021b; SLC 2021b).

There are six private heliports and one public seaplane airbase within approximately 10 miles of PSL. Along with the PSL onsite FPL heliport, the other private heliports include the St. Lucie

Medical Center (5 miles southwest); Lawnwood Medical Center (8.4 miles northwest); Neshama (9.8 miles south-southeast); Floridian National Golf Club (10.1 miles south-southwest); and Martin Memorial Medical Center (10.2 miles south). The Fort Pierce Seaplane Base (7.4 miles north-northwest) is open for public use. Other nearby public airport facilities are Witham Field Airport (11.6 miles south) and Treasure Coast International Airport (12.9 miles northwest), a general service airport which has passenger service and U.S. Customs capabilities. (AirNav 2021; SLC 2021c) Located in West Palm Beach, FL, the Palm Beach International Airport is the nearest full-service commercial airport, located approximately 46.9 miles south-southeast of PSL (AirNav 2021).

Regarding nearby industrial and military activities, no significant facilities are located within 10 miles of PSL, including oil and gas pipelines, military bases, chemical plants, and drilling operations. Commercial shipping lanes are located east and west of PSL. The St. Lucie County portion of the Intracoastal Waterway (a north-south transportation route extending the length of the east coast) passes through the Indian River on the west. Atlantic Ocean shipping lanes are about 10 to 15 nautical miles east of PSL. A small sand mining operation is located along the western shore of the Indian River approximately four miles northwest of the plant site. St. Lucie County has constructed a wastewater treatment facility on Hutchinson Island, approximately 2 miles south of PSL along SR A1A.

### 3.1.2 Station Features

PSL is situated on a relatively flat, sheltered area of Hutchinson Island between Bid Mud Creek to the north and Indian River to the south on an area previously degraded through flooding, drainage, and channelization for mosquito control projects (NRC 2012c). Section 3.2 discusses St. Lucie County's current management of mangrove impoundments for mosquito control. There are red mangrove swamps on the western side of the island that gradually slope downward to a mangrove fringe bordering the intertidal shoreline of the Indian River Lagoon. East of the facility, land rises from the ocean shore to form dunes and ridges approximately 15 feet above mean low water. Tropical hammock areas are present north of the discharge canal, and additional red mangrove swamps are present north of Big Mud Creek. (NRC 2012c)

The principal structures of PSL are identified in Section 2.2 (see Figure 3.1-1). FPL owns the land within the PSL site boundary and controls the use of all land and water areas contained within the 1,132-acre site. The area pre-empted by the plant within the site boundary is about 300 acres, or approximately 27 percent of the total land owned by FPL. The plant restricted (non-public) area is the fenced-off area surrounding Units 1 and 2. The PSL EAB is based on a radius of 0.97 miles from the plant center. There are no unrelated industrial, commercial, institutional, or residential structures onsite.

SR A1A traverses FPL property and the EAB in a north-south direction east of the plant restricted area. Formal arrangements are made with the state of Florida to control the traffic and activities of the public on SR A1A and on the state and federal waters and beach adjacent to the property. Recreational facilities for limited use by FPL employees and their families are located within the site boundary. The Ocean Bay Riverside park and Walton Rocks Beach and Dog Park public beach access fall within the PSL site boundary to the south. To the north, Blind Creek public access (Riverside South and Beachside units) falls outside of the site boundary. The parks are managed by St. Lucie County (see Section 3.1.3). The location of the nearest resident to PSL is 1.5 miles southeast of the plant on Hutchinson Island (FPL 2020b).

### 3.1.3 Federal, Native American, State, and Local Lands

As shown in Figure 3.1-5 and Figure 3.1-6, there are a variety of national, state, and local public lands, aquatic preserves, wildlife management areas, and state and local parks located in the PSL 50-mile region. As described in Table 3.1-1, there are 39 local and state lands, as well as the Jensen Beach to Jupiter Inlet Aquatic Preserve, located within the 6-mile radius of PSL, all of which are located within St. Lucie County. Portions of the Jensen Beach to Jupiter Inlet Aquatic Preserve and the Savannas Preserve State Park are also located in neighboring Martin County. Figure 3.1-5 includes the general location of some of the state and local lands discussed in this section and their proximity to PSL. The closest local parks to PSL, managed by St. Lucie County, are Walton Rocks Beach and Dog Park, Ocean Bay Riverside, Blind Creek Riverside South, and Blind Creek Beachside. The Jensen Beach to Jupiter Inlet Aquatic Preserve is located adjacent to PSL in the Indian River Lagoon. (FDEP 2021a; SLC 2020a; USCB 2020b; USDA 2020a; USDOT 2021a; USGS 2021a)

The Seminole Tribe of Florida has two reservations located within the PSL 50-mile region. The larger of the two is the Brighton Reservation, with portions of reservation lands falling within the 50-mile region in Glades County (see Figure 3.1-6). Nearer to PSL, the Fort Pierce Reservation is approximately 50 acres in size and located in St. Lucie County northwest of the site. (NCSL 2021; STF 2021; USCB 2020b) No military installations were identified in the PSL region (USDOT 2021a).

### 3.1.4 Federal and Non-Federal Related Project Activities

Since the initial PSL license renewal was finalized, the plant has undertaken the following construction or maintenance activities at the site and staff has identified potential projects that may be undertaken in the future.

In late 2016, FPL made arrangements to strengthen offsite power coming to the plant. As part of the project, one of the three power lines coming to PSL from the Midway Road substation (located on the mainland) was moved to a more diverse substation. Next, a new transmission line was added that ran under the Indian River Lagoon to the PSL site. These two changes were undertaken to add defense-in-depth for switchyard power at PSL.

In 2020, as a pilot project, FPL installed a unique submerged breakwater in the Atlantic Ocean about 400 feet off and parallel to the shoreline in front of the PSL discharge canal. Concrete reef balls attached to concrete mats by stainless steel cables were place in 8-10 feet of water in an effort to stop beach erosion in the PSL waterfront area and create marine habitat for fish, crustaceans, and other organisms. (TCPalm 2021)

Future projects may include dredging of intake and discharge canals, with the potential renovation of PSL onsite spoils ponds. The project is in a conceptual phase and no construction plans have been developed or completion dates established.

PSL staff has also identified a need to increase stormwater discharge capacity, which would trigger revision of the plant stormwater pollution prevention plan (SWPPP). Once again, plans are conceptual with no established schedule.

The possible need to expand the ISFSI and scope of any such expansion cannot be determined at this time, as such expansion would depend on the status of the U.S. Department of Energy's (DOE's) future performance of its obligation to accept spent nuclear fuel (SNF) or the availability of other interim storage options. Consequently, the possibility of such expansion is currently speculative, and not reasonably foreseeable. The ISFSI is sized to accommodate all SNF generated through the first period of extended operation, and the spent fuel pools could presumably accommodate another 20 years of SNF. If expansion occurred, it would likely be on already disturbed land.

In 2020, St. Lucie County announced that Accel International Holdings, a wire and cable manufacturer, had selected Port St. Lucie for its southeastern Florida expansion. The company will build a new 150,000-square foot manufacturing facility, which is expected to generate 125 new jobs by 2021. (SLC 2021c)

As discussed in Section 3.1.1, Brightline is constructing a new rail line to bring passengers from southern Florida (Miami, Fort Lauderdale, and West Palm Beach) to central Florida (Orlando). The route includes Martin and St. Lucie counties. Rail service is expected to be available by 2022 (Brightline 2021).

**Table 3.1-1 Federal, State, and Local Lands Totally or Partially within a 6-Mile Radius of PSL (Sheet 1 of 2)**

| Name[a] | Land Type | Management |
|---|---|---|
| Ancient Oaks | Local | St. Lucie County |
| Blind Creek Beachside | Local | St. Lucie County |
| Blind Creek North | Local | St. Lucie County |
| Blind Creek Riverside North | Local | St. Lucie County |
| Blind Creek Riverside South | Local | St. Lucie County |
| Captain Hammond Hammock Natural Area | Local | St. Lucie County |
| Citrus Hammock Natural Area | Local | St. Lucie County |
| Collins Park | Local | St. Lucie County |
| Dollman Park Beachside | Local | St. Lucie County |
| Dollman Preserve | Local | St. Lucie County |
| Evans | Local | City of Port St. Lucie |
| Frederick Douglass Memorial Park | Local | St. Lucie County |
| Herman's Bay Beach | Local | St. Lucie County |
| Idabelle Island | Local | St. Lucie County |
| Jane Murray Brooks Park | Local | St. Lucie County |
| Jensen Beach to Jupiter Inlet Aquatic Preserve | State | State of Florida |
| John Brooks Park Beachside | Local | St. Lucie County |
| John Brooks Park Riverside | Local | St. Lucie County |
| Mariposa Cane Slough Preserve | Local | City of Port St. Lucie |
| Martin Parcel | Local | St. Lucie County |
| Middle Cove Beach | Local | St. Lucie County |
| Midport Lake | Local | City of Port St. Lucie |
| Normandy Beach | Local | St. Lucie County |
| Ocean Bay Beachside | Local | St. Lucie County |
| Ocean Bay Riverside | Local | St. Lucie County |
| Oxbow Eco Center | Local | St. Lucie County |
| Palm Lake Park | Local | St. Lucie County |
| River Park Marina | Local | St. Lucie County |
| Sandhill Crane Park | Local | City of Port St. Lucie |
| Savannah Park | Local | St. Lucie County |
| Savannas Outdoor Recreation Area | Local | St. Lucie County |
| Savannas Preserve State Park | State | State of Florida |
| Vitolo Family Preserve North | Local | St. Lucie County |

**Table 3.1-1 Federal, State, and Local Lands Totally or Partially within a 6-Mile Radius of PSL (Sheet 2 of 2)**

| Name[a] | Land Type | Management |
|---|---|---|
| Vitolo Family Preserve South | Local | St. Lucie County |
| Walton Rocks Beach and Dog Park | Local | St. Lucie County |
| Walton Scrub | Local | St. Lucie County |
| Waveland Beach Park | Local | St. Lucie County |
| Weldon B Lewis Park | Local | St. Lucie County |
| Wood Stork Trail Park | Local | City of Port St. Lucie |
| Zorc Kerr | Local | St. Lucie County |

(FDEP 2021b; SLC 2020a; USCB 2020b; USDA 2020a; USDOT 2021a; USGS 2021a)

a. List is based on best available public information and includes lands that are totally or partially located within a 6-mile radius of PSL.

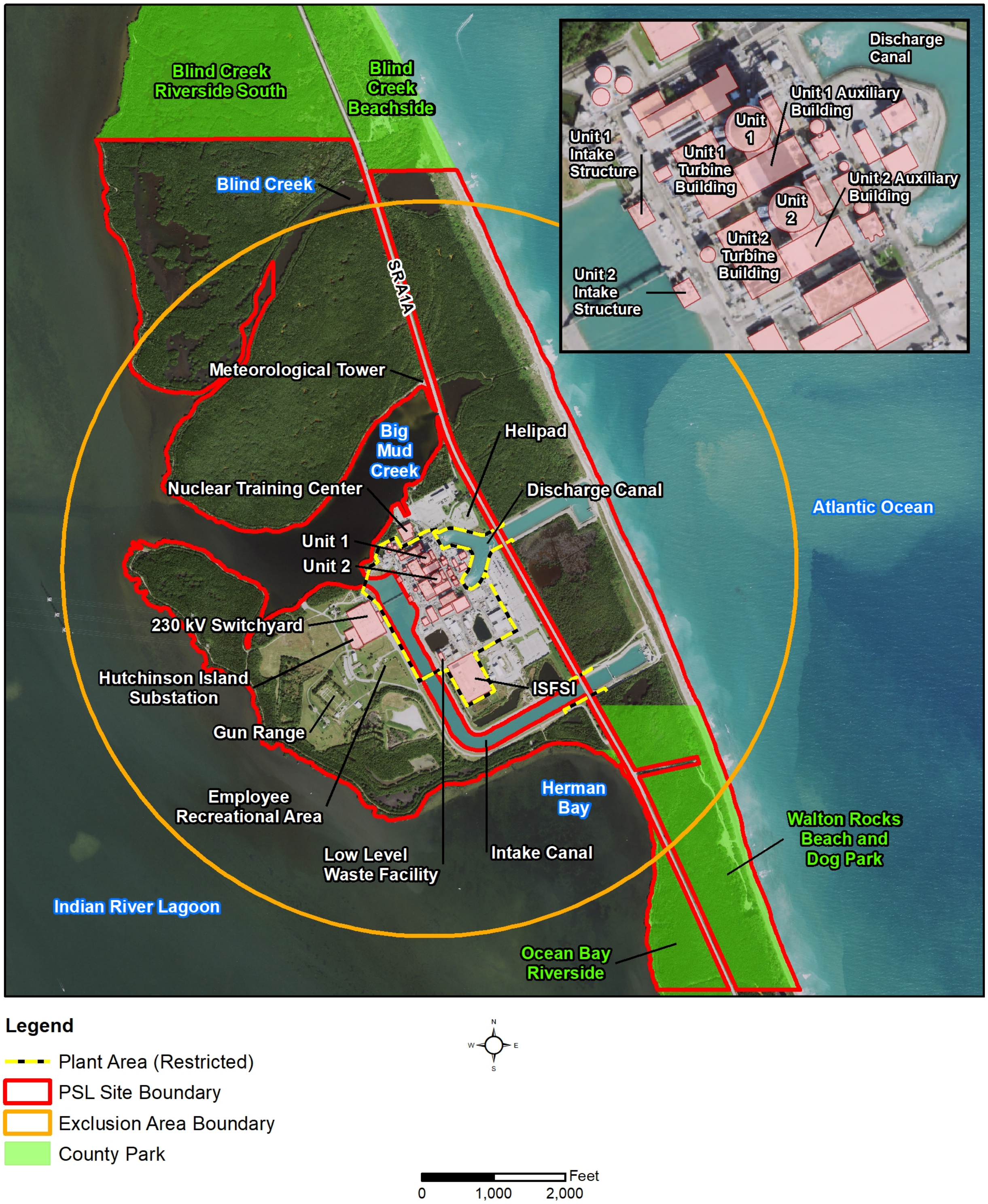



**Figure 3.1-1 PSL Site Layout**


**Figure 3.1-2 PSL Site Area and Topography**

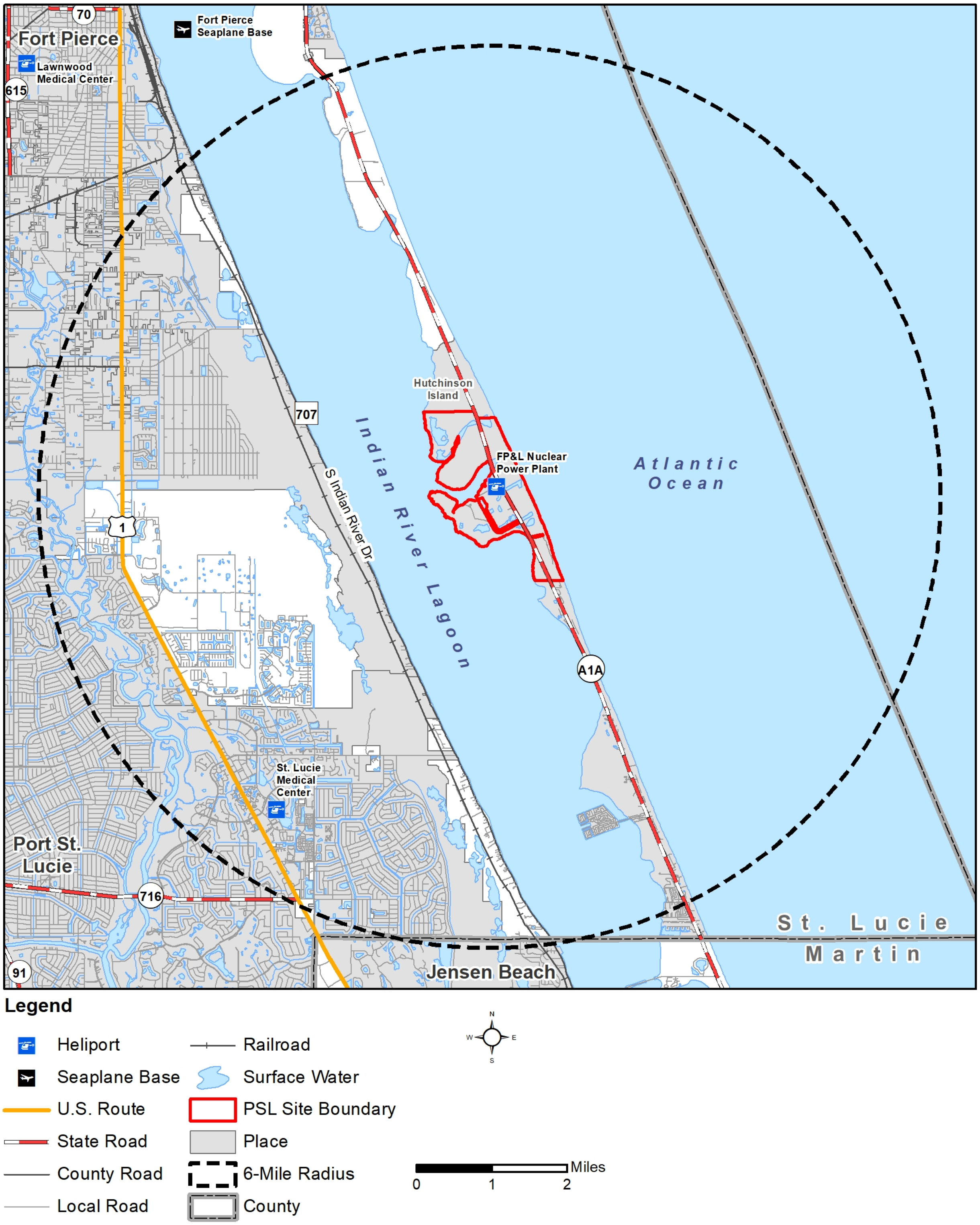



**Figure 3.1-3 6-Mile Radius of PSL**


**Figure 3.1-4 50-Mile Radius of PSL**

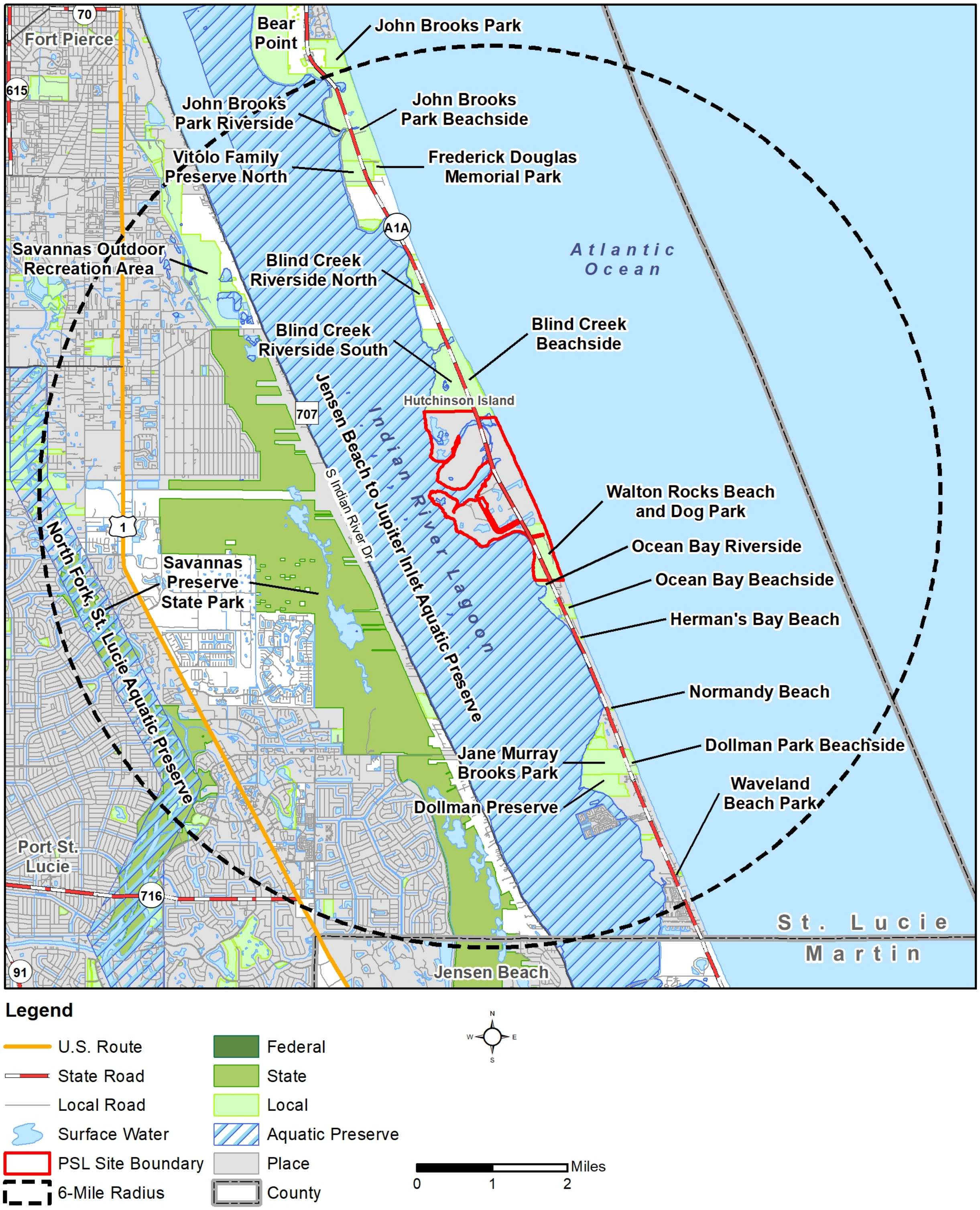



**Figure 3.1-5 Federal, State, and Local Lands, 6-Mile Radius of PSL**

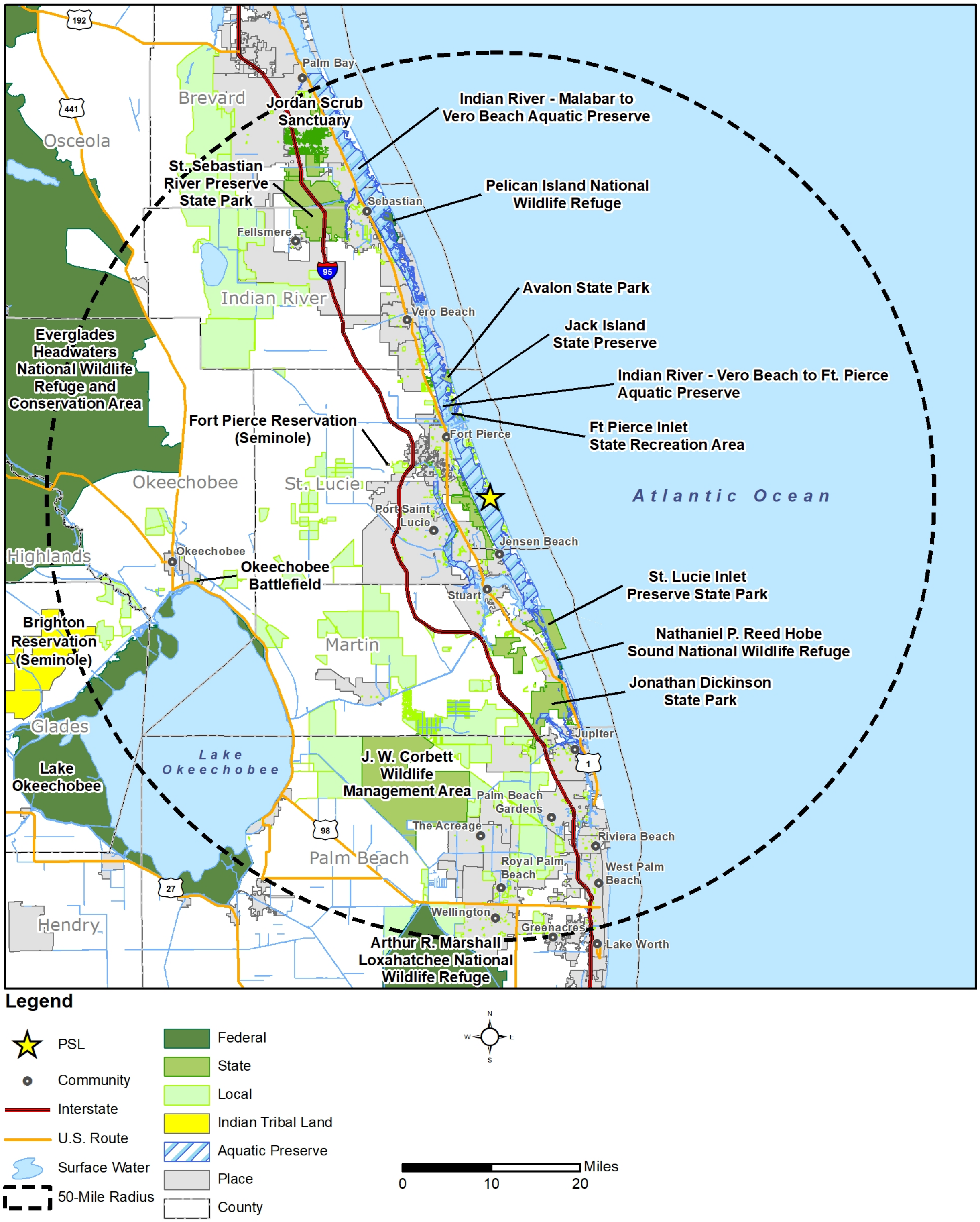



**Figure 3.1-6 Federal, State, and Local Lands, 50-Mile Radius of PSL**

## 3.2 Land Use and Visual Resources

Land use descriptions focus on St. Lucie and Martin counties, Florida, because as described in Section 2.5, approximately 78 percent of the permanent PSL workforce reside in these two counties, and because PSL pays property taxes to St. Lucie County.

### 3.2.1 Onsite Land Use

PSL is located on Hutchinson Island in an unincorporated area of eastern St. Lucie County, Florida. The site consists of approximately 1,132 acres and is bordered by the Atlantic Ocean to the east and the Indian River tidal lagoon to the west. Of the 1,132 acres, about 300 acres, or approximately 27 percent, is pre-empted by the plant for purposes of plant operation. FPL owns all land within the PSL site boundary. As illustrated in Figure 3.1-1, the site is traversed by SR A1A in a north-south direction east of the plant area. As described in Section 3.1, there is public access within the site boundary to the parks and designated beach and recreation areas located onsite, as well as via SR A1A. No activities unrelated to PSL operations are permitted in the area pre-empted by the plant without PSL approval, and there are no other proposed land uses within the PSL site boundary . The nearest communities to PSL are Ocean Breeze and Jensen Beach, FL, at approximately 7 miles to the south, and Port St. Lucie, FL, the city center of which is approximately 7 miles west-southwest of the site and is the largest city within 50 miles.

Undeveloped areas of the site are occupied by dense vegetation, characteristic of Florida coastal mangrove swamps . Portions of the mangrove swamps are used as mosquito impoundments by the impoundment division of St. Lucie county's Mosquito Control District, and are either inundated or intertidal to minimize available mud flat habitats as part of the effort to control mosquito populations (SLC 2021d).

As shown in Table 3.2-1 and illustrated in Figure 3.2-1, the woody wetlands category is the largest land use/land cover category within the PSL site boundary, covering approximately 46 percent of the site. The emergent herbaceous wetlands category is the next largest land use/land cover category with approximately 21.4 percent of the PSL site. Open water and developed areas (including areas developed for plant operations and roads) are the next largest land use/land cover categories, with approximately 22.5 percent and 6.2 percent respectively. The remaining three land use/land cover categories found onsite comprise approximately 4 percent. (MRLC 2020)

The St. Lucie County land development code implements policies and objectives outlined in the St. Lucie County comprehensive plan and regulates land development within unincorporated portions of St. Lucie County. The PSL site is zoned utilities (U) and residential/conservation (R/C). The plant area is zoned U for principle uses associated with utility, transportation, and communication. Conditional uses for this zoning district include electric generation plants and associated infrastructure. (SLC 2021e; SLC 2021f) The remainder of the PSL site is zoned R/C, which denotes privately controlled lands that contain unique vegetation or have characteristics that warrant special attention prior to their being developed (SLC 2020b). According to the St. Lucie County future land use map, the PSL site is zoned transportation/utilities (T/U) and R/C for existing and future land uses through 2040 (SLC 2020c).

### 3.2.2 Offsite Land Use

As seen in Table 3.11-2 and Table 3.11-3, both St. Lucie and Martin counties have seen an increase in total population since 2010, and this trend is expected to continue through 2063.

As described in Section 3.1, the vicinity (6-mile radius) surrounding PSL includes portions of St. Lucie and Martin counties, Florida. The land use/land cover categories located within the vicinity of PSL are illustrated in Figure 3.2-2. The Atlantic Ocean and Indian River Lagoon are the predominate natural features in the vicinity, and as noted in Table 3.2-2, open water is the largest land use/land cover category at approximately 65 percent. The next largest land use/land cover categories in the vicinity are developed lands (19.9 percent); woody wetlands (8.1 percent); and emergent herbaceous wetlands (4.3 percent). The remaining land use/ land cover categories found within the vicinity of PSL comprise approximately 2.8 percent. (MRLC 2020)

St. Lucie County occupies approximately 365,878 acres of land, of which 225,971 acres (61.8 percent) are proportioned to farmland. The 2017 census of agriculture reports that the county had a total of 415 farms, with an average farm size of 545 acres. Approximately 166 farms produce crops, with the primary crops reported as orchards (39,760 acres) and forage (2,027 acres). Livestock is also an important product in the county, with livestock commodities such as cattle and calves (234 farms), layers (50 farms), hogs and pigs (22 farms), sheep and lambs (19 farms), and broilers and other meat-type chickens (1 farm) reported. Other agricultural uses of farmland within the county included pasturelands (139,573 acres; 301 farms), permanent pasture and rangeland (116,577 acres; 282 farms), and woodlands (22,699 acres; 80 farms). (USDA 2021)

Martin County occupies approximately 347,986 acres of land, of which 153,732 acres (44.2 percent) are proportioned to farmland. In 2017 it was reported that the county had a total of 594 farms, with an average size of 259 acres. Approximately 231 farms produce crops, with primary crops, with the primary crops reported as orchards (14,958 acres), sugarcane (12,324 acres), and forage (2,457 acres). Livestock is also an important product in the county, with livestock commodities such as cattle and calves (319 farms), broilers and other meat-type chickens (40 farms), hogs and pigs (30 farms), and sheep and lambs (21 farms) reported. Other agricultural uses of farmland within the county included pasturelands (93,431 acres; 370 farms), permanent pasture and rangeland (61,070 acres; 343 farms), and woodlands (23,298, 126 farms). (USDA 2021)

The State of Florida requires that each local government adopt a comprehensive plan. These plans are to provide principles, standards, and strategies that guide a community's future economic, social, physical, environmental, and fiscal development in an orderly and balanced manner. Chapter 163, Part II, Section 3177 of the Florida statute sets forth minimum criteria and lists required elements of a comprehensive plan, which include:

- Future land use element
- Transportation element
- Water, sewer, and waste element
- Conservation element
- Recreation and open space element
- Housing element
- Intergovernmental coordination element
- Coastal management element

Comprehensive plans may include optional elements as determined by local governments (TFS 2020). Both St. Lucie and Martin counties have comprehensive plans in place that characterize current conditions and establish standards, regulations, and goals for land development and appropriate uses for land, water, and resources. St. Lucie County's plan was adopted April 2, 2019. Martin County's plan was adopted February 20, 1990, and was last amended on December 11, 2018. (MC 2020; SLC 2020b)

St. Lucie and Martin counties have implemented comprehensive plans with the goal of maintaining and promoting orderly and balanced growth while protecting natural and manmade resources and minimizing threats of degradation to the health, safety, and welfare of citizens, native wildlife, and environment through incompatible land uses. The two counties utilize land use planning tools, such as zoning and the future land use maps, to manage existing and future growth and development. Planning agencies in both counties require urban development be confined within urban service districts with the goal of managing urban area expansion and promoting locations that optimize the efficiency of public services and conserve valuable natural resources. As discussed in Section 3.11, both St. Lucie and Martin counties have experienced population growth since 2010 with much of the residential, commercial, and industrial development concentrated along and east of the I-95 corridor and in coastal areas. Land use west of the I-95 corridor has generally remained agricultural interspersed with small towns and villages, wetlands habitats, lakes, and recreational areas. Both counties anticipate growth and expansion of urban area development to continue in urban service districts along coastal areas and have periodically amended the future land use elements of their comprehensive plans to account for population growth trends and manage urban sprawl, while protecting environmental resources and preserving agriculture areas that are vital to their economies. (MC 2020; SLC 2020b)

### 3.2.3 Visual Resources

As discussed in Section 3.1, PSL is located in an unincorporated area of eastern St. Lucie County, Florida. Figure 3.1-1 shows building site layout and the property site boundary in association with the Atlantic Ocean and Indian River Lagoon. The surrounding area is characterized by residential and commercial development intermixed with natural and recreational areas and open water. As described in Section 3.1, the nearest resident to PSL is approximately 1.5 miles southeast of the plant on Hutchinson Island (FPL 2020b).

The tallest structures onsite are the Units 1 and 2 reactor containment buildings, which are approximately 200 feet in height. Predominant visual features at PSL are the reactor containment buildings, the associated auxiliary building, service and turbine buildings, and the fuel handling building. (FPL 2001) Although the area immediately surrounding PSL generally consists of dense vegetation which provides visual screening, the plant and its associated lighting are clearly visible where SR A1A traverses the site, as well as to portions of the Indian River Lagoon and the Atlantic Ocean. Predominant features are also visible from the mainland and to residents and travelers along SR 707 to the west, across the Indian River Lagoon. Nearby beach and recreational areas as well as residential areas south of PSL on Hutchinson Island may also have views of the tallest structures, though mangroves and tree growth provide some screening.

**Table 3.2-1 Land Use/Land Cover, PSL Site**

| Category | Acres | Percent |
|---|---|---|
| Open Water | 70.28 | 6.2 |
| Developed, Open Space | 73.39 | 6.4 |
| Developed, Low Intensity | 35.58 | 3.1 |
| Developed, Medium Intensity | 60.71 | 5.3 |
| Developed, High Intensity | 86.29 | 7.6 |
| Barren Land (Rock/Sand/Clay) | 43.81 | 3.8 |
| Grassland/Herbaceous | 1.78 | 0.2 |
| Cultivated Crops | 0.22 | 0.02 |
| Woody Wetlands | 523.29 | 45.9 |
| Emergent Herbaceous Wetlands | 243.52 | 21.4 |
| **Total** | **1,138.88**[a] | **100.0** |

a. The acreages presented in this table are based on the Multi-Resolution Land Characteristics Consortium (MRLC) land use/land cover data. These data are presented in a raster (pixel-based) format and because of their square geography, they do not exactly match the PSL site boundary. This geographic variation creates a small difference between total acreage reported in Table 3.2-1 compared to the PSL site acreage stated throughout the ER. (MRLC 2020)

**Table 3.2-2 Land Use/Land Cover, 6-Mile Radius of PSL**

| Category | Acres | Percent |
|---|---|---|
| Open Water | 4,7061.15 | 65.0 |
| Developed, Open Space | 6,434.99 | 8.9 |
| Developed, Low Intensity | 5,363.27 | 7.4 |
| Developed, Medium Intensity | 2,056.04 | 2.8 |
| Developed, High Intensity | 552.87 | 0.8 |
| Barren Land (Rock/Sand/Clay) | 163.02 | 0.2 |
| Deciduous Forest | 10.01 | 0.01 |
| Evergreen Forest | 1,517.18 | 2.1 |
| Mixed Forest | 42.92 | 0.1 |
| Shrub/Scrub | 93.41 | 0.1 |
| Grassland/Herbaceous | 116.98 | 0.2 |
| Pasture/Hay | 20.24 | 0.03 |
| Cultivated Crops | 44.92 | 0.1 |
| Woody Wetlands | 5,862.10 | 8.1 |
| Emergent Herbaceous Wetlands | 3,092.62 | 4.3 |
| **Total** | **72,431.7** | **100.0** |

(MRLC 2020)


**Figure 3.2-1 Land Use/Land Cover, PSL Site**

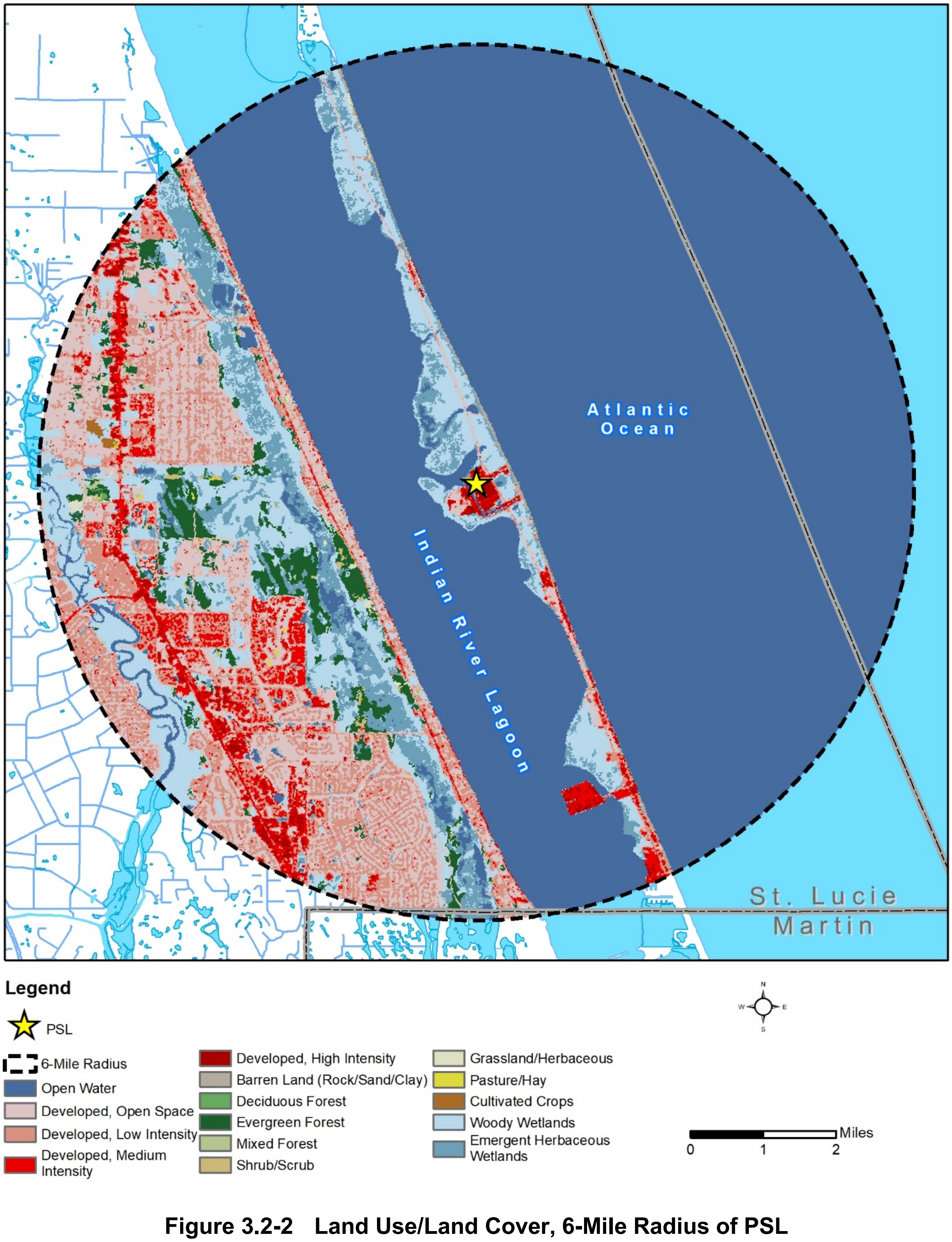



**Figure 3.2-2 Land Use/Land Cover, 6-Mile Radius of PSL**

## 3.3 Meteorology and Air Quality

The meteorology, climate, and air quality of PSL were previously evaluated during the PSL Units 1 and 2 license renewal approval processes (NRC 2003, Section 2.2.4). PSL is located on Hutchinson Island, a barrier island on the eastern coast of Florida near Port St. Lucie, Florida. The climate of the region is subtropical with mild dry winters and long, warm summers with abundant rainfall (NRC 2003, Section 2.2.4). A high-level overview of the plant layout is provided in Figure 3.1-1.

Climatological data presented below have been provided to represent a range of meteorological conditions considered typical for the PSL site region. The Vero Beach weather station is the closest first-order National Weather Service (NWS) data collection station to PSL with a significant period of meteorological data. The West Palm Beach weather station (another first order weather station) is also located within the region of PSL. Data from both stations have been used to describe the representative climatic conditions for the PSL region. West Palm Beach climatological information has been used in previous PSL licensing environmental reviews, thus making its continued use appropriate for comparison. (NRC 2003, Section 2.2.4)

Hourly meteorological data for PSL is available from July 2013. The meteorological data archive prior to that date has been permanently stored on microfilm. Data from the Fort Pierce weather station, located 6.8 miles northwest of PSL, was used to supplement daily data from the site to support analysis of local climatic conditions. Fort Pierce and the site have similar topography and location relative to the ocean. As such, Fort Pierce was considered representative of the local meteorological conditions at PSL.

### 3.3.1 General Climate

The Vero Beach weather station is located approximately 22 miles north PSL of on the southeastern coast of Florida, a few miles inland of the Atlantic Ocean. Its climate is strongly influenced by its maritime location. The coldest weather in Vero Beach normally occurs in January, when low temperatures (°F) usually average 51.7°F, and the high temperatures average 72.8°F. Freezing temperatures, less than 32°F occur one day on average with record low temperatures near 20°F. Summertime high temperatures above 90°F occur about 48 days a year. (NCDC 2019a)

Precipitation averages 51.87 inches per year and occurs in all seasons but most abundantly in summer when showers are common. Thunderstorms are present approximately 70 to 80 days a year. Monthly precipitation amounts in winter are about half those in summer and are due in part to cold frontal systems traversing the region. Vero Beach lies at the northern boundary of a tropical rainy region with hurricane activity occurring during summer and fall. Of the hurricanes that pass close to Vero Beach, many move northward offshore, some cross the peninsula of Florida moving generally eastward but being weakened by their passage over land, and some enter the coastal area from the Atlantic Ocean. The frequency of the latter group has been small, about 5 in 114 years. (NCDC 2019a)

The West Palm Beach weather station is located approximately 38.5 miles south-southeast of PSL on the southeast coast of Florida, a few miles inland of the Atlantic Ocean . The coldest weather in West Palm Beach normally occurs in January, when low temperatures (°F) usually average 57.1°F, and the high temperatures average 75.1°F. Freezing temperatures, less than 32°F, occur about one day one per three years at the station; however, in the farmlands further from the coast the frequency of light freezes is higher. Summertime high temperatures above 100°F are uncommon, and temperatures above 90°F occur about 50 times a year. (NCDC 2019b)

Precipitation averages 62.33 inches per year and is heaviest during the summer and fall, the fall rainfall occurring from occasional heavy rains accompanying tropical disturbances. The moist, unstable air results in frequent showers, usually of short duration. Thunderstorms are frequent during the summer, occurring every other day. High winds, associated with hurricanes, have been estimated at about 140 mph in the city. Heavy fog occurs on an average of only one morning a month in the winter and spring, and almost never in the summer and fall. (NCDC 2019b)

The prevailing climatology of the PSL site is dominated by the presence of the Azores-Bermuda high pressure system resulting in a subtropical marine type climate for the eastern Florida coast. This climate is featured by a long, warm summer with abundant rainfall followed by a mild, relatively dry winter. The high frequency of onshore winds and the proximity of the warm waters of the Gulf Stream result in warm, humid conditions during most of the year. Temperatures in excess of 90° F typically occur on about 45 days each year, but summer heat is tempered by sea breezes along the coast and by frequent afternoon or early evening thundershowers in all areas. During the winter months, the area is occasionally subjected to an outbreak of cold continental air; however, the cold air mass usually moderates rapidly. Consequently, subfreezing temperatures rarely occur in the area. Rainfall is unevenly distributed during the year. In general, the heaviest rainfall occurs during the period of June through October, coincident with the hurricane and thunderstorm season. A distinct dry period exists from November through March.

The site area is periodically affected by the passage of tropical cyclones of various intensities; the months of September and October have the highest frequency of occurrence. Tornadoes and waterspouts have been observed throughout the year in this part of Florida. Along the immediate coastline and areas such as Hutchinson Island, well developed sea-breeze conditions result in persistent, slightly stable, on-shore air flow.

Meteorological conditions conducive to high air pollution potential are infrequent in southeastern Florida. The warm waters of the adjacent Gulf Stream current, located a few miles offshore, inhibit the formation of strong persistent low-level inversions while instability during the day is aided by strong insolation. Along the immediate coastline and areas such as Hutchinson Island, well developed sea-breeze conditions result in persistent, slightly stable, on-shore flow. The terrain in the site area is essentially flat with elevations in the surrounding area ranging approximately from 20 to 30 feet mean sea level (MSL). The topography should exert little or no influence on synoptic-scale atmospheric processes in the site area.

## 3.3.2 Meteorology

### 3.3.2.1 Wind Direction and Speed

The prevailing wind direction at PSL exhibits northerly components during the winter months shifting to southerly directions during the summer months. Annually the prevailing wind directions are from the east-northeast through the south-southeast. The average annual wind speed is 6.6 mph (see Table 3.3-2).

For Vero Beach, the 36-year period of record data show the annual prevailing wind direction (i.e., the direction from which the wind blows most often) is from 60 degrees (i.e., from the east-northeast). Monthly prevailing winds are from the northwest from November through January. Late winter through the end of summer prevailing winds are from the east-southeast and southeast. During September and October, the prevailing winds are from the east-northeast. As listed in Table 3.3-1, the mean wind speed over the past 36-year period of record was 8.2 miles per hours (mph). A maximum 3-second wind speed of 74 mph was recorded in October 2016. (NCDC 2019a)

For West Palm Beach, the 36-year period of record data show the annual prevailing wind direction (i.e., the direction from which the wind blows most often) is from 70 degrees (i.e., from the east-northeast). Monthly prevailing winds range from east-northeast through southeast for the rest of the year. As listed in Table 3.3-1, the mean wind speed over the past 36-year period of record was 9.4 mph. A maximum three-second wind speed of 101 mph was recorded in October 2005. (NCDC 2019b)

Mean monthly wind speeds at the PSL site are based on a 7-year record (2013–2019) of measurements from the lower level (32.8 feet above ground level) of the onsite meteorological monitoring system (see Table 3.2-2). Annual wind rose diagrams for the period 2015–2019 are provided in Figures 3.3-1, 3.3-2, 3.3-3, 3.3-4, and 3.3-5.

### 3.3.2.2 Temperature

Representative regional temperature averages and extremes are available from the Vero Beach monitoring station. The local climate data summary for the Vero Beach area indicates that the mean daily maximum temperature is highest during August (90°F) and decreases to the seasonal low in January (72.8°F). The Vero Beach area experiences normal temperatures above 90°F approximately 47.9 days per year from March through November. The highest temperature of record (102°F) occurred in June 2009. The mean daily minimum temperature is above 60°F from April through November and is at its lowest in January, when the mean daily minimum decreases to 52.9°F. Record low temperatures less than 32°F have been recorded in December, January, February, and March, with below-freezing temperatures normally occurring approximately 1.7 days per year from December through February. The lowest temperature of record by the Vero Beach station is 21°F, occurring in January 1985. (NCDC 2019a) Monthly and annual daily mean temperature data and temperature extremes for the Vero Beach area are summarized in Table 3.3-3.

Representative regional temperature averages and extremes are also available from the West Palm Beach monitoring station. The local climate data summary for the West Palm Beach area indicates that the mean daily maximum temperature is highest during August (90.5°F) and decreases to the seasonal low in January (75.1°F). The West Palm Beach area experiences normal temperatures above 90°F approximately 50.3 days per year from March through November. The highest temperature of record (101°F) occurred in July 1942. The mean daily minimum temperature is above 60°F from March through December and is at its lowest in January, when the mean daily minimum decreases to 57.1°F. Record low temperatures at or less than 32°F have been recorded in December, January, and February, with below freezing temperatures normally occurring approximately 0.3 days per year. The lowest temperature of record by the West Palm Beach station is 27°F, occurring in January 1977. (NCDC 2019b) Monthly and annual daily mean temperature data and temperature extremes for the West Palm Beach area are summarized in Table 3.3-3.

Representative local temperature averages and extremes for PSL are available from the Fort Pierce monitoring station. The local climate data summary for the Fort Pierce area indicates that the mean daily maximum temperature is highest during August (89.8 °F) and decreases to the seasonal low in January (72°F). The highest temperature of record (101°F) occurred in July 1993. The mean daily minimum temperature is above 60°F from April through November and is at its lowest in January, when the mean daily minimum decreases to 51.5°F. Record low temperatures less than 32°F have been recorded in December through March. The lowest temperature of record by the Fort Pierce station is 24°F, occurring in December 2010. (NCDC 2020) Monthly and annual daily mean temperature data and temperature extremes for the Fort Pierce area are summarized in Table 3.3-4.

Average temperatures in the area of PSL are 65.5°F in January and 82.2°F in August, with annual extremes of approximately 35.6°F low and 97.4°F high. Monthly and annual daily mean temperature data and temperature extremes for the PSL area are summarized in Table 3.3-4. On average PSL has temperatures consistent with the regional and local stations with monthly average temperatures of the site falling within all of the mean daily maximum and mean daily minimum values for the representative stations.

### 3.3.2.3 Precipitation

As noted in Section 3.1.1, the prevailing climatology of the coastal site of Hutchinson Island is dominated by the presence of the Azores-Bermuda high pressure system resulting in a subtropical marine type climate for the eastern Florida coast. The westward position of this system in May to October occurs together with the highest percentage of rainfall. As listed in Table 3.3-6, PSL has two periods of precipitation that are greater than the rest of the year. The first is in May and June followed by August and September. The pattern is similar for Fort Pierce, which shows more precipitation from May through October, with the most precipitation occurring in June, August, and September. (NCDC 2020) As listed in Table 3.3-5, precipitation at the regional stations exhibits a similar pattern.

The precipitation records of normal rainfall totals for the Vero Beach area indicate that precipitation of 0.01 inches or more occurs on average for 122.6 days per year, with six or more days per month receiving at least some precipitation. The annual average precipitation at the Vero Beach station is 51.87 inches per year. Precipitation recorded at the station shows the highest seasonal precipitation occurs from May through October, with the most precipitation occurring in June, August, and September. The highest seasonal precipitation occurs during the summer and beginning of fall (approximately 50 percent falling June through September). Normal regional precipitation and extremes are shown in Table 3.3-5. The maximum 24-hour precipitation total recorded at Vero Beach, 11.26 inches, occurred in May 2016. Vero Beach received a record minimum monthly rainfall total (0.01 inches) in October 2010. (NCDC 2019a)

The precipitation records of normal rainfall totals for the West Palm Beach area indicate that precipitation of 0.01 inches or more occurs on average for 135.9 days per year, with seven or more days per month receiving at least some precipitation. The annual average precipitation at the West Palm Beach station is 62.33 inches per year. Precipitation recorded at the station shows the highest seasonal precipitation occurs from May through October, with the most precipitation occurring in June, August, and September. The highest seasonal precipitation occurs during the summer and beginning of fall (approximately 49 percent falling June through September). Normal regional precipitation and extremes are presented in Table 3.3-5. The maximum 24-hour precipitation total recorded at West Palm Beach, 15.23 inches, occurred in April 1942. West Palm Beach received a record minimum monthly rainfall total (0.04 inches) in April 1967. (NCDC 2019b)

### 3.3.2.4 Snow and Glaze

The PSL site and the Fort Pierce station do not record snow and glaze data. The regional stations in Vero Beach and West Palm beach report similar snowfall trends indicating that these stations are representative of snowfall in the PSL region.

In both Vero Beach and West Palm Beach, winters are mild with daytime temperatures rarely going below freezing. No information on ice storms (freezing rain or glaze) are recorded. The stations indicate that the maximum amounts of snow recorded are trace amounts and snow events are rare. (NCDC 2019a; NCDC 2019b)

### 3.3.2.5 Relative Humidity and Fog

The closest available fog data for the PSL region are from the Vero Beach observation station. The local climatological data for Vero Beach indicate an average of 19 days per year of heavy fog. Heavy fog is defined by the NWS as fog that reduces visibility to 0.25 mile or less. (NCDC 2019a) Fog events are not recorded by PSL.

## 3.3.2.6 Severe Weather

### *3.3.2.6.1 Thunderstorms*

Most heavy rainfall is associated with thunderstorms or passage of hurricanes. Thunderstorms are frequent during the summer months and early fall, with the greatest occurrence during the month of August. The mean number of days with thunderstorms in each month for Vero Beach and West Palm Beach are provided in Table 3.3-7. (NCDC 2019a; NCDC 2019b) Based on National Centers for Environmental Information (NCEI) records, St. Lucie County, Florida, has recorded 46 significant thunderstorm events since 1975 with most of the thunderstorms occurring in June, July, and August. (NCEI 2020)

### *3.3.2.6.2 Tornados*

Tornadoes and waterspouts have been observed throughout the year in this part of Florida. Based on NCEI records, a total of 44 tornadoes have been recorded in St. Lucie County, Florida since 1953. The records show that the intensity of the storms was limited to EF0, EF1, F0, F1, and F2 with the exception of two F3 tornados that occurred on August 3, 1954, and April 15, 1958. (NCEI 2020)

### *3.3.2.6.3 Hurricanes*

As recorded in National Oceanic and Atmospheric Administration (NOAA) historical storm records, there have been 60 hurricanes which tracked within 100 miles of St. Lucie County, Florida, between 1853 and 2020. Hurricane Dorian, which ended September 9, 2019, was the most recent hurricane that tracked within that distance, but the hurricane never made landfall in Florida. A large mid-level trough over the eastern United States kept the hurricane east of Florida. Hurricane Dorian skirted the eastern coastline of the United States and made landfall in Nova Scotia, Canada. Hurricane Matthew, which ended October 10, 2016, was the most recent hurricane to track within 50 miles of St. Lucie County, Florida, making landfall in South Carolina. Eastern Florida sustained tropical storm force winds. (NOAA 2020)

Historical records indicate that 11 hurricanes tracked within St. Lucie County, Florida. Four hurricanes have occurred within St. Lucie County since PSL started operations in June 1976. The hurricane intensities experienced at the site between June 1976 to present ranges from Category 1 through Category 3. (NOAA 2020) Hurricane Francis, in 2004, resulted in beach erosion on the PSL site. However, analysis showed that the beach dunes and mangroves are not needed to protect safety related structures and equipment from probable maximum hurricane (PMH) surge and erosion damage. As noted above, Hurricane Dorian necessitated dredging to the intake canal, but no hurricane damage affecting safety-related systems, structures, or components has occurred. All site activities and repairs associated with hurricane damage are managed through the corrective action program.

Hurricane Jeanne, in September 2004, was the most recent hurricane to track though St. Lucie County, Florida, achieving a Category 3 rating by the time of landfall on September 26, 2004, with maximum sustained winds of 105 knots (120.8 mph) and an estimated minimum central pressure of 950 millibars. Hurricane Jeanne made landfall at the southern end of Hutchinson Island east of Stuart, Florida, approximately 10 miles southeast of PSL. (NOAA 2020)

Hurricane Frances, in September 2004, made landfall over the southern end of Hutchinson Island on September 5, 2004, as a Category 2 hurricane. At the time of landfall its maximum wind speed was 90 knots (103.6 mph) with minimum pressure of 960 millibars. (NOAA 2020)

Hurricane Irene, in October 1999, made landfall in southern Florida on October 15, 1999, as a Category 1 hurricane. The hurricane traversed Florida and crossed into the ocean in northern Palm Beach County near Jupiter, Florida. At the time of its seaward crossing its maximum wind speed was 65 knots (74.8 mph) with a minimum pressure of 985 millibars. (NOAA 2020)

Hurricane David, in September 1979, made landfall at midday near Jupiter Island, Florida, a little north of Palm Beach. Moving north-northwest at 10 to 12 mph, David's eye passed over the coastal sections of Martin, St. Lucie, Indian River and Brevard counties. The strongest winds recorded in Florida were gusts of 95 mph at the Fort Pierce Coast Guard Station in St. Lucie County.

St. Lucie County has been hit by the impacts of seven tropical storm events since October 2005. The latest of which occurred on August 2, 2020. Tropical storm Isaias skirted the coast of Florida making landfall as a Category 1 hurricane in South Carolina. At its nearest approach to PSL, the storm was producing 60 knot winds with a minimum pressure of 994 millibars. (NCEI 2020)

#### 3.3.2.7 Atmospheric Stability

Atmospheric stability is a meteorological parameter that describes the dispersion characteristics of the atmosphere. It can be determined by the difference in temperature between two heights. A seven-category atmospheric stability classification scheme (ranging from A for extremely unstable to G for extremely stable) based on temperature differences is set forth in the NRC's Regulatory Guide 1.23, Revision 1 (NRC 2007). When the temperature decreases rapidly with height (typically during the day when the sun is heating the ground), the atmosphere is unstable and atmospheric dispersion is greater. Conversely, when temperature increases with height (typically during the night as a result of the radiative cooling of the ground), the atmosphere is stable, and dispersion is more limited. The stability category between unstable and stable conditions is D (neutral), which would occur typically with higher wind speeds and/or higher cloud cover, irrespective of day or night. (NRC 2013c, Section 2.9.1.4).

Based on a 5-year average (2015–2019), onsite temperature difference data recorded at PSL indicate that stable atmospheric conditions (E to G) occurred about 40.5 percent of the time and unstable conditions (A to C) occurred about 36.7 percent of the time. The remaining observations (about 22.8 percent) fell into the neutral (D) category. Stability class distributions at PSL covering the period 2015–2019 are presented in Table 3.3-8.

### 3.3.3 Air Quality

#### 3.3.3.1 Clean Air Act Nonattainment Maintenance Areas

The Clean Air Act (CAA) was established in 1970 [42 USC § 7401 et seq.] to reduce air pollution nationwide. The EPA has developed primary and secondary national ambient air quality standards (NAAQS) under the provisions of the CAA. The EPA classifies air quality within an air quality control region (AQCR) according to whether the region meets or exceeds federal primary and secondary NAAQS. An AQCR or a portion of an AQCR may be classified as being in attainment or non-attainment, or it may be unclassified for each of the six criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide ($NO_2$), particulate matter ($PM_{2.5}$, fine particulates; and $PM_{10}$, coarse particulates), ozone, and sulfur dioxide ($SO_2$).

Emissions from nonradiological air pollution sources, including the criteria pollutants, are controlled through compliance with federal, state, and local regulations. Nonattainment areas are areas where the ambient levels of criteria air pollutants in the air are designated as exceeding the criteria set forth in federal, state, and local regulations. Attainment areas are areas that do not exceed the criteria or cannot be classified (depending on the pollutant and other factors). A maintenance area is an area that formerly did not exceed the attainment criteria, but currently exceeds the attainment criteria. (EPA 2020a)

The PSL site is in eastern St. Lucie County, Florida, which is part of the Southeast Florida Intrastate AQCR. All of the counties (Broward, Dade, Indian River, Martin, Monroe, Okeechobee, Palm Beach, and St. Lucie) within this AQCR are in attainment of the NAAQSs [40 CFR 81.49 and 40 CFR 81.310]. There are no nonattainment areas in Florida. The nearest maintenance area in the state of Florida is on the Hillsborough and Nassau county line (2010 $SO_2$ standard), over 100 miles west-northwest of the PSL site (EPA 2020a). There are no Class I federal areas within 100 miles of the PSL site where visibility is an important value [40 CFR 81.407].

As illustrated in Figure 3.1-6, there are four national wildlife refuges in the region of the PSL property that are prevention of significant deterioration Class II federal areas. The closest is the Nathaniel P. Reed Hobe Sound National Wildlife Refuge, which is south along the coast. Pelican Island National Wildlife Refuge is north along the coast. The Everglades Headwaters National Wildlife Refuge and Conservation Area is west of the site and the Arthur R. Marshall Loxahatchee National Wildlife Refuge is south at the perimeter of the region.

#### 3.3.3.2 Air Emissions

PSL holds an air operation permit (1110071-016-AO) that authorizes the operation of PSL under standard industrial classification No. 4911, which replaces the previous federally enforceable state operating Permit No. 1110071-013-AF. The state reviewed the renewal application and recommended the change in permit type. The facility consists of two nuclear generating units; four stationary emergency diesel generators (emissions unit [EU] 001) that supply backup power to the nuclear plant auxiliary equipment; four stationary emergency diesel and propane generators (EUs 006 & 007) that supply power to certain office buildings; and miscellaneous diesel, liquefied petroleum gas (LPG)/propane or gasoline portable and temporary equipment (EUs 003 and 005). The existing main plant stationary emergency diesel generators (EU 001), as well as the fleet generator and communication tower generator (EU 006), are subject to work practice requirements under NESHAP 40 CFR Part 63, Subpart ZZZZ only. The new 800-kW administrative generator and 20-kW ISFSI generator (EU 007) are subject to emissions limitations and requirements under NSPS 40 CFR Part 60, Subpart IIII. Miscellaneous portable non-emergency and temporary generators reported under EUs 003 and 005 are non-road engines and therefore have no regulatory requirements under 40 CFR Part 60 or Part 63. Because PSL utilizes a once-through cooling system for condenser cooling purposes, there are no cooling towers or associated particulate emissions. (NRC 2003, Section 2.1.3)

As discussed in Chapter 9, PSL has received a site certification in accordance with the Florida Power Plant Siting Act (PPSA). This process provides a certification that encompasses all licenses and permits needed for affected Florida state, regional, and local agencies. The conditions of certification require FPL to comply with the provisions and limitations set forth in its air operation permit. To protect Florida's ambient air quality standards and ensure that impacts from facilities that generate air emissions are maintained at acceptable levels, the FDEP governs the discharge of regulated pollutants by establishing specific conditions in the air permit. Permitted emission sources and conditions established in PSL air operation permit (1110071-016-AO) shown in Table 3.3-9. As discussed in Chapter 9, there have been no notices of violations or non-compliances associated with PSL air emissions over the most recent 5 years (2015–2019).

Annual emissions for the most recent 5 years (2015–2019) are shown in Table 3.3-10. The emissions reported in Table 3.3-10 are based on PSL's annual operating report for air pollutant emitting facility submitted to FDEP. Beginning in 2020, annual air emission reports are no longer required by FDEP for PSL. As discussed in Section 2.3, no SLR-related refurbishment has been identified. In addition, FPL's review did not identify any future upgrade or replacement activities necessary for plant operations (e.g., diesel generators, diesel pumps) that would affect PSL current air emissions program. Therefore, no increase or decrease of air emissions is expected over the proposed SLR operating term.

Studies have shown that the amount of ozone generated by even the largest industry transmission lines in operation (765 kV) would be insignificant (NRC 2013c, Section 4.3.1.1). As presented in Section 2.2.5, the in-scope transmission lines at PSL are 230-kV. Therefore, the amount of ozone generated from in-scope transmission lines is anticipated to be minimal.

### 3.3.4 Greenhouse Gas Emissions and Climate Change

No PSL data exist for mobile sources such as visitors and delivery vehicles. Therefore, FPL calculated estimates of greenhouse gas (GHG) gas emissions on those direct (stationary and portable combustion sources) in Table 3.3-10 and indirect (workforce commuting) plant activities from information that was reasonably available in Table 3.3-11. As discussed in Section 9.5.2.3, PSL maintains a program to manage stationary refrigeration appliances at the plant to recycle, recapture, and reduce emissions of ozone-depleting substances, including perfluorocarbons, and is in compliance with Section 608 of the CAA. These emissions are not expected to add to the values in Table 3.3-11, therefore FPL did not include potential emissions as result of leakage, servicing, repair, and disposal of refrigerant equipment at PSL.

**Table 3.3-1 Regional Wind Conditions**

| Measurement | Period of Record (years) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Vero Beach, Florida[a]** | | | | | | | | | | | | | | |
| Mean speed (mph) | 36 | 8.4 | 8.7 | 9.4 | 9.4 | 8.9 | 7.5 | 6.8 | 6.6 | 7.3 | 8.5 | 8.5 | 8 | 8.2 |
| Prevailing direction (degrees from) | 36 | 320 | 130 | 110 | 140 | 110 | 110 | 120 | 120 | 60 | 60 | 320 | 320 | 60 |
| Max 3-second speed (mph) | 18 | 47 | 52 | 54 | 62 | 58 | 61 | 63 | 59 | 60 | 74 | 45 | 46 | 74 |
| Max speed year of occurrence | | 2016 | 2007 | 2017 | 2018 | 2006 | 2014 | 2015 | 2011 | 2011 | 2016 | 2017 | 2004 | Oct. 2016 |
| **West Palm Beach, Florida[b]** | | | | | | | | | | | | | | |
| Mean speed (mph) | 36 | 9.9 | 10 | 10.9 | 10.6 | 10 | 8.3 | 7.7 | 7.7 | 8.4 | 9.9 | 10.2 | 9.6 | 9.4 |
| Prevailing direction (degrees from) | 41 | 330 | 330 | 90 | 140 | 90 | 140 | 140 | 110 | 90 | 70 | 80 | 330 | 70 |
| Max 3-second speed (mph) | 26 | 56 | 62 | 51 | 59 | 66 | 82 | 54 | 61 | 91 | 101 | 46 | 48 | 101 |
| Max speed year of occurrence | | 2016 | 2010 | 2011 | 2011 | 2012 | 2019 | 2017 | 2012 | 2017 | 2005 | 1994 | 1994 | Oct. 2005 |

a. (NCDC 2019a)

b. (NCDC 2019b)

**Table 3.3-2 PSL Wind Conditions**

| Measurement | Period of Record (years) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean speed (mph) | 7 | 7.0 | 8.2 | 6.9 | 7.0 | 6.7 | 5.5 | 5.3 | 6.4 | 6.0 | 7.2 | 7.0 | 6.7 | 6.6 |
| Prevailing direction (degrees from) | 7 | 330 | 160 | 120 | 140 | 80 | 160 | 160 | 160 | 80 | 70 | 70 | 170 | 70 |

**Table 3.3-3 Regional Temperatures**

| Measurement | Period of Record (years) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Vero Beach, Florida[a]** | | | | | | | | | | | | | | |
| Mean daily maximum (˚F) | 59 | 72.8 | 73.2 | 77.7 | 80.5 | 85.2 | 87.8 | 89.9 | 90 | 87.3 | 83.7 | 77.6 | 74.3 | 81.7 |
| Highest daily maximum (˚F) | 36 | 88 | 90 | 93 | 95 | 99 | 102 | 99 | 98 | 97 | 94 | 92 | 89 | 102 |
| Year of occurrence | | 1991 | 2019 | 2003 | 2015 | 2000 | 2009 | 1998 | 1999 | 2019 | 2009 | 2002 | 2018 | Jun-09 |
| Mean daily minimum (˚F) | 59 | 52.9 | 53.8 | 58.2 | 62.1 | 68 | 71.5 | 73.5 | 73.9 | 73.1 | 68.9 | 61 | 55.8 | 64.4 |
| Lowest daily minimum (˚F) | 36 | 21 | 28 | 31 | 40 | 47 | 57 | 67 | 64 | 61 | 45 | 37 | 23 | 21 |
| Year of occurrence | | 1985 | 1989 | 2013 | 2009 | 1999 | 1984 | 2008 | 1984 | 2006 | 2012 | 2018 | 1989 | Jan-85 |
| **West Palm Beach, Florida[b]** | | | | | | | | | | | | | | |
| Mean daily maximum (˚F) | 79 | 75.1 | 75.8 | 79.3 | 82.3 | 86 | 88.3 | 90.3 | 90.5 | 88.4 | 85 | 80 | 76.7 | 83.1 |
| Highest daily maximum (˚F) | 82 | 89 | 90 | 95 | 99 | 97 | 98 | 101 | 99 | 97 | 95 | 91 | 90 | 101 |
| Year of occurrence | | 1942 | 1949 | 2011 | 1971 | 2008 | 2011 | 1942 | 2006 | 1937 | 1989 | 1992 | 2009 | Jul-42 |
| Mean daily minimum (˚F) | 79 | 57.1 | 57.8 | 61.8 | 65.8 | 70.3 | 73.4 | 75.1 | 75.4 | 74.6 | 71.2 | 64.7 | 60 | 67.3 |
| Lowest daily minimum (˚F) | 82 | 27 | 32 | 30 | 43 | 51 | 61 | 66 | 65 | 66 | 46 | 36 | 28 | 27 |
| Year of occurrence | | 1977 | 1989 | 1980 | 1987 | 1992 | 1984 | 1937 | 1957 | 1938 | 1968 | 1950 | 1989 | Jan-77 |

a. (NCDC 2019a)

b. (NCDC 2019b)

**Table 3.3-4 PSL and Fort Pierce Temperatures**

| Measurement | Period of Record (years) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PSL Temperature Records** | | | | | | | | | | | | | | |
| Monthly average (˚F) | 7 | 65.5 | 68.8 | 70.8 | 74.9 | 77.4 | 80.3 | 81.8 | 82.2 | 81.5 | 78.9 | 73.3 | 70.8 | 75.7 |
| Highest daily maximum (˚F) | 7 | 84.1 | 85.9 | 90.0 | 92.5 | 89.9 | 91.9 | 92.6 | 96.4 | 97.4 | 90.6 | 93.6 | 84.7 | 97.4 |
| Year of occurrence | 7 | 2017 | 2019 | 2017 | 2020 | 2019 | 2018 | 2020 | 2014 | 2017 | 2016 | 2018 | 2018 | 2017 |
| Lowest daily minimum (˚F) | 7 | 35.8 | 39.9 | 47.7 | 55.5 | 59.1 | 69.5 | 71.5 | 63.2 | 35.6 | 51.4 | 37.4 | 44.2 | 35.6 |
| Year of occurrence | 7 | 2018 | 2015 | 2017 | 2018 | 2017 | 2014 | 2013 | 2015 | 2017 | 2017 | 2018 | 2017 | 2017 |
| **Fort Pierce, Florida, Temperature Records[a]** | | | | | | | | | | | | | | |
| Mean daily maximum (˚F) | 30 | 72 | 74.6 | 77.1 | 81.2 | 84.6 | 87.9 | 89 | 89.8 | 87.7 | 84.2 | 78.1 | 74.9 | 81.8 |
| Highest daily maximum (˚F) | 30 | 89 | 89 | 91 | 94 | 98 | 100 | 101 | 98 | 99 | 98 | 92 | 92 | 101 |
| Year of occurrence | 30 | 1991 | 1997 | 1991<br>1992<br>1994<br>1995<br>1997<br>2011 | 1996<br>1999 | 1995 | 1998 | 1993 | 1993<br>1998 | 1998 | 1998 | 1992 | 1992 | Jul-93 |
| Mean daily minimum (˚F) | 30 | 51.5 | 54.6 | 57.5 | 62.6 | 68.1 | 71.9 | 72.9 | 73.2 | 72.2 | 68.4 | 60.4 | 55.7 | 64.1 |
| Lowest daily minimum (˚F) | 30 | 28 | 25 | 30 | 42 | 45 | 61 | 64 | 61 | 59 | 44 | 34 | 24 | 24 |
| Year of occurrence | 30 | 1996 | 1996 | 2010 | 1990 | 1992 | 1995 | 1995 | 1997 | 1998 | 1993 | 1993 | 2010 | 2010 |

a. (NCDC 2020)

**Table 3.3-5 Regional Precipitation**

| Measurement | Period of Record (years) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Vero Beach, Florida[a]** | | | | | | | | | | | | | | |
| Normal monthly precip. (inches) | 30 | 2.5 | 2.67 | 4.12 | 2.72 | 3.36 | 6.67 | 5.63 | 7.03 | 6.79 | 4.91 | 3.28 | 2.19 | 51.87 |
| Maximum monthly precip. (inches) | 36 | 9.39 | 6.91 | 12.78 | 10.45 | 17.98 | 20.73 | 13.72 | 18.91 | 23.01 | 21.93 | 11.76 | 6.92 | 23.01 |
| Year occurred | | 2016 | 1998 | 1993 | 1997 | 2016 | 1992 | 2007 | 2008 | 2004 | 2011 | 1984 | 2019 | Sep-04 |
| Maximum 24-hour (inches) | 36 | 3.38 | 3.44 | 6.8 | 3.72 | 11.26 | 4.15 | 4.21 | 7.08 | 8.62 | 8.34 | 5.67 | 4.66 | 11.26 |
| Year occurred | | 1991 | 1991 | 1993 | 1998 | 2016 | 2007 | 2000 | 2008 | 2017 | 2011 | 1994 | 2019 | May-16 |
| Minimum monthly precip. (inches) | 36 | T | 0.04 | 0.25 | 0.03 | 0.09 | 0.3 | 0.61 | 1.47 | 1.67 | 0.01 | 0.34 | 0.21 | 0.01 |
| Year occurred | | 2012 | 2001 | 2002 | 1986 | 2004 | 1998 | 2016 | 2013 | 1988 | 2010 | 1989 | 1987 | Oct-10 |
| **West Palm Beach, Florida[b]** | | | | | | | | | | | | | | |
| Normal monthly precip. (inches) | 30 | 3.13 | 2.82 | 4.59 | 3.66 | 4.51 | 8.3 | 5.76 | 7.95 | 8.35 | 5.13 | 4.75 | 3.38 | 62.33 |
| Maximum monthly precip. (inches) | 80 | 11.18 | 8.71 | 16.78 | 18.26 | 15.69 | 20.09 | 17.74 | 22.66 | 29.4 | 18.74 | 14.63 | 11.69 | 29.4 |
| Year occurred | | 1998 | 1983 | 1982 | 1942 | 2009 | 2002 | 1941 | 2012 | 2004 | 1965 | 1982 | 1994 | Sep-04 |
| Maximum 24-hour (inches) | 80 | 9.12 | 5.28 | 8.99 | 15.23 | 7.69 | 9.21 | 5.83 | 6.72 | 10.92 | 9.58 | 7.67 | 8.22 | 15.23 |
| Year occurred | | 1998 | 2002 | 2010 | 1942 | 2013 | 1945 | 1972 | 1988 | 2004 | 1965 | 1984 | 2006 | Apr-42 |
| Minimum monthly precip. (inches) | 80 | 0.11 | 0.14 | 0.33 | 0.04 | 0.39 | 1.07 | 1.22 | 1.73 | 1.39 | 0.56 | 0.23 | 0.06 | 0.04 |
| Year occurred | | 2009 | 2009 | 1956 | 1967 | 1967 | 1952 | 1961 | 1987 | 2019 | 1997 | 1970 | 1968 | Apr-67 |

a. (NCDC 2019a)
b. (NCDC 2019b)

**Table 3.3-6 PSL and Fort Pierce Precipitation Records**

| Measurement | Period of Record (years) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PSL Precipitation Records, 2013–2020** | | | | | | | | | | | | | | |
| Monthly precip. (inches) | 6 | 1.7 | 1.2 | 0.9 | 1.2 | 2 | 2 | 1.4 | 2.4 | 2.3 | 1.2 | 1.3 | 1.3 | 18.9 |
| Maximum monthly precip. (inches) | 6 | 3.5 | 2.5 | 1.5 | 2.3 | 3.1 | 3.1 | 2.3 | 3.8 | 4.5 | 2.1 | 1.7 | 2.3 | 23.1 |
| Year occurred | 6 | 2016 | 2014 | 2017 | 2015 | 2016 | 2016 | 2017 | 2019 | 2017 | 2017 | 2018 | 2015 | 2014 |
| Minimum monthly precip. (inches) | 6 | 0.6 | 0.0 | 0.0 | 0.5 | 1.3 | 0.7 | 0.4 | 0.6 | 0.7 | 0.3 | 0.5 | 0.6 | 11.2 |
| Year occurred | 6 | 2015 | 2018 | 2018 | 2014 | 2015 | 2015 | 2016 | 2018 | 2019 | 2018 | 2016 | 2016 | 2018 |
| **Fort Pierce Precipitation Records, 1990–2019[a]** | | | | | | | | | | | | | | |
| Monthly precip. (inches) | 30 | 3 | 2.7 | 3.1 | 3.4 | 4.1 | 6 | 5.8 | 7.4 | 8.2 | 5.4 | 3.1 | 2.4 | 54.4 |
| Maximum monthly precip. (inches) | 30 | 13.6 | 9.7 | 12.5 | 10.4 | 13.1 | 14.1 | 13.2 | 18.4 | 25.7 | 15.9 | 8.1 | 7.4 | 80.2 |
| Year occurred | 30 | 2014 | 1994 | 1996 | 1997 | 2016 | 1992 | 1991 | 2008 | 2017 | 2011 | 1998 | 1994 | 1994 |
| Minimum monthly precip. (inches) | 30 | 0.00 | 0.10 | 0.10 | 0.60 | 0.40 | 2.30 | 0.00 | 3.40 | 2.70 | 0.30 | 0.30 | 0.10 | 29.80 |
| Year occurred | 30 | 2012 | 2001 | 2002 | 1993 | 2000 | 2009 | 2009 | 1996 | 2006 | 2010 | 2009 | 2001 | 2009 |

a.(NCDC 2020)

**Table 3.3-7 Regional Thunderstorms**

| Period of Record (years) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Vero Beach, Florida[a]** | | | | | | | | | | | | | |
| 44 | 0.8 | 1.2 | 2.5 | 3.3 | 5.3 | 11.3 | 13.3 | 13.6 | 8.8 | 2.7 | 0.8 | 0.5 | 64.1 |
| **West Palm Beach, Florida[b]** | | | | | | | | | | | | | |
| 72 | 1.1 | 1.4 | 2.6 | 3.5 | 7.6 | 14 | 16.2 | 16.6 | 11.8 | 4 | 1.5 | 0.8 | 81.1 |

a. (NCDC 2019a)

b. (NCDC 2019b)

**Table 3.3-8 PSL Stability Class Distributions**

| Percent Frequency of Occurrence by Stability Class Pasquill Stability Class | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Year** | **A** | **B** | **C** | **D** | **E** | **F** | **G** |
| 2015 | 38.3 | 2.7 | 1 | 19.4 | 35.1 | 3 | 0.6 |
| 2016 | 29.3 | 3 | 1.3 | 21.8 | 38.8 | 4.5 | 1.3 |
| 2017 | 39 | 2.3 | 1.2 | 20.2 | 30.5 | 4.7 | 2 |
| 2018 | 26.1 | 3.6 | 1.9 | 25.9 | 37.2 | 3.9 | 1.5 |
| 2019 | 28.8 | 3.5 | 1.5 | 26.8 | 32.5 | 4.2 | 2.8 |
| 2015-2019 | 32.3 | 3 | 1.4 | 22.8 | 34.8 | 4.1 | 1.6 |

Classes are as follows (NRC 2007, Regulatory Guide 1.23, Table 1):

Class A: Extremely unstable

Class B: Moderately unstable

Class C: Slightly unstable

Class D: Neutral

Class E: Slightly stable

Class F: Moderately stable

Class G: Extremely stable

**Table 3.3-9 Permitted Air Emission Sources (Sheet 1 of 2)**

| Emission Source[(a)] | Description | Capacity Rating | Permit Conditions |
|---|---|---|---|
| EU ID 001 | (4) MKW<br>Model 12-645-E4<br>Diesel<br>Generators | (2) 3,400 kW<br>(2300 HP) each<br><br>(2) 3,800 kW<br>(3070 HP)<br>each | SO2 – May burn only distillate fuel oil with sulfur content of less than 0.0015% (15 ppm) by weight.<br>Cetane and Aromatic – Must have a minimum cetane index of 40 or must have a maximum aromatic content of 35 percent by volume.<br>Unlimited usage for emergency situations.<br>Limited to 100 hours per year for recommended maintenance.<br>Limited to 50 hours per year of non-emergency use as a part of the 100 hours per year for maintenance.<br>Limited to 30 minutes for startup. |
| EU ID 006 | John Deere<br>Model 4039D<br>Diesel Generator | 60 kW (80 HP) | SO2 – may burn only distillate fuel oil with sulfur content of less than 0.0015% (15 ppm) by weight<br>Cetane and Aromatic – must have a minimum cetane index of 40 or must have a maximum aromatic content of 35 percent by volume<br>Unlimited usage for emergency situations<br>Limited to 100 hours per year for recommended maintenance<br>Limited to 50 hours per year of non-emergency use as a part of the 100 hours per year for maintenance.<br>Limited to 30 minutes for startup |
| EU ID 006 | Onan<br>Model 47GGFE-4132<br>Propane<br>Generator | 47 kW (63 HP) | Fuel shall be propane only<br>Unlimited usage for emergency situations<br>Limited to 100 hours per year for recommended maintenance<br>Limited to 50 hours per year of non-emergency use as a part of the 100 hours per year for maintenance.<br>Limited to 30 minutes for startup |

**Table 3.3-9 Permitted Air Emission Sources (Sheet 2 of 2)**

| Emission Source[a] | Description | Capacity Rating | Permit Conditions |
|---|---|---|---|
| EU ID 007<br>EP 1 | Kohler<br>Model 20REOZD<br>Diesel Generator | 20 kW (36HP) | SO2 – may burn only distillate fuel oil with sulfur content of less than 0.0015% (15 ppm) by weight<br>Cetane and Aromatic – must have a minimum cetane index of 40 or must have a maximum aromatic content of 35 percent by volume<br>Unlimited usage for emergency situations<br>Limited to 100 hours per year for recommended maintenance, emergency demand response, and deviation of voltage or frequency.<br>Limited to 50 hours per year of non-emergency use as a part of the 100 hours per year for maintenance.<br>Limited to 30 minutes for startup.<br>NMHC and NOx - shall not exceed 7.5 g/kW-hr<br>CO – shall not exceed 5.5 g/kW-hr<br>PM – shall not exceed 0.60 g/kW-hr |
| EU ID 007<br>EP 2 | Cummins<br>Model DQCC-1964904<br>Diesel Generator | 800 kW<br>(1080 HP) | SO2 – may burn only distillate fuel oil with sulfur content of less than 0.0015% (15 ppm) by weight<br>Cetane and Aromatic – must have a minimum cetane index of 40 or must have a maximum aromatic content of 35 percent by volume<br>Unlimited usage for emergency situations<br>Limited to 100 hours per year for recommended maintenance, emergency demand response, and deviation of voltage or frequency.<br>Limited to 50 hours per year of non-emergency use as a part of the 100 hours per year for maintenance.<br>Limited to 30 minutes for startup<br>NMHC and NOx - shall not exceed 6.4 g/kW-hr<br>CO - shall not exceed 3.5 g/kW-hr<br>PM - shall not exceed 0.20 g/kW-hr |

a. Stationary combustion sources also subject to 40 CFR Part 63, Subpart ZZZZ—National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines.

**Table 3.3-10 Reported Annual Air Emissions Summary, 2015–2019**

| Annual Emissions (tons/year) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Year** | **CO** | **CPM** | **NOX** | **PM** | **PM 10** | **PM 2.5** | **SO2** | **VOC** |
| 2015 | 8.7468 | 0.0323 | 33.2211 | 1.7914 | 1.7914 | 0.0000 | 1.2744 | 4.7818 |
| 2016 | 5.1609 | 0.0157 | 18.7616 | 1.0447 | 1.0447 | 0.0000 | 0.7780 | 3.6136 |
| 2017 | 5.2445 | 0.0183 | 19.5216 | 1.0603 | 1.0603 | 0.0000 | 0.7633 | 3.1872 |
| 2018 | 5.7493 | 0.0271 | 22.4878 | 1.1339 | 1.1339 | 0.0000 | 0.7323 | 2.2587 |
| 2019 | 6.4018 | 0.0216 | 24.1853 | 1.3327 | 1.3229 | 0.0092 | 0.9966 | 3.7356 |

**Table 3.3-11 Annual Greenhouse Gas Emissions Inventory Summary, 2015–2019[a]**

| Carbon Dioxide Equivalent ($CO_2e$) Emissions, Metric Tons | | | | | |
|---|---|---|---|---|---|
| **Emission Source** | **2015** | **2016** | **2017** | **2018** | **2019** |
| Combustion Sources[a] | 1,353 | 763 | 797 | 962 | 978 |
| Workforce Commuting[b] | 3,546 | 3,546 | 3,546 | 3,546 | 3,546 |
| **TOTAL** | 4,899 | 4,309 | 4,343 | 4,508 | 4,524 |

a. GHG calculated emissions are based on the following:

Fuel usage for combustion sources shown in PSL annual compliance certification reports for 2015-2019 indicated by the referenced sources of Table 3.3-10; EPA Table 1 GHG Emission Factors for Greenhouse Gas Inventories – Distillate Fuel Oil No. 2; and 40 CFR Part 98 Table A-1 to Subpart A Global Warming Potentials.

b. Workforce commuting calculations are based on:

1. Statistical information from U.S. Census Bureau indicates that 4.7 percent of Florida workers in the Transportation and warehouse and utilities industry carpool to work (USCB 2020c). Number of PSL employees as of December 2020 was 804. Utilizing the 4.7 percent USCB carpool statistic, a value of "766" passenger vehicles per day was utilized.

2. The EPA's greenhouse gas equivalencies calculator the $CO^2e$/year to be 3,564 metric tons for 766 vehicles (EPA 2020b; EPA 2020c).

3. Carbon dioxide has a global warming potential (100-year time horizon) of "1" based on Table A-1 to Subpart A of 40 CFR Part 98.

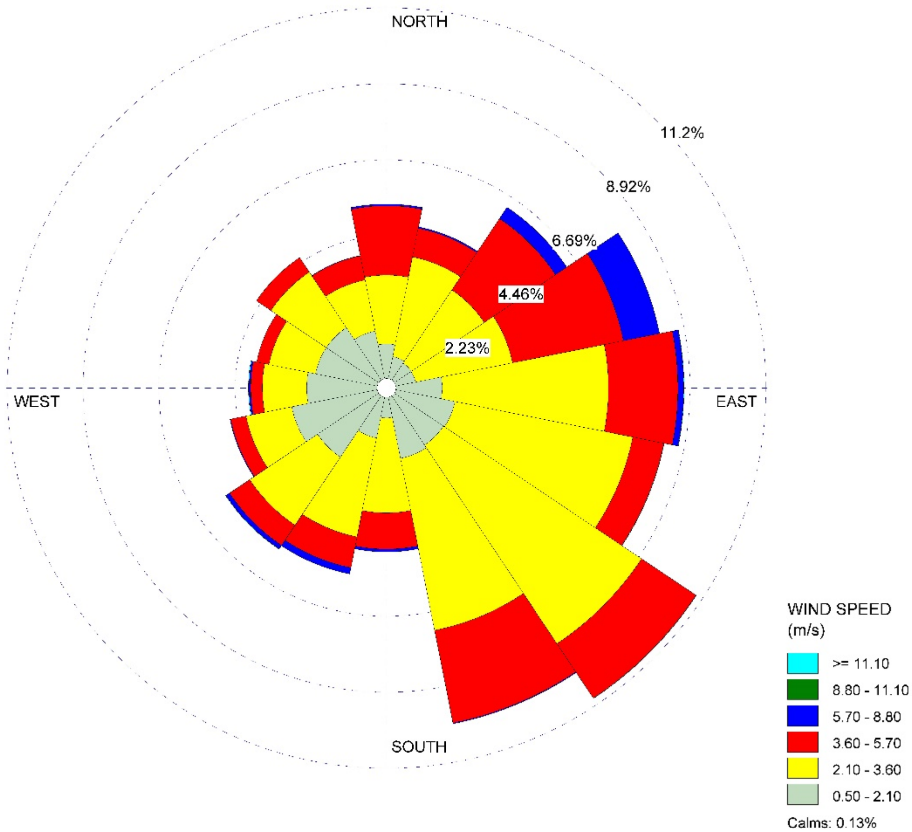
4. 3,546 metric tons $CO^2e$/year × 1 (global warming potential).

WIND ROSE PLOT:

**PSL**
**2015**

DISPLAY:

**Wind Speed**
**Direction (blowing from)**




COMMENTS:

DATA PERIOD:

**Start Date: 1/1/2015 - 00:00**
**End Date: 12/31/2015 - 23:00**

COMPANY NAME:

MODELER:

CALM WINDS:

**0.13%**

TOTAL COUNT:

**8756 hrs.**

AVG. WIND SPEED:

**2.91 m/s**

DATE:

**12/15/2020**

PROJECT NO.:

**ENERCON 2020**

WRPLOT View - Lakes Environmental Software

**Figure 3.3-1 2015 PSL Wind Rose**

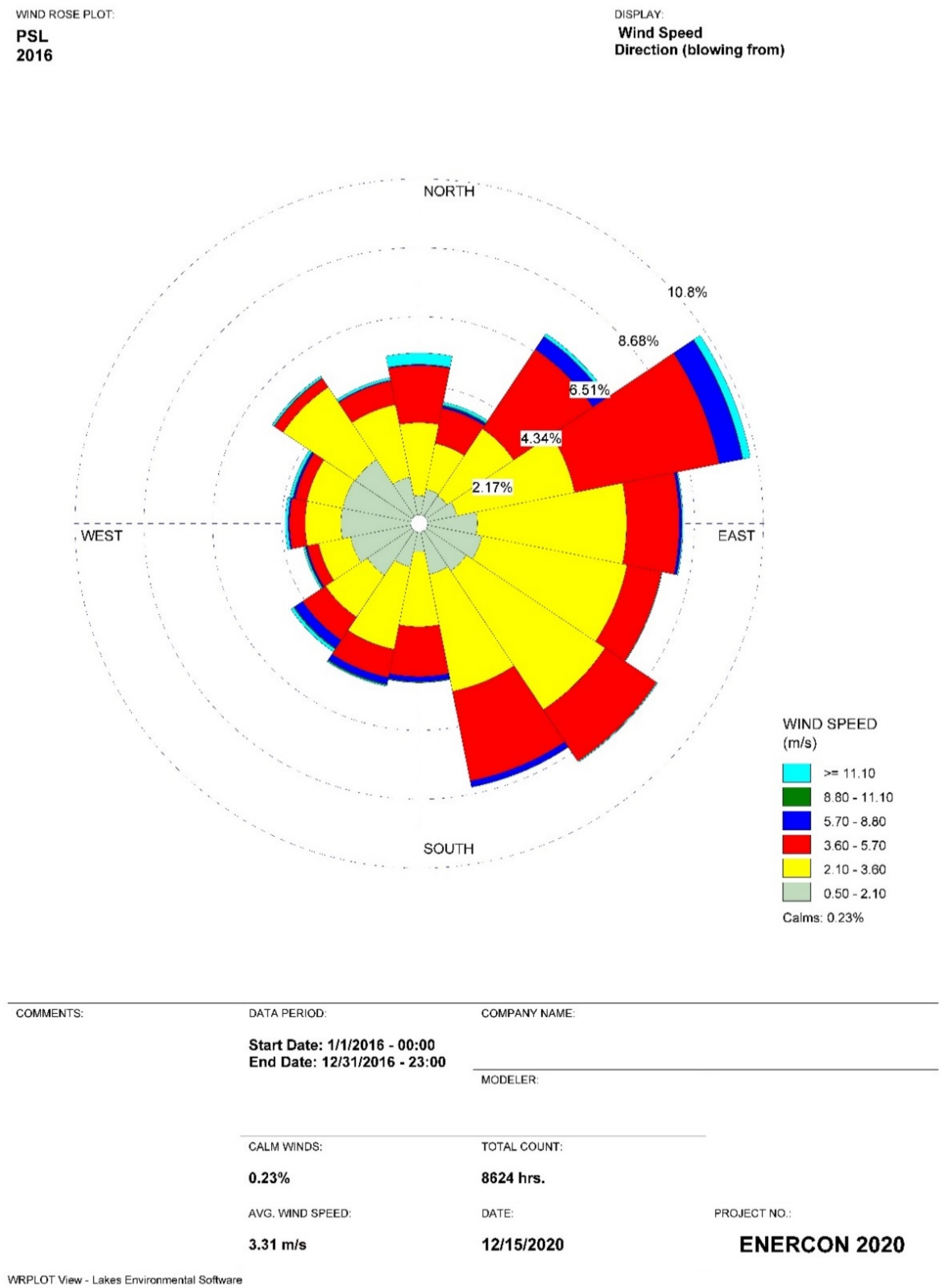



**Figure 3.3-2 2016 PSL Wind Rose**

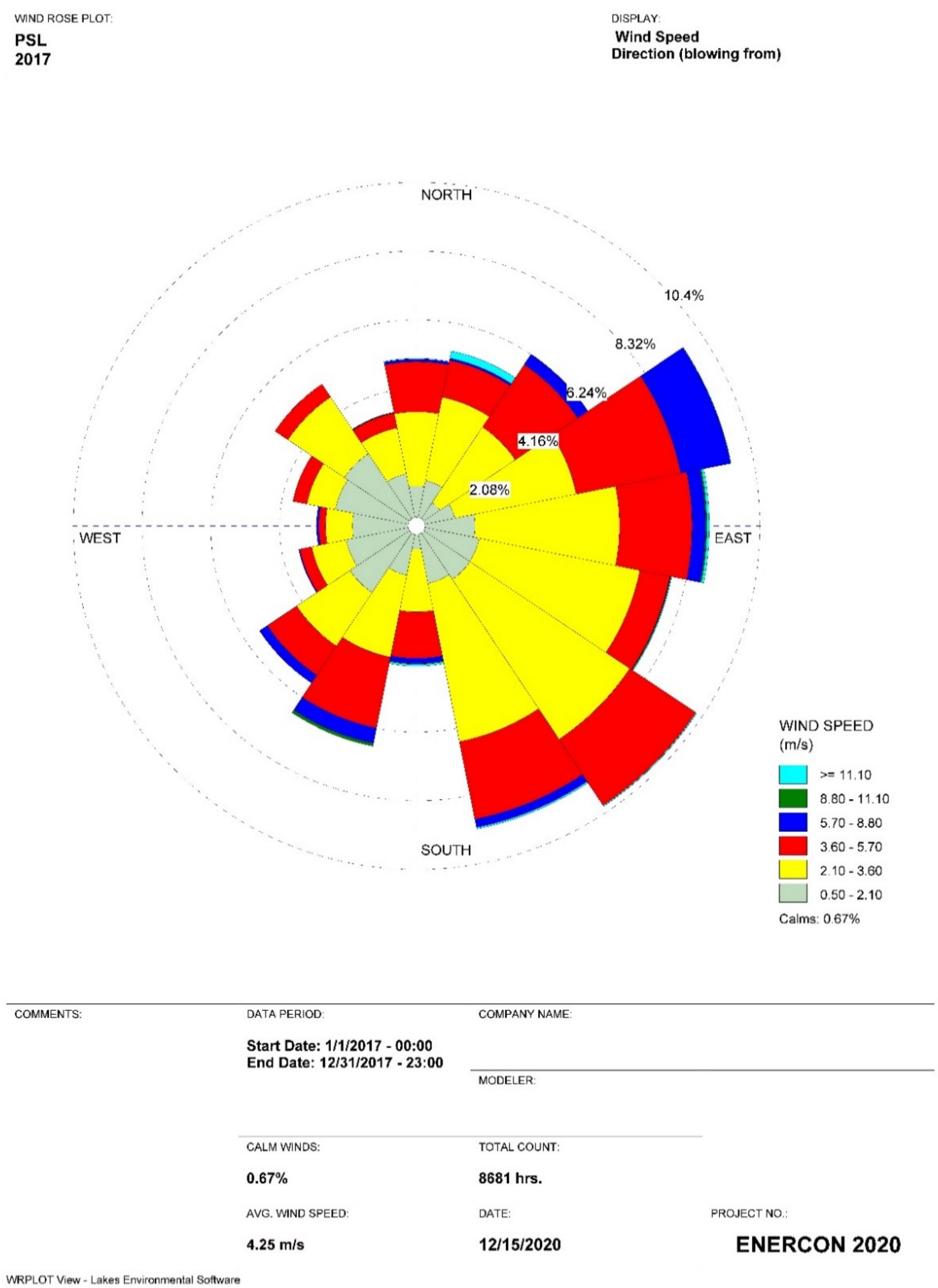



**Figure 3.3-3 2017 PSL Wind Rose**

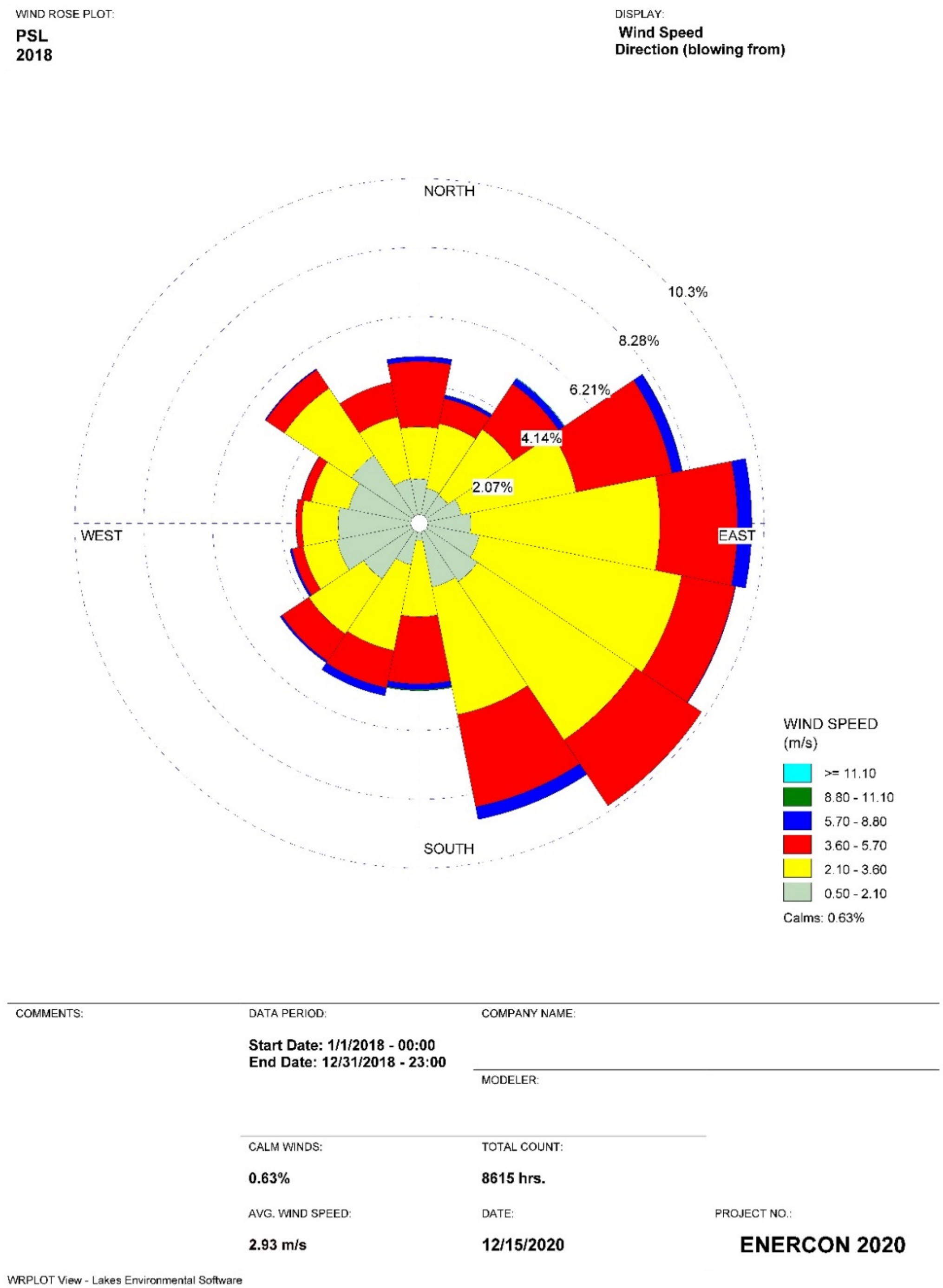



**Figure 3.3-4 2018 PSL Wind Rose**

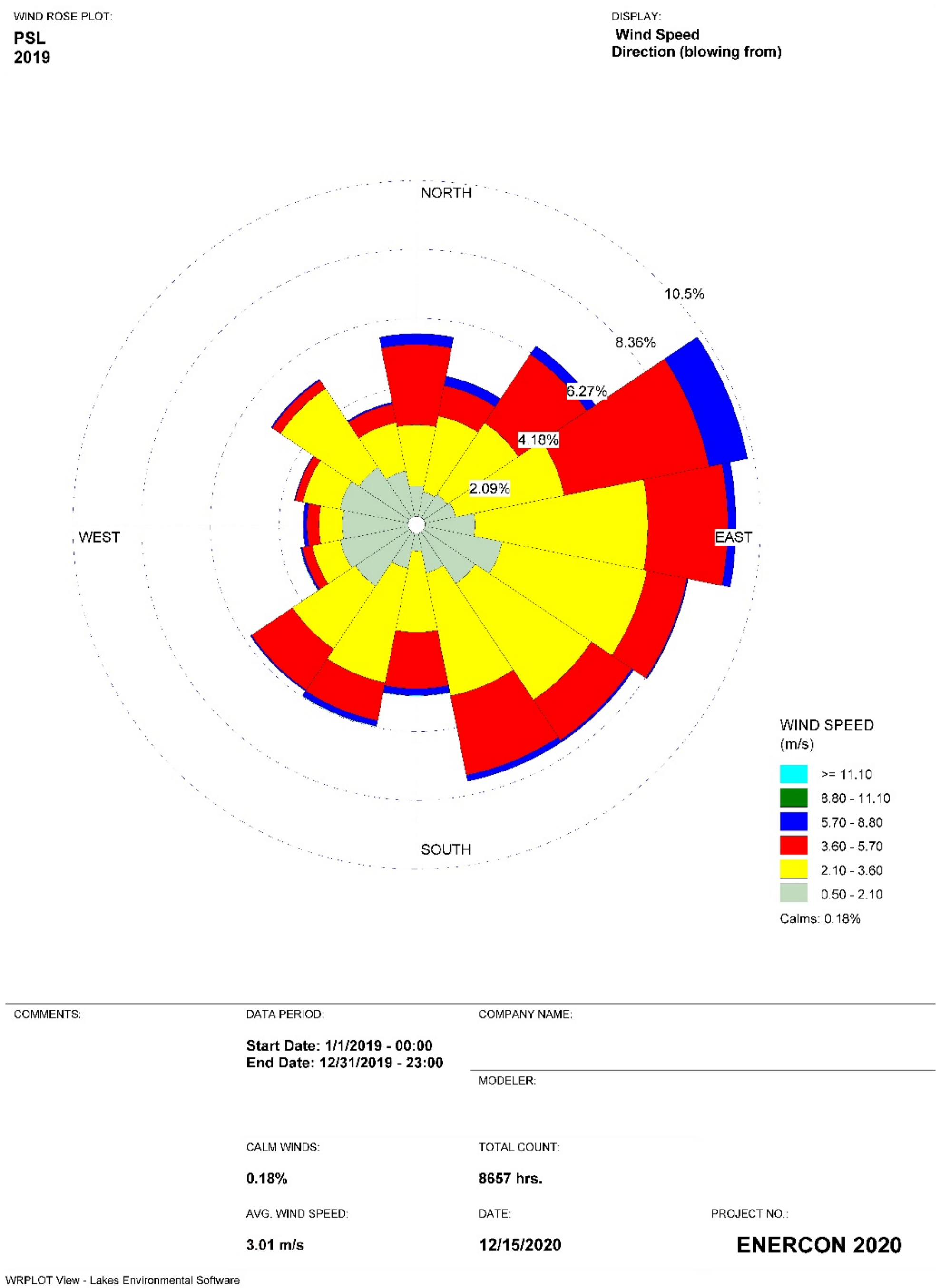



**Figure 3.3-5 2019 PSL Wind Rose**

## 3.4 Noise

Noise is produced at PSL from industrial plant operations and site activities. Industrial background noise at PSL is generally from emergency diesel generator operations, turbine generators, transformers, loudspeakers, transmission lines, firing range, and the main steam safety valves.

The loudest sounds emitted from PSL plant systems are from emergency sirens, the releasing of steam into the atmosphere, and the use of firearms at the site's security training facility. The point of the site boundary closest to the firing range is approximately 670 feet from the closest point of the site boundary to the south-southwest. The nearest residence is approximately 1.5 miles southeast of the plant on Hutchinson Island (FPL 2020b).

St. Lucie County's noise control ordinance requires that noise levels shall not exceed 70 A-weighted decibel scale (dBA) for industrial sites. However, noise resulting from electric generation plants is exempt from the noise ordinance requirements. The City of Fort Pierce and the City of Port St. Lucie have also established maximum permissible noise levels for different land use categories. However, electric generation plants are also exempt from noise ordinance requirements established by the City of Fort Pierce and the City of Port St. Lucie ordinances.

An ambient noise study was performed in September 2007 as part of the PSL site certification application (SCA) for the power uprate project. As part of the noise study, data were collected at six far-field and four boundary monitoring locations. These noise measurements provide information on the baseline noise levels in the area during both the daytime and nighttime periods for the far-field locations. (FPL 2007)

The noise study considers Leq and L90 parameters to determine baseline noise levels. The Leq (equivalent sound pressure level averaged for the sampling period) represents the total sound energy observed over the monitoring which includes transient noise. The L90 best represents noise from continuous noise sources such as power plants because transient noise, such as traffic, is generally excluded. The Leq noise levels reflect the total noise energy over a 15-minute period at each of the far-field locations and 1 minute at each of the near-field locations. As a result, louder transient noises such as noise from sporadic traffic, high-flying aircraft, and insects all influence the observed values. These transient noise sources, especially where much high maximum sound level was observed during the monitoring period, bias the Leq higher than if those noise sources are excluded. For this reason, the L90 is a more representative noise metric, especially in determining the noise influence from a continuous noise source such as a power plant. (FPL 2007)

The L90 sound levels observed at the residential area nearest to PSL ranged from 41 to 59 dBA during the daytime and from 41 to 49 dBA at night. With the exception of the daytime noise monitoring at one monitoring location, the observed noise levels were below the maximum permissible noise levels in the St. Lucie County noise ordinance. Noise level at one monitoring location was higher during daytime due to ongoing construction in the vicinity of the monitoring location. The results of the noise survey indicate that the noise levels from PSL do not exceed the maximum permissible noise levels in the St. Lucie County noise ordinance. (FPL 2007)

Because PSL is located in a rural area (away from urban areas), it is unlikely that noise levels from the plant would affect offsite residences. This is further substantiated by the fact that during the most recent 5 years (2015–2019), there have been no noise complaints received from offsite residences by PSL as it relates to PSL plant operational and outage activities. Therefore, no noise issues affecting offsite residences are anticipated during the proposed SLR operating term because noise levels at PSL are expected to remain the same as under current operating conditions.

Noise from PSL at locations on the plant site is barely noticeable except very close to the reactor containment vessels. From offsite, approaching from the north or south along SR A1A or across the Indian River, no noise is heard from the plant. (NRC 2003)

The FPL hearing conservation procedure requires implementation of noise control methods in all facilities and at all jobsites where employees are exposed to noise levels at or above the 8-hour time weighted average of 85 decibels (dB). FPL considers a high noise area as any area in which an individual may receive equal to or greater than an 8-hour time-weighted average of 90 dB measured on the A scale of a sound level meter. The FPL hearing conservation procedure requires annual audiometric exams to identify any hearing threshold shifts.

## 3.5 Geologic Environment

### 3.5.1 Regional Geology

The PSL site is in eastern Florida, which falls within the Coastal Plain physiographic province. The Floridian section of the Coastal Plain is subdivided into multiple provinces (Figure 3.5-1). The Florida peninsula is a prominent southeastward protrusion of the North American continent forming the eastern boundary of the Gulf of Mexico and separates the Gulf from the Atlantic Ocean. The peninsula is about 400 miles long and approximately 150 miles wide at its widest point.

The peninsula of the State of Florida is the exposed portion above sea level of the Floridan Plateau and lies entirely within the Coastal Plain physiographic province .

The site is situated on the southern portion of the Floridan Plateau, a stable carbonate platform on which thick deposits of Cretaceous and Tertiary limestones, dolomites, evaporites, and comparatively small amounts of clastic sediments have accumulated. The Florida peninsula, as it exists today, is the emergent part of this plateau, and lies totally within the Coastal Plain physiographic province of eastern North America.

The Coastal Plain sediments deposited on the Floridan Plateau consist of sequences of Cretaceous, Tertiary, and Quaternary carbonate rocks such as dolomites, evaporites, and limestones. For the most part, these deposits were accumulated in shallow transgressive and regressive seas. Occasionally, major regressions of the sea exposed sections of the Coastal Plain, resulting in buried erosional surfaces and unconformities.

The Floridan Plateau is flanked on the west by abyssal depths of about 12,000 feet in the Gulf of Mexico. The water depth decreases from about minus 5,000 feet between Key West and Cuba to about minus 1,800 feet between the Floridan Plateau and the Bahama Banks, southeast of the site. East of the shoreline is the submerged continental shelf. The major morphological element of the shelf is a submerged coastal plain with naturally divisible inner and outer zones. In the area between Palm Beach and Port Canaveral, the shelf region varies from two to 38 miles in width and is 12 miles wide in the site area. It terminates at a break marking the top of the Florida-Hatteras slope in water depths ranging from 80 to 230 feet. The Florida-Hatteras slope forms the western wall of the Straits of Florida.

The major landforms are generally aligned in a northerly direction and may be grouped into three classifications: 1) highland ridges, 2) interior plains and valleys, and 3) coastal lowland areas. The site is located within the coastal lowlands.

The coastal lowlands are characterized by relatively flat relief and swampy or marshy terrain. The lowlands along the coastal areas consist of marine terraces having elevations generally less than 25 feet MSL.

Recognizable landforms within the coastal lowlands are: 1) the present coastline depositional environment, 2) the Atlantic Coastal Ridge, and 3) a broad shallow valley or swale that contains the headwaters of the St. Johns River and the St. Lucie River. West of the Coastal Lowlands is a higher terrace of the interior plain and valleys, which extends westward to the highland ridges.

The easternmost landform within the coastal lowlands depositional environment includes the barrier islands and the lagoonal areas of the Indian River. The barrier islands, including Hutchinson Island, were probably formed as offshore bars during a period of higher sea level. These islands vary in width from a few hundred feet to about one mile. Surface elevations range from sea level to about plus 15 feet with the higher elevations along the present coastline. The western portions of the islands are primarily mangrove swamps.

The western bank of the Indian River is the Atlantic Coastal Ridge, where surface elevations reach a maximum of about plus 40 feet. The ridge is an almost continuous landform extending from the Sebastian River in northern Indian River County south to the St. Lucie River at Stuart. The average width of the ridge is approximately one quarter to one half mile. The Atlantic Coastal Ridge is a remnant of an offshore bar that was formed in the Pamlico Sea.

West of the coastal ridge is a flat or shallow trough-shaped area that is analogous to the present Indian River. Portions of the broad flat area are divisible into the St. Johns Marsh to the north and the Allapattah Flats to the south.

### 3.5.2 Site Geology

The site is located in the Atlantic Coastal Ridge region of the east coast, which is characterized by barrier islands. The site is located on Hutchinson Island and is bounded by the Atlantic Ocean to the east, Herman Bay to the south, the Indian River to the west, and Big Mud Creek to the north. (FPL 2013, Section 6a)

In the St. Lucie region, the upper 600 feet of sediments consist of partially cemented and indurated sands and clays. Below 600 feet, sediments are moderately hard to hard limestones and dolomites with some sandstones, shales, and anhydrites.

The U.S. Geological Survey (USGS) online map of the geology of Florida maps Holocene sediments and the Pleistocene Anastasia Formation underlying soils on the PSL site. Holocene sediments consist of quartz sands with minor amounts of peat, clay, and carbonate sands and muds. The major lithologic constituents of the Anastasia Formation are interbedded sands and coquinoid limestones with unconsolidated to moderately indurated unfossiliferous to very fossiliferous beds. Figure 3.5-2 depicts the Surficial Geology map of the subject property and surrounding areas. (USGS 2021b)

In the vicinity of the site, the surficial aquifer soils are composed of Holocene-age quartz sand of the Pamlico Sand and the underlying Pleistocene-age Anastasia Formation is composed of an interbedded mixture of sand, silt, clay, shells, and limestone, which extend to a depth of approximately 150 feet below land surface (bls). The Anastasia Formation consists of gray, slightly clayey and silty, fine to medium sand with fragmented shells, and in places, fragmented shell beds with slightly clayey and silty fine sands. Underlying the Anastasia Formation is a thin sequence of shell marls and sands, known as the Tamiani Formation. The Tamiani Formation is underlain by about 400 feet of partially cemented and indurated sands, clays, and sandy limestones of the Miocene Hawthorne Formation.

The upper 100 to 150 feet of the Hawthorne Formation consists of green, slightly clayey, and silty, very fine sand. The lower part becomes generally more clayey. The lithology of the Hawthorne Formation changes slightly to a gray white, phosphatic, sandy clay in the site area below elevation minus 450 feet.

The low permeability Hawthorne Group sediments (approximately 500 to 600 feet thick) consist of clays and marls to depths ranging from approximately 650 to 750 feet bls .

Underlying the Hawthorne Group sediments are the Eocene to Paleocene-age marine carbonates (generally limestone and dolomite) that comprise the Floridan aquifer. In descending order, there are approximately 100 feet of Ocala Limestone, 1,450 feet of Avon Park Formation, 1,100 feet of Oldsmar Formation, and 900 feet of Cedar Keys Formation. These sedimentary deposits are underlain by Cretaceous-age sediments consisting of carbonates, evaporites, sands, and shales that occur at an approximate depth of -4,150 feet National Geodetic Vertical Datum (NGVD).

The lower and upper subdivisions of the Ocala Limestone are based on distinct lithologic differences. The lower subdivision consists of a more granular limestone (grainstone to packstone). The lower facies is not present everywhere and may be partially to completely dolomitized in some regions. The upper unit is composed of variably muddy (carbonate), granular limestone (packstone to wackestone with very limited grainstone). Often this unit is very soft and friable with numerous large foraminifera. (Scott 1992)

The Avon Park Formation is primarily composed of fossiliferous limestone interbedded with vuggy dolostone. The Oldsmar Formation consists predominantly of limestone interbedded with vuggy dolostone. The Paleocene Cedar Keys Formation consists primarily of dolostone and evaporites (gypsum and anhydrite) with a minor percentage of limestone. (Scott 1992)

All of these formations slope gently to the southeast and overlie a Paleozoic crystalline basement. Columnar geologic cross sections are shown in Figures 3.5-3a, 3.5-3b, 3.5-3c, and 3.5-3d.

Solutioning of carbonate rocks and resulting karst topography is well developed in some portions of Florida. However, a study of satellite photography shows no evidence of advanced solutioning of carbonate bedrock formations and resulting lake development within 40 miles of the site.

The site is located in one of the least likely areas for sinkhole development. This is because 1) the water-bearing limestones of the Floridan aquifer in the site area were never significantly emergent, precluding the formation of extensive cavernous zones; 2) they were relatively quickly buried by thick sequences of impermeable Hawthorne sediments; 3) considering the thickness of the Hawthorne sequence, Late Neogene sea level fluctuations probably never reached down to the underlying limestones; 4) the potentiometric surface is, and was, considerably above the artesian system, creating considerable upward pressure in the overlying sediment; and 5) there is little or no leakage, natural or artificial, through the overlying sediments to reduce that pressure.

### 3.5.3 Soils

#### 3.5.3.1 Onsite Soils and Geology

Soil units that occur within the PSL property boundary are described in detail in Table 3.5-1 and shown in Figure 3.5-4. They are also summarized below. Approximately 96.1 percent of the site has soil cover. The remaining 3.9 percent of the area is covered in water (1.2 percent) and waters of the Atlantic Ocean (2.8 percent). (USDA 2020b)

- Arents, 0 to 5 percent slopes
- Arents, 45 to 65 percent slopes
- Beaches
- Canaveral fine sand
- Palm Beach fine sand
- Kesson-Terra Ceia complex
- Urban land

The naturally occurring soil and sediments near the power block were excavated to an elevation of approximately -62 feet NGVD and replaced with Class I fill. Outside of the power block area, the soil and sediments were also excavated to approximately -62 feet NGVD or shallower and were replaced with Class II fill material.

#### 3.5.3.2 Erosion Potential

Because PSL has been operational since the early 1970s, stabilization measures are already in place to prevent erosion and sedimentation impacts to the site and vicinity. Based on information from the U.S. Department of Agriculture (USDA), all soil units listed in Table 3.5-1 subject to erosion have a slight erosion potential (USDA 2020b).

PSL maintains and implements a SWPPP that identifies potential sources of pollution reasonably expected to affect the quality of stormwater, such as erosion, and identifies BMPs that will be used to prevent or reduce the pollutants in stormwater discharges. These practices, as they relate to erosion, include cement or gravel aprons installed at the intake and discharge canals, paved or gravel secured areas of PSL, native vegetation planted at the beach irrigated as necessary, and vegetated natural wetlands, as necessary. In addition, the PSL SWPPP must be amended whenever there is a change in design, construction, operation, or maintenance, which has a significant effect on the potential for the discharge of pollutants to waters of the state or if the plan proves to be ineffective in the general objectives of reducing pollutants in wastewater or stormwater discharges.

#### 3.5.3.3 Prime Farmland Soils

The USDA's Natural Resources Conservation Service maps show no areas of prime farmland surrounding and within the developed portion of the PSL site (USDA 2020b). Soil units and prime farmland designations are listed in Table 3.5-1.

### 3.5.4 Seismic History

The magnitude of a seismic event is described by two methods: the modified Mercalli (MM) intensity scale and the Richter magnitude scale. The MM intensity is an estimate of the amount of damage caused at a site by an earthquake. The Richter magnitude scale is an approximate measure of the total amount of energy released by an earthquake. Accurate locations for earthquake epicenters have been available since the installation of modern seismographs in the region. Without seismographs, earthquakes were described using the MM intensity.

Most of the major earthquakes of the world have been related to distinct structural features. The strains associated with the continuing deformation of these features are the proximate causes of the earthquakes. In the southeastern United States, with the absence of both contemporary mountain building and continuing faulting, earthquakes are more difficult to explain. Although various hypotheses have been advanced relating the earthquakes to structural features in this region, there is no direct evidence of their association. The geologic evidence suggests that southeast earthquakes are the result of minor adjustments from the residual strains associated with earlier movements or with continuing warping.

Specific geologic structures or faults are not generally recognized in the southeastern United States as being capable of generating earthquakes.

The site is located within the Coastal Plain province of the southeastern United States. With the exception of Charleston, South Carolina area, the Atlantic and Gulf Coastal Plain region has been essentially aseismic during the 200-year historical period. The Atlantic Coastal Plain is underlain by basement rocks of the Appalachian orogenic belt, whereas basement rocks of the western Gulf Coastal Plain belong to the Ouachita belt. Tectonic features which might be responsible for the few scattered earthquakes within this region are hidden by thick deposits of unconsolidated sediments, and no tectonic cause for the observed seismicity is known. Extraction of fluids may be responsible for some of the small, isolated earthquakes, particularly in the Gulf Coastal Plain.

Earthquakes in Florida have been infrequent, of low to moderate intensity, and have epicenters at least 100 miles from the site. Several small earthquakes have been felt in the vicinity of Green Cove Springs, located near Jacksonville, more than 180 miles north of the site. The other minor earthquakes within the state have been randomly scattered. There is no evidence that any are related to observed structural features. The strongest earthquake felt in the state during the 200 years of historic record was the 1886 Charleston, South Carolina, earthquake, centered about 380 miles to the north.

Most of the Florida epicenters are randomly scattered individual events. However, it is significant that five of the epicenters have occurred within about 50 miles of Green Cove Springs, a small town 25 miles south of Jacksonville. The nearest event in this group of epicenters is approximately 180 miles from the site. The origin and depth of focus of these earthquakes have not been established. No specific geologic or geophysical investigations relating geology in the Green Cove Springs area to the earthquake epicentral concentration have been published.

Epicentral locations of seismic events greater than intensity IV/magnitude 3.0 within a 400-km (approximately 248.5 miles) radius of the site from 1879 through 2020 are listed in Table 3.5-2 and shown in Figure 3.5-5 (USGS 2020b). There were five experimental explosions in 2016 triggering magnitude 3.7 and 3.8 seismic events in the Atlantic Ocean east of Jacksonville, Florida (USGS 2020b).

The USGS's national seismic hazard map shows that the PSL site is in a region with a 2 percent in 50 years (once in 2,500 years) probability of exceeding a peak ground acceleration between 0.04 and 0.08g (Peterson et al. 2015, Figure 1).

**Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 1 of 2)**

| Map Unit Symbol[(a)] | Soil Unit Name | Description | Farmland Designation |
|---|---|---|---|
| 4 | Arents, 0-5% slopes, slightly eroded | The Arents component makes up 4.1% of the map unit. Slopes are 0-5%. This component is on rises on marine terraces. The parent material consists of altered marine deposits. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is high to very high. Available water to a depth of 3 inches is very low. Runoff class is high. This soil is not flooded. It is not ponded. The frost-free period is 350-365 days. Depth to the water table is 18-36 inches. Non-irrigated land capacity classification is 6s. The soil does not meet hydric criteria. | Not prime farmland |
| 5 | Arents, 45-65% slopes, erosion not rated | The Arents component makes up 9.4% of the map unit. Slopes are 45-65%. This component is on ridges on marine terraces. The parent material consists of altered marine deposits. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high to very high. Available water to a depth of 3.6 inches is low. Runoff class is negligible. This soil is not flooded. It is not ponded. The frost-free period is 350-365 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 7e. The soil does not meet hydric criteria. | Not prime farmland |
| 9 | Beaches, erosion not rated | The Hiwassee component makes up 1.7% of the map unit. Slopes are 1-15%. This component is beaches on marine terraces. The natural drainage class is poorly drained. This soil is frequently flooded. The frost-free period is 190-210 days. Depth to the water table is about 0-72 inches. Non-irrigated land capacity classification is 8. The soil hydric status is unranked. Additional soil properties are not reported. | Not prime farmland |
| 10 | Canaveral fine sand, 0-5% slopes, slightly eroded | The Canaveral component makes up 7.7% of the map unit. Slope are 0-5%. This component is on flats and ridges on marine terraces. The parent material consists of sandy marine deposits. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is very high. Available water to a depth of 4.8 inches is low. Runoff class is negligible. This soil is not flooded. It is not ponded. The frost-free period is 350-365 days. Depth to the water table is about 18-42 inches. Non-irrigated land capacity classification is 6s. The soil does not meet hydric criteria. | Not prime farmland |

**Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 2 of 2)**

| Map Unit Symbol[(a)] | Soil Unit Name | Description | Farmland Designation |
|---|---|---|---|
| 27 | Palm Beach fine sand, 0-5% slopes, slightly eroded | The Palm Beach component makes up 1.4% of the map unit. Slopes are 0-5%. This component is on dunes and ridges on marine terraces. The parent material consists of shells and sandy marine deposits. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is excessively drained. Water movement in the most restrictive layer is very high. Available water to a depth of 2.4 inches is very low. Runoff class is negligible. This soil is not flooded. It is not ponded. The frost-free period is 350-365 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 7s. The soil does not meet hydric criteria. | Not prime farmland |
| 35 | Kesson-Terra Ceia complex, tidal, slightly eroded | The Kesson-Terra Ceia component makes up 67.7% of the map unit. Slopes are 0-1%. This component is on tidal marshes on marine terraces. The parent material consists of sandy marine deposits with shells. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is high to very high. Available water to a depth of 5.8 inches is low. Runoff class is very high. This soil is very frequently flooded. It is not ponded. The frost-free period is 350-365 days. Depth to the water table is about 0 inches. Non-irrigated land capacity classification is 8. The soil meets hydric criteria. | Not prime farmland |
| 47 | Urban land, 0-2% slopes, erosion not rated | Urban land makes up 4.1% of the map unit. Slopes are 0-2%. This component is on hills, rises, flatwoods, knolls, and ridges on marine terraces. There is no reported parent material. Runoff class is not reported. The frost-free period is 345-365 days. Depth to the water table is not reported. Non-irrigated land capacity is not reported. The hydric soil rating is unranked. Additional soil properties are not reported. | Not prime farmland |

(USDA 2020b)

a. See Figure 3.5-4 for map unit symbols.

**Table 3.5-2 Historic Seismic Events of Intensity IV/Magnitude 3.0 Body-Wave or Greater within 400 km of PSL, 1879–2020[a]**

| Earthquake Date | Time | Latitude | Longitude | Magnitude | Distance from PSL (km/miles) | Approximate Location |
|---|---|---|---|---|---|---|
| 1/12/1879 | Not reported | 29.5 | -82.0 | VI MM | 294/183 | Green Cove Springs, FL |
| 6/20/1893 | Not reported | 30.4 | -81.7 | IV MM | 367/228 | Jacksonville, FL |
| 10/31/1900 | Not reported | 30.4 | -81.7 | V MM | 367/228 | Jacksonville, FL |
| 10/29/1927 | Not reported | Unknown | Unknown | VI MM | 275/171 | St. Augustine, FL |
| 1930 | Not reported | Unknown | Unknown | V MM | 170/106 | Marco Island, FL |
| 11/13/1935 | Not reported | Unknown | Unknown | IV or V MM | 276/171 | Green Cove Springs, FL |
| 1/19/1942 | Not reported | Unknown | Unknown | IV MM | 168/104 | Lake Okeechobee, FL |
| 11/27/1973 | Not reported | 28.7 | -81.0 | V MM | 167/104 | Lake Harney, FL |
| 12/4/1975 | Not reported | 29.2 | -81.0 | IV MM | 218/135 | Daytona Beach, FL |
| 1/12/1978 | Not reported | 28 | -81.5 | IV MM | 143/89 | Haines City, FL |
| 2/21/1992 | 23:21 | 26.356 | -78.888 | 3.2 body-wave | 174/108 | Bahama Islands |
| 6/11/2001 | 13:27 | 30.226 | -79.885 | 3.3 mblg | 321/199 | Off the east coast of the United States |
| 6/10/2016[b] | 12:10 | 30.0335 | -79.6406 | 3.7 body-wave | 303/188 | 156 km ENE of Flagler Beach, FL |
| 6/23/2016[b] | 12:20 | 29.9948 | -79.449 | 3.8 ml | 303/188 | 172 km ENE of Ormond-by-the-Sea, FL |
| 7/16/2016[b] | 15:00 | 29.7651 | -79.4341 | 3.7 body-wave | 279/173 | 163 km ENE of Daytona Beach Shores, FL |
| 9/4/2016[b] | 13:29 | 30.0952 | -79.5416 | 3.8 ml | 312/194 | 168 km E of Saint Augustine Beach, FL |
| 9/21/2016[b] | 11:30 | 30.0745 | -79.5044 | 3.8 ml | 311/193 | 170 km ENE of Flagler Beach, FL |

a. All earthquakes within 400 km of PSL with an intensity IV/magnitude of 3.0 or greater.

b. Seismic events caused by experimental explosions with a magnitude of 3.0 or greater.

mblg = short-period surface wave; ml = local magnitude; MM = modified Mercalli

(USGS 2020b)

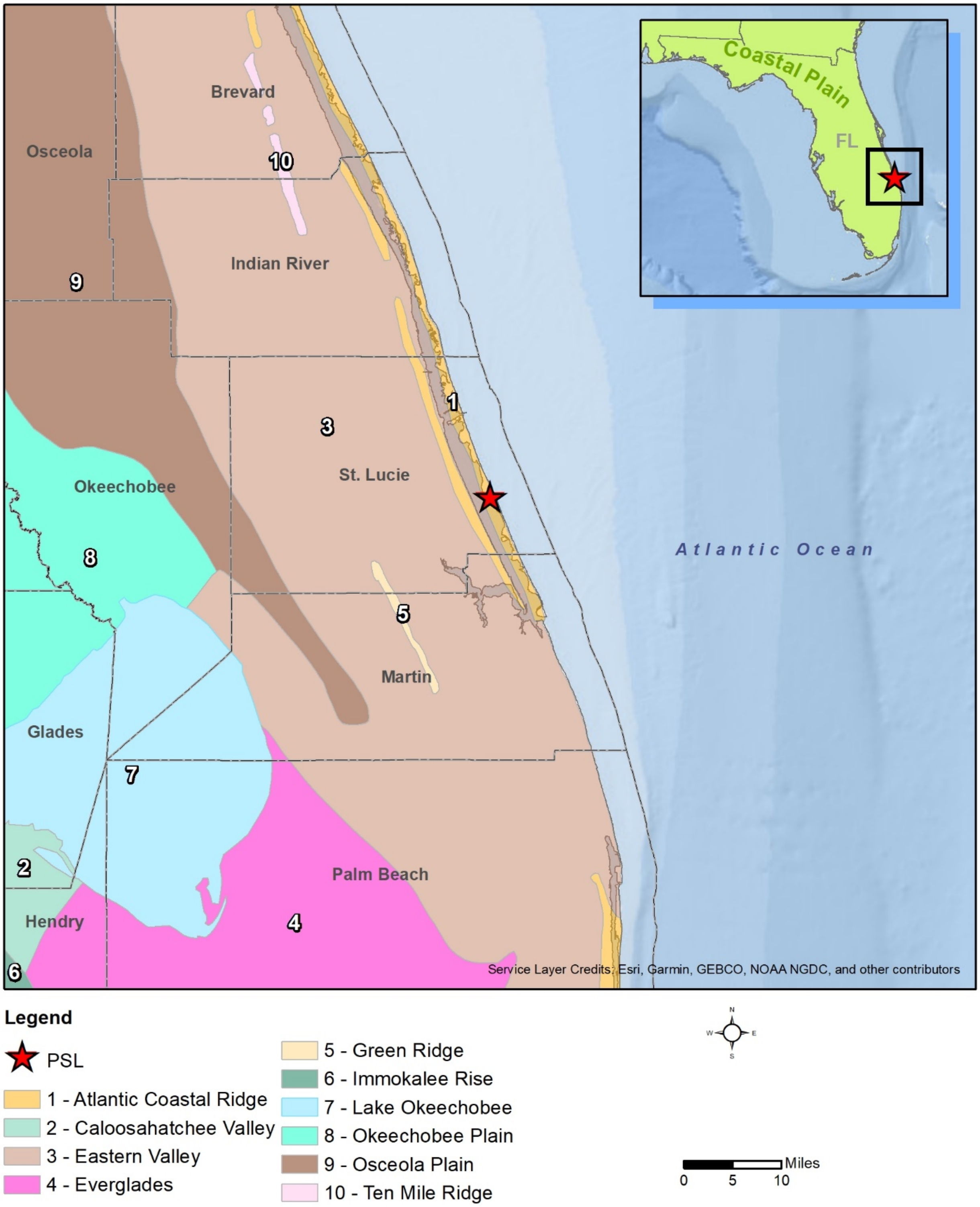
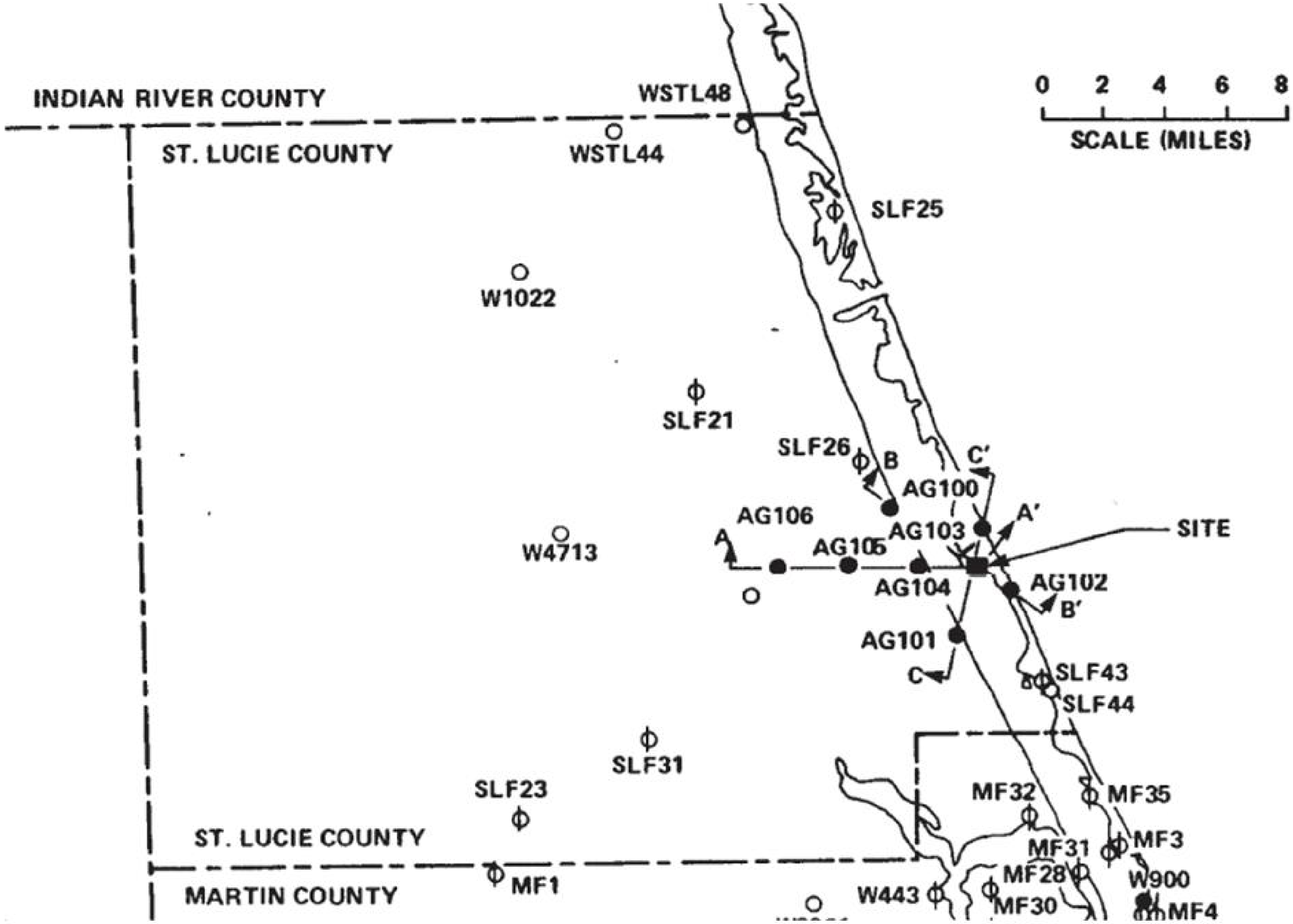



**Figure 3.5-1 Physiographic Provinces Associated with the PSL Site**


**Figure 3.5-2 Surficial Geology Map, PSL Property**




**Legend**
- ○ Wells with sample cuttings
- ɸ Wells with electric logs
- ● Borings drilled by Law Engineering

**Figure 3.5-3a Hydrological Cross-Section Locations on PSL Site**

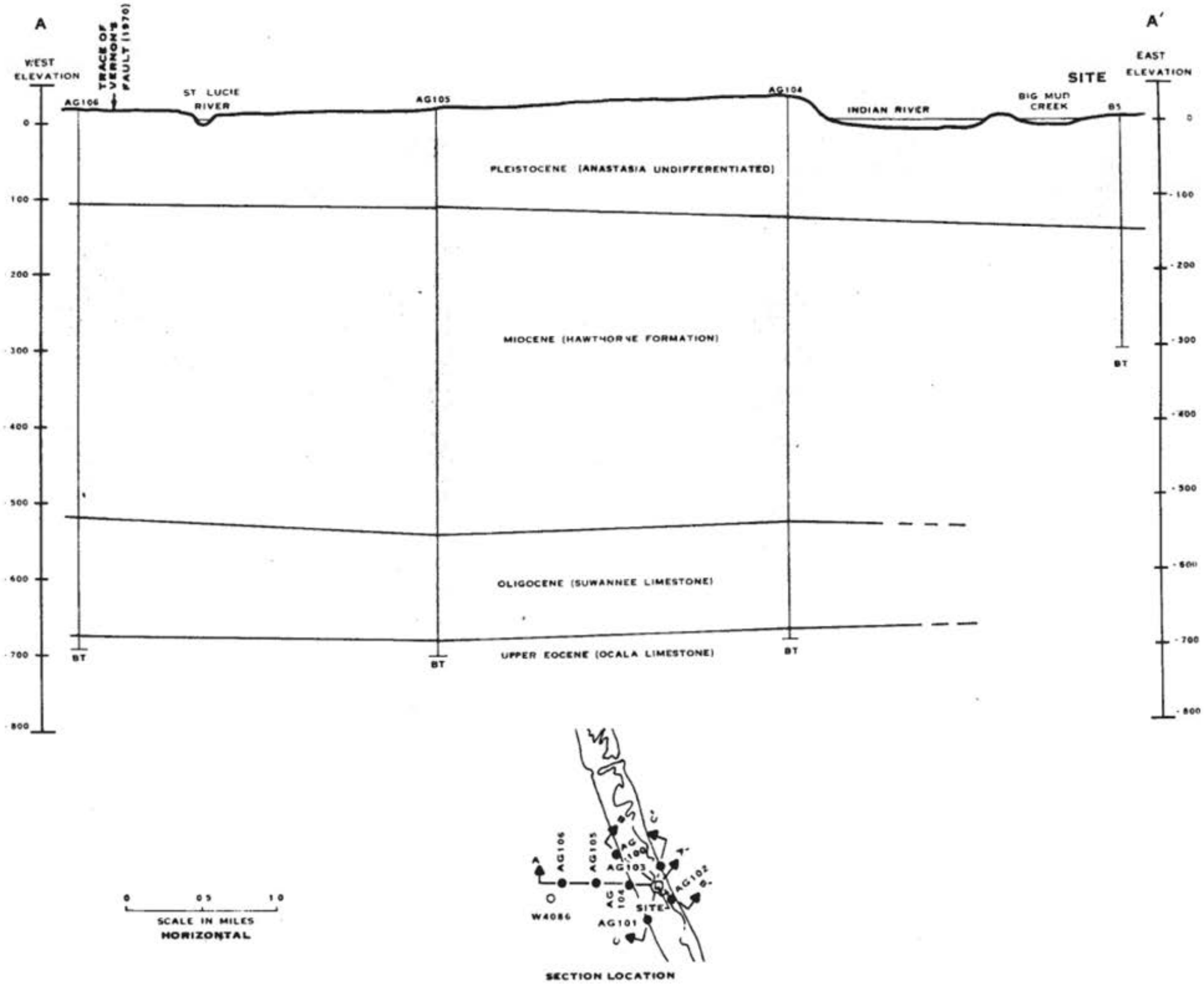



Figure 3.5-3b Cross-Section A-A'

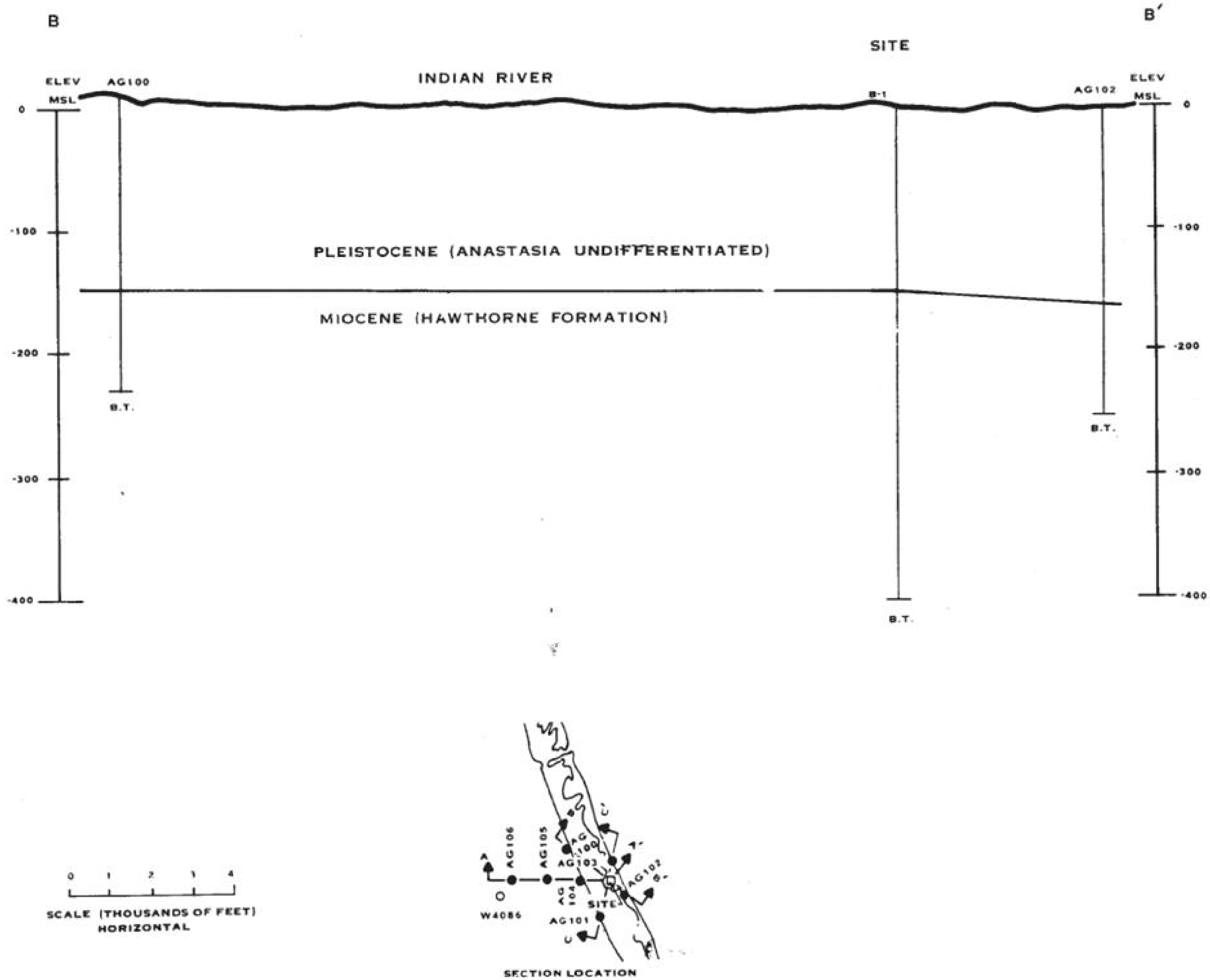



**Figure 3.5-3c Cross-Section B-B'**

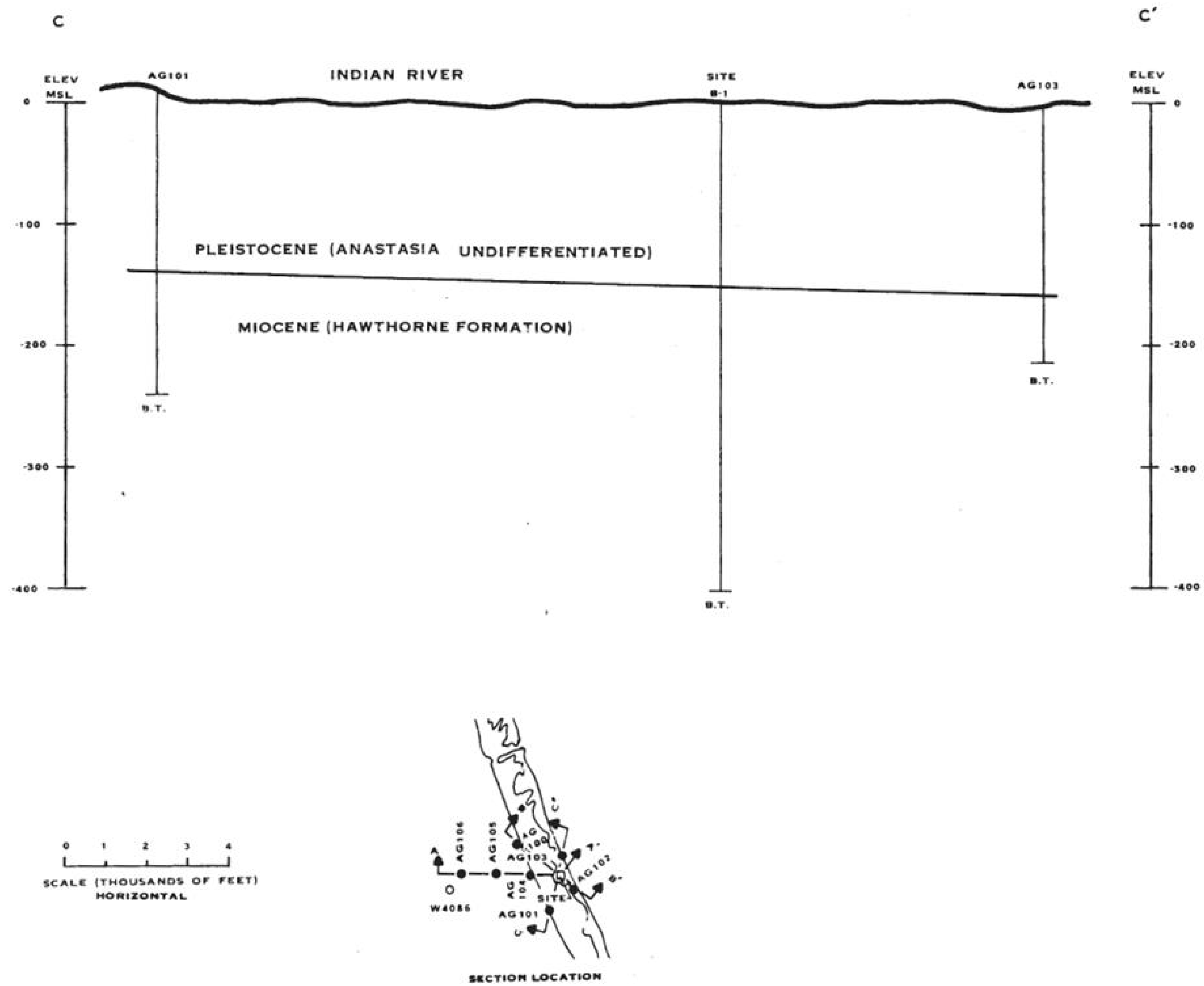



Figure 3.5-3d Cross-Section C-C'


**Figure 3.5-4 Distribution of Soil Units, PSL Property**

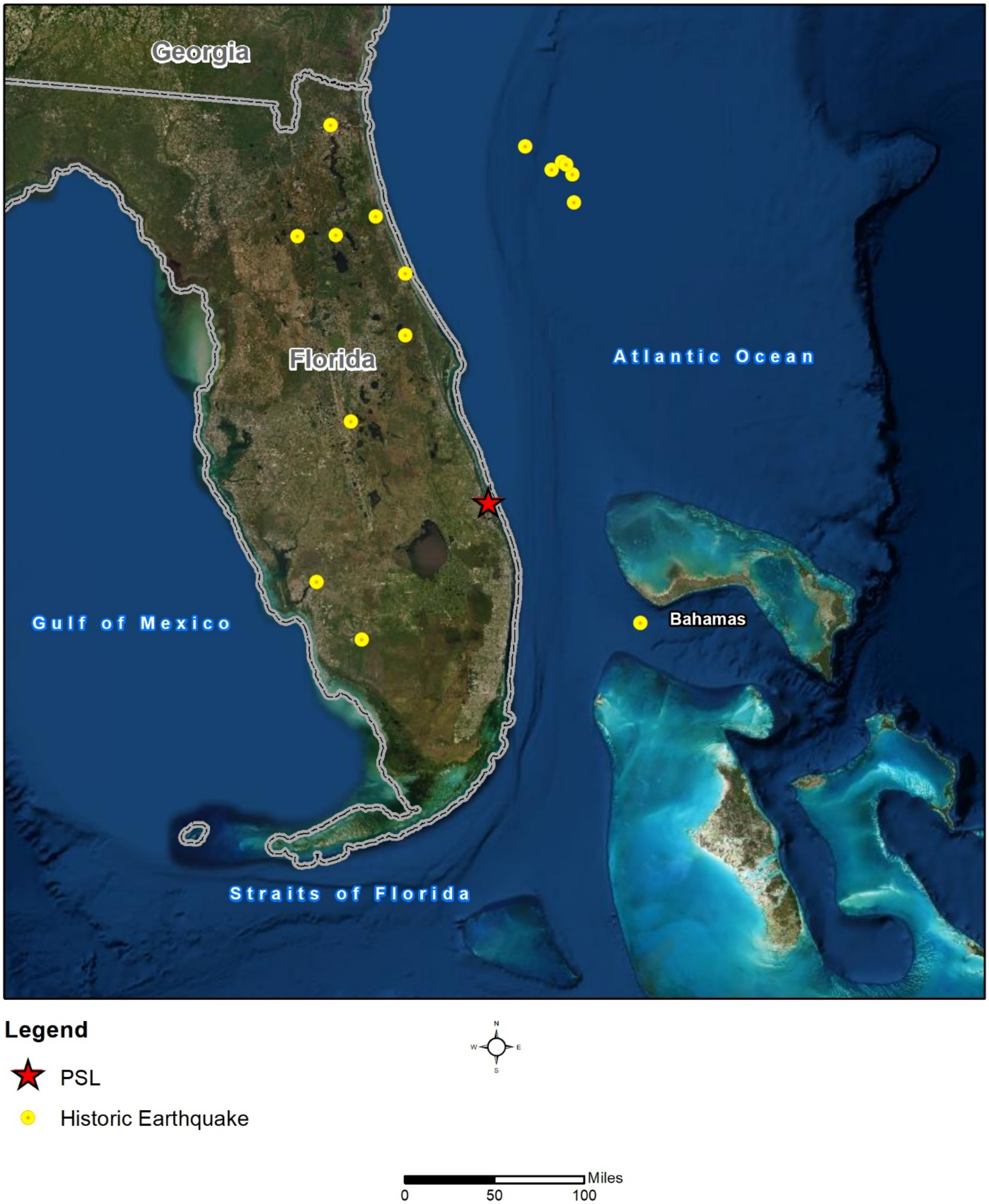



**Figure 3.5-5 Historic Seismic Events, 1879–2020**

## 3.6 Water Resources

### 3.6.1 Surface Water Resources

PSL is located on Hutchison Island in St. Lucie County, Florida, and is approximately 80 miles north of Miami Beach, Florida (Figure 3.6-1). The site comprises approximately 1,132 acres of land on the widest section of Hutchinson Island owned by FPL (FPL 2001, Section 2.1). Hutchinson Island is a barrier island bounded by several natural surface water bodies including the Atlantic Ocean to the east, Herman Bay to the south, the Indian River to the west, and Big Mud Creek to the north. The Indian River is open to the Atlantic Ocean at the Saint Lucie inlet located approximately 13 miles south of the PSL site and near Fort Pierce, FL, approximately 8 miles northwest of the site.

The Indian River, to the west of the island, separates the island from the mainland. The Indian River is not a flowing stream, but rather a long, fairly shallow, tidal lagoon which parallels a portion of the eastern coast of Florida and separates the mainland from a series of barrier islands, one of which is Hutchinson Island. The Indian River is part of the intracoastal waterway. The east coast of Hutchinson Island is relatively smooth and regular. Fronting the Atlantic Ocean is a typical east coast grassed dune. This is generally continuous and ranges in elevation from about 8 to 20 feet above local mean low water. The western coast of Hutchinson Island is very irregular and is typified by points, bays, and inlets. Large portions of the island have been diked to maintain minimal water levels (6 to 8 inches) as a mosquito control measure.

Several artificial surface water bodies exist at the site. The cooling water intake canal is approximately 170 feet wide and exists on the southern and western sides of the PSL property. It extends from the Atlantic Ocean westward 3,000 feet and then northward approximately 2,500 feet to the intake cooling water systems at the plant. The intake canal has a reported bottom elevation of approximately -31 feet NGVD where it enters the facility. The canal sides are lined with permeable filter fabric bags with gravel down to elevation -13 feet NGVD, except for the north-south area of the canal, which is unlined. The bottom of the intake canal is lined primarily with articulating concrete block mats. The permeable sides of the intake canal allow groundwater from the site to discharge into the canal. The discharge canal extends from the plant to the Atlantic Ocean. This canal is bifurcated at its west end and receives discharge from the cooling water system. Approximately 1,000,000 gpm of cooling water are pumped through the facility when both reactors are active. As this water is withdrawn from the intake canal and discharged to the discharge canal, the hydraulic head in the intake canal (approximately -4.5 feet NGVD) is significantly lower than in the discharge canal (approximately +7.7 feet NGVD).

The PSL evaporation/percolation pond system consists of four unlined basins constructed of native soils. The basins are located south of the power block area. They receive equipment/non-equipment-related stormwater as well as discharges from certain plant systems. Most of the flow is initially received by the east and west basins via the plant storm drainage system. The east and west basins overflow via underground piping and a drainage trench, respectively, to the south basin. The south basin is, in turn, connected to the southeast basin by a short culvert. All four basins are unlined, with compacted sloped berms. Bottom sediments of all the basins generally consist of natural organics and sand. The entire system is sized to accommodate an average of 14,000,000 gallons of water per month.

The west basin receives drainage from the west side of the plant, including the secondary system floor drains of each unit, and support areas. The basin is rectangular in shape, with a surface area of approximately 75,000 square feet. Average depth is approximately 20 feet, resulting in an operating capacity of about 11,200,000 gallons. Overflow to the south basin is protected by a floating boom.

The east basin receives drainage from the east side of the plant, including the radiation control area and miscellaneous support areas. The basin is irregular in shape, with a surface area of approximately 77,000 square feet. Average depth is approximately 8 feet, resulting in an operating capacity of about 4,600,000 gallons. Overflow to the south basin is protected by a floating boom.

The south basin receives overflow from the east and west basins. This basin has a long, rectangular shape, with a surface area of approximately 105,000 square feet. Average depth is approximately 8 feet, resulting in an operating capacity of about 6,300,000 gallons. As stated previously, this basin is connected to the southeast basin by a short culvert. The southeast basin is irregular in shape, with a surface area of approximately 160,000 square feet. Basin depth varies considerably, but is estimated to average about 4 feet, which results in an operating capacity of about 4,800,000 gallons. A discharge outfall is permitted (NPDES FL0002208) from this basin to the plant's intake canal. This outfall is used when local rainfall amounts result in pond levels that threaten plant operating equipment. This discharge is manually controlled by opening a valve and allowing the pond to discharge by gravity to the intake canal.

Depending on whether these ponds are receiving wastewater and/or stormwater, their stage elevations may be equal to or higher than the surrounding groundwater elevations. Consequently, they affect groundwater flow patterns. The ponds receive stormwater runoff and water pumped from the facility; therefore, some tritiated water can get into the ponds, which are unlined.

A basin formerly used to neutralize sulfuric acid and caustic sodium hydroxide from the regeneration of the ion exchange resins used to treat water from the Fort Pierce public water system exists in the northwest part of the site. This neutralization basin has an impervious lining consisting of 6-inch thick reinforced concrete overlain by a 100-mil thick Schlegel high density polyethylene (HDPE) liner, with a leak collection system between the liners. This basin was closed in January 1988 in accordance with a closure plan that had been approved by the FDEP and is no longer operational. Based on its construction and lack of use, this basin does not influence groundwater flow patterns.

#### 3.6.1.1 Potential for Flooding

The PSL site includes approximately 12,000 feet of frontage along the Atlantic Ocean on the east side of the plant. There has been no recorded flooding of Hutchinson Island in the vicinity of the plant. There have, however, been a few tidal surges documented as follows: 1) September 1947, Indian River near Fort Pierce, tides 6-8 feet MSL; 2) August 1949, Stuart near St. Lucie Inlet, tides 8.5 feet MSL; 3) September 1928, Palm Beach (affected Fort Pierce, tides 9.8 feet MSL.

The St. Lucie County engineer has indicated that the highest recorded tide at Fort Pierce since 1950 was 4.5 feet MSL. In general, a tide elevation on the order of 8+ feet has been the highest observed in the Indian River in the vicinity of Hutchinson Island.

Flooding due to high tides associated with hurricanes could occur along the Atlantic coast of the barrier island, both shores of the Indian River and in the lower reaches of the St. Lucie River system. Some flooding along the north fork of the St. Lucie River could occur because of runoff from the Hutchinson Island.

Based on Federal Emergency Management Agency (FEMA) data, the active plant area of the PSL property is located in an area of minimal flood hazard outside the 1 percent annual chance floodplain. Two thin parallel strips along the eastern (beach) property line are within the shallow flooding zone (average depths of 1 to 3 feet) and the coastal floodplains with additional hazards associated with storm waves. The remainder of the PSL property has been designated within the 1 percent annual chance floodplain. (Figure 3.6-2)

#### 3.6.1.2 Surface Water Discharges

##### *3.6.1.2.1 FDEP-Permitted Outfalls*

Chemical additives approved by the FDEP are used to control pH, scale, and corrosion in the circulating water system and biofouling of plant equipment. Process wastewaters are monitored and discharged to the Atlantic Ocean via the NPDES Outfall D-001 in accordance with the PSL NPDES Permit No. FL0002208. The current NPDES permit authorizes discharges from four outfalls (one external outfall and three internal outfalls). (FDEP 2020b) Outfall D-001 is depicted in Figure 3.6-3, and the associated effluent limits for Outfall D-001 and the three internal outfalls are listed in Table 3.6-1.

##### *3.6.1.2.2 Stormwater Runoff*

The PSL site is bounded by Herman Bay to the south and by Big Mud Creek to the north. Big Mud Creek is not a flowing stream but rather an inlet off the Indian River. Surface drainage from the site is either to the Atlantic Ocean, Indian River, or Big Mud Creek and hence to the Indian River. All of these are saline bodies of water and do not serve as potable water supply sources.

PSL has two major stormwater systems which flow to the east and west settling areas, and two minor retention basins, one draining the area around the spare startup transformer, and the other draining the area near the spare main transformer. There are two other basins: the south and southeast. These basins receive overflow from the east and west basins. The PSL stormwater systems have approximately 81 stormwater drains. Equipment area stormwater is routed through an oil/water separator prior to discharge to the stormwater basins and then to the intake canal through the southeast basin (FDEP 2020b). The stormwater system that empties into the east settling basin drains areas north and west of the discharge canal. The stormwater system that empties into the west settling basin drains areas south of the intake canal. An area north of the intake canal drains to a separate stormwater retention basin. In addition, the ISFSI surface water management system includes a system of inlets, catch basins, and pipes conveying stormwater flow to a sediment forebay and detention pond. A listing of the plant's stormwater basins and their capacities is provided below.

**Stormwater Basins & Capacities**

| Stormwater Basins | Basin Capacities |
|---|---|
| East basin | 4.6 million gallons |
| West basin | 11.2 million gallons |
| South basin | 6.3 million gallons |
| Southeast basin | 4.8 million gallons |
| ISFSI basin | 1 million gallons |
| Retention area north of spare startup TX (transformer stored at Gate "B") | 1.1 million gallons |
| Retention area east of spare main TX (transformer stored at Gate "B") | 0.11 million gallons |

All facility floor drains, which are not routed to the oil/water separator, storm drains, or catchment boxes, are routed to the east and west stormwater basins. An earthen dike separates the basins from the intake canal. The contents of these basins are sampled prior to discharge to the Atlantic Ocean. Adequate capacity is also available in the south and southeast stormwater basins, which receive overflow from the east and west settling basins respectively. Containment booms are located in the basins at the overflow to retain oil that could be released to the south stormwater basin.

Stormwater discharges associated with FPL industrial activities are regulated and controlled through the NPDES Permit No. FL0002208 issued by the FDEP. PSL also maintains and implements a SWPPP that identifies potential sources of pollution, such as erosion, that would reasonably be expected to affect the quality of stormwater and identifies BMPs that will be used to prevent or reduce the pollutants in stormwater discharges.

PSL staff collects stormwater runoff samples on a quarterly basis (when there is a flow) at stormwater outfalls which receive runoff from the entire industrial area, and also conducts screening through visual observations for pollutants as specified in the SWPPP. In addition to routine and inspections and quarterly visual monitoring, PSL staff conducts site compliance evaluations at least annually to provide an overall assessment of the conditions at the facility that potentially impact stormwater quality and the effectiveness of the current SWPPP.

##### *3.6.1.2.3 Sanitary Wastewaters*

The current IWFP (FDEP 2020b) for PSL Units 1 and 2 requires no groundwater monitoring at the site. Plant effluent is discharged to the Atlantic Ocean (a Class III marine water), the mangrove impoundment, and the intake canal. All discharges are monitored and regulated under the industrial wastewater facility permit. (NRC 2003, Section 2.2.3)

An onsite package plant was originally used to treat the site sanitary wastewater. The treated wastewater was discharged to the discharge canal. However, since September 1997, upon completion of St. Lucie County's South Hutchinson Island water reclamation facility, site sanitary wastewater has been discharged to the St. Lucie County system for treatment. (NRC 2003, Sections 2.1.5 & 2.2.3)

##### *3.6.1.2.4 Dredging*

PSL personnel assess the need for dredging periodically. Maintenance dredging to remove sediment build-up in the vicinity of the intake and discharge has not been conducted for approximately 17 years. After Hurricane Dorian, dredging of the intake canal (east of State Highway A1A) was conducted in 2019 under Permit # SAJ-1993-01803 identified in Section 9.5.3.1. In addition, PSL site personnel do not anticipate dredging the stormwater or wastewater ponds. Vegetation removal occurs twice a year in these ponds to maintain stormwater flow as permitted.

##### *3.6.1.2.5 Compliance History*

As presented in Chapter 9, over the 5-year period 2016–2020, there has been one noncompliance, but no notices of violation associated with PSL wastewater discharges to receiving surface waters.

On May 17, 2016, FPL notified the FDEP with an initial 24-hour oral notification of a trial usage of chemicals for water treatment that had not been properly permitted prior to the usage. A follow-up e-mail for this non-compliance event was submitted the following day (May 18, 2016) satisfying the conditions of certification 3-day written confirmation.

##### *3.6.1.2.6 Water Temperatures Reporting*

Cooling water intake and discharge water temperatures for each unit are measured by PSL and the raw data averaged for each month. The averaged values for 2015 to 2020 are plotted in Figure 3.6-4 (intake) and Figure 3.6-5 (discharge).

The discharge of heated water through the Y-port and multiport diffusers ensures distribution over a wide area and rapid and efficient mixing with ambient waters. Modeling studies presented by the AEC and the NRC in the operating stage FESs indicate that the areas of the thermal plumes to the 2°F isotherm from the PSL Units 1 and 2 diffusers under typical conditions would be approximately 180 acres and 175 acres, respectively (FPL 2001, Section 3.1.3.2)

Temperature of the discharged cooling water is limited by the industrial wastewater facility permit for PSL Units 1 and 2. These limits require that heated water from the diffusers, as measured near the exit from the discharge canal, not exceed 115°F or 30°F above ambient during normal operations; a maximum temperature of 117°F or 32°F above ambient is permitted during certain maintenance operations, when throttling circulating water pumps to minimize use of chlorine, and when biofouling of the circulating water system occurs. (FDEP 2020b; FPL 2001, Section 3.1.3.2)

The intake cooling water system for PSL Units 1 and 2 is also a once-through cooling system, but uses much less water than the circulating water systems. Ocean cooling water is pumped from the intake canal using intake cooling water pumps. This non-contact cooling water is pumped through heat exchangers to provide cooling for a wide variety of plant equipment and is discharged to the discharge canal. (FPL 2001, Section 3.1.3.2)

## 3.6.2 Groundwater Resources

### 3.6.2.1 Groundwater Aquifers

In the four-county region encompassed by St. Lucie, Martin, Indian River, and Okeechobee counties, two main aquifers are found: (1) a shallow, non-artesian or locally artesian aquifer; and (2) a deeper, artesian aquifer known as the Floridan Aquifer. The shallow (surficial) aquifer is located primarily in the Anastasia Formation. It is separated from the Floridan Aquifer by an aquiclude, mostly in the Hawthorne Formation. Pumping of the shallow aquifer along several portions of the mainland coast has caused saltwater intrusion. In general, however, the hydraulic gradient in the Anastasia Formation is toward the Atlantic Ocean, precluding movement from the site westward toward the mainland. The piezometric level in the Floridan Aquifer is higher than that in the shallow aquifer in the site area. This, in addition to the aquiclude separating the two aquifers, precludes movement of water from the site downward to the Floridan Aquifer.

The discharge of the shallow aquifer is by a flow into streams or lakes, by direct flow into the ocean, by evapotranspiration, or by pumping from wells. Some discharge is to local canals and ditches.

The surficial aquifer, consisting of the Pamlico Sand, Anastasia Formation, and at PSL, Class I and Class II fill, has a combined thickness of approximately 150 feet. The surficial aquifer is not used as a source of potable water on Hutchinson Island, but on the mainland, the Anastasia Formation production zone is the primary source of potable water in the surficial aquifer system. The inland extent of the saltwater interface in the surficial aquifer system is generally located along the east coast of the mainland of St. Lucie County, west of Hutchinson Island.

The transmissivity of the shallow aquifer in Martin County has been measured to be approximately 20,000 gallons per day (gpd) per foot. In St. Lucie County, tests have measured transmissivities of about 5,000 to 60,000 gpd per foot. These low to moderate values indicate non-uniformity in the permeability and in the thickness of the shallow aquifer.

Below the Anastasia Formation, the upper 100 to 150 feet of the 400-foot Hawthorne Formation at the site consists of a green slightly clayey and silty very fine sand. The lower part becomes generally more clayey. The deep aquifer of the area, and principal artesian aquifer of the region, is the Floridan Aquifer. It underlies all of Florida and southern Georgia and consists mainly of permeable limestone beds.

The Floridan Aquifer consists of the upper Floridan and lower Floridan aquifers, which are separated by the middle-confining unit. In the PSL area, the upper Floridan Aquifer is approximately 300 feet thick. The lower Floridan Aquifer is approximately 1,950 feet thick. A highly permeable interval called the boulder zone occurs between 2,900 and 3,200 feet bls. A lower confining unit bounds the lower Floridan Aquifer at a depth of approximately 3,450 feet bls.

The top of the Floridan Aquifer in Martin County is typically between 600 and 800 feet below ground surface, and underlies the Hawthorne Formation, which is an aquiclude and in some areas acts like an aquitard. The Floridan Aquifer underlies Indian River County at depths ranging from about 250 to more than 500 feet. In St. Lucie County, the aquifer lies about 700 feet below the land surface.

The principal recharge area of the Floridan Aquifer in this region is in and around Polk County. Here the limestone aquifer is overlain by semi-confining beds of the Hawthorne Formation, which is locally permeable and permits downward recharge.

The points of discharge of the Floridan Aquifer are springs, wells, and locations where upward leakage occurs through the confining beds. There are no known natural springs in the four-county region. The groundwater table occurs very near or at the ground surface at PSL. A continuous body of groundwater is present throughout the site.

### 3.6.2.2 Hydraulic Properties

The hydraulic gradient beneath the plant is significantly altered by the intake and discharge canals. The hydraulic gradient in the immediate vicinity of the discharge canal is slightly greater than the average hydraulic gradient at the site because of the greatly elevated surface water elevation in the discharge canal. The discharge canal is lined with concrete by the apron, with stone on the straight portion of the banks and with grout-filled fabric near the headwall, but has widely spaced, small diameter pipes through the liner. These pipes allow hydraulic connection between the surface water in the canal and the groundwater, but limit the actual quantity of flow between the canal and the aquifer. As a result, the head decreases quickly away from the discharge canals.

Similarly, the gradient increases near the unlined intake canal where groundwater discharges. The gradient is especially steep between the western evaporation/retention pond and the intake canal, due to the elevated water level in the pond. The elevated levels in the evaporation/retention ponds also influence the flow directions and gradients around them as shown on Figure 3.6-7. While no specific water elevation data was available for the ponds, piezometric contours were developed to reflect their presumed higher heads elevations. Based on their use and construction (unlined), the ponds would decrease the hydraulic gradient on the up-gradient side and increase the hydraulic gradient on the down gradient side. The effects of the mounded pond elevations appear limited to the area immediately surrounding ponds.

Based upon 2007 synoptic groundwater elevation data, minor vertical hydraulic gradients were observed by comparing the shallow versus deep water table monitoring wells. These water levels near the diesel tank area (DTA) (Unit 2) result in a calculated, very slight downward or effectively neutral gradient of 0.007 feet/feet. Other water levels measured near the DTA (Unit 1), showed a very slight upward or effectively neutral vertical gradient of 0.002 feet/feet. A vertical hydraulic gradient was also measured in the mixed plume area. The measurement indicates a very slight downward vertical hydraulic gradient of approximately 0.0032 feet/feet.

#### 3.6.2.3 Potentiometric Surfaces

The water table at PSL is located at approximately elevation plus 2 to plus 3 feet MSL. There are no natural slopes in the area that could adversely affect the plant island.

A contour map of the shallow groundwater based on water level data collected in November 2016 (as part of the Nuclear Energy Institute's (NEI) groundwater protection initiative [GPI] program) is provided as Figure 3.6-7. Groundwater generally flows from east toward the west. Based on Figure 3.6-7 and previous groundwater elevation contour maps (constructed for high tide and low tide on August 24, 2007; high tide and low tide on September 14, 2007; and February 2013), groundwater generally moves from the discharge canals in the northeastern part of the site toward the intake canal. The elevated water level in the discharge canal, also induces components of groundwater flow towards Big Mud Creek to the north and towards the portion of the intake canal to the south.

Groundwater flow conditions onsite are significantly influenced by man-made structures including the intake and discharge canals, evaporation/retention ponds, subsurface foundation structures, and pump-and-treat remedial systems. Groundwater flow patterns are largely controlled by the intake and discharge canals. The discharge canal is bifurcated at its west end creating a Y-shape section. The bottom of the discharge canal slopes from -9 feet NGVD at its upstream ends to -19 feet NGVD at the confluence of the two legs that form the Y-shape.

There are four evaporation/retention basins located south of the power block area, which are constructed in the native soils and are unlined. The impact of the evaporation/retention ponds on groundwater flow is dependent on the surface water elevation within each pond, which is dependent on the quantity of storm and plant waters discharged into them.

#### 3.6.2.4 Groundwater Protection Program

In May 2006, the NEI implemented the GPI, an industry-wide voluntary effort to enhance nuclear power plant operators' management of groundwater protection (NEI 2007).

Industry implementation of the GPI identifies actions to improve licensee management and response to instances where the inadvertent release of radioactive substances may result in detectable levels of plant-related materials in subsurface soils and water, and also describes communication of those instances to external stakeholders. Aspects addressed by the initiative include site hydrology and geology, site risk assessment, onsite groundwater monitoring, and remediation. In August 2007, NEI published updated guidance on implementing the GPI as NEI 07-07, Industry Ground Water Protection Initiative-Final Guidance Document (NEI 2007). This guidance was further updated in February 2019. The purpose of NEI 07-07 is to improve the management of situations involving inadvertent radiological releases that get into groundwater and to improve communications with external stakeholders to enhance trust and confidence on the part of local communities, states, the NRC, and the public in the nuclear industry's commitment to a high standard of public radiation safety and protection of the environment. (NEI 2019a)

In 2010, FPL implemented a groundwater protection program. This initiative was developed to ensure timely and effective management of situations involving inadvertent releases of licensed material to ground water. As part of this program, PSL monitored 10 wells in 2019 (FPL 2020b). No gamma or difficult-to-detect radionuclides, other than naturally occurring radionuclides, were identified in well samples between 2016 and 2020.

In conjunction with the GPI and the NRC's Decommissioning Planning Rule 10 CFR 20.1501, PSL performs groundwater monitoring from a total of 42 onsite and 10 offsite locations to monitor for potential radioactive releases to groundwater, environmental conditions, and groundwater elevation in accordance with site procedures. Figure 3.6-6 shows locations of these groundwater monitoring wells with construction details presented in Table 3.6-2.

#### 3.6.2.5 Sole Source Aquifers

A sole source aquifer (SSA), as defined by the EPA, is an aquifer that supplies at least 50 percent of the drinking water consumed by the area overlying the aquifer, and there is no reasonably available alternative drinking water source should the aquifer become contaminated. The SSA program was created by the U.S. Congress as part of the Safe Drinking Water Act and allows for the protection of these resources. (EPA 2021a)

PSL is located in EPA Region 4, which has oversight responsibilities for the public water supply in Florida and seven other southeastern states. Two of these SSAs (Biscayne and Volusia-Floridan) are located in Florida. PSL is not located within either of these SSA areas. The Volusia-Floridan SSA is located northeast-central Florida, well beyond the boundaries of the local hydrologic system underlying the plant area. The Biscayne SSA and recharge zones are located on the mainland much farther to the west and south of PSL. These areas have no alternative drinking water source(s) that could physically, legally, and economically supply all those who depend upon the aquifer for drinking water. Groundwater beneath PSL is not a drinking water source because of its salinity, which is further discussed in Sections 3.6.2.1 and 3.6.3.2. Therefore, PSL's property is not situated over any of these designated SSAs. (EPA 2021a)

### 3.6.3 Water Use

#### 3.6.3.1 Surface Water Use

Water use associated with the operation of PSL consists of saltwater withdrawn from the Atlantic Ocean for non-contact cooling purposes and freshwater from a municipal water source for potable and service water use, discussed further in Section 3.6.3.2. Minor amounts of ocean water are also withdrawn by St. Lucie County from the intake canal for seasonal flushing of the mangrove impoundment between the intake and discharge canals to enhance growth of mangroves and assist in mosquito control. FPL also withdraws small amounts of water from the canals for mariculture and related projects. (FPL 2001, Section 3.1.3.1)

The three cooling water intake structures for PSL are located approximately 1,200 feet offshore where the water is approximately 23 feet deep. Two of the structures were installed prior to startup of Unit 1 in 1976. The third intake structure, which is larger than the initial two, was installed in 1983. Water withdrawn from the structures is conveyed through separate buried pipes, beneath the beach and dune system, to the intake canal. (FPL 2001, Section 3.1.3.2)

The intake canal receives water directly from the Atlantic Ocean through subaqueous intake water pipes which run under the beach and end at the start of the canal east of SR A1A. In the unlikely event of blockage of the intake canal or pipes, emergency cooling water is taken from Big Mud Creek through the emergency cooling water canal. Big Mud Creek and the connecting Indian River are saltwater estuaries of the Atlantic Ocean.

The intake canal, a 4,920-foot long trapezoidal channel approximately 180 feet wide and 30 feet deep at normal water levels, conveys cooling water to the intake wells during normal operation. Water is withdrawn from the intake canal at eight separate intake wells (four per unit). Water enters the wells through a series of trash racks (vertical bars spaced 3 inches apart), then through traveling screens (3/8-inch mesh), which are periodically backwashed. The water is then pumped from the wells through the main turbine condensers. Heated water is discharged to the discharge canal. (FPL 2001, LRA Section 3.1.3.2)

The PSL intake system described above withdraws once-through cooling water from the Atlantic Ocean. The average surface water withdrawal rate by PSL in 2020 was reported as 1,425.72 MGD and averaged 1,404.08 MGD between 2016 and 2020 (Table 3.6-3a). A summary of monthly surface water withdrawals reported by PSL between 2016 and 2020 is included as Table 3.6-3b.

In 2015, total surface water withdrawals in St. Lucie County were reported as 1,511.55 MGD, of which 1,482.93 MGD was used for power generation and 28.62 MGD was used for irrigation. The total surface water withdrawals in Indian River County to the north were reported as 38.03 MGD, of which 35.69 MGD was withdrawn for irrigation, 2.19 MGD for power generation, and 0.15 MGD for mining, with no reported domestic or public supply uses. For Martin County to the south, total surface water withdrawals were reported 124.67 MGD, of which 97.6 MGD was withdrawn for irrigation, 25.9 MGD for power generation, 0.68 MGD for industrial, self-supplied, and 0.49 MGD for mining. (USGS 2021c) A summary of surface water use in St. Lucie County is presented in Table 3.6-4.

### 3.6.3.2 Groundwater Use

The cities of Fort Pierce and Stuart have water supply systems and Hutchinson Island receives water via pipeline from South Gulf Utilities (Stuart) and Fort Pierce Utility Corporation (Ft. Pierce). The Stuart system extends far north as the Beach Club Colony, and the Fort Pierce system as far south as Turtle Reef Club.

The City of Port St. Lucie also has a private water supply for its population of 189,396. General Development Corporation supplies approximately one-half of the water used by the residents of Port St. Lucie. The other half is supplied by private residential wells. All public and most domestic supplies of water in the region are obtained from groundwater sources (surficial aquifer and the deeper Floridian Aquifer) (Port St. Lucie 2019). Groundwater is also used extensively for irrigation, stock watering, and industry.

The cities of Fort Pierce and Stuart have public water supplied from wells developed in the shallow aquifer (surficial aquifer) and the deeper Floridian Aquifer (FPUA 2019). The City of Fort Pierce water supply wells are 10 miles northwest of the site and Stuart wells are 11 miles southwest of the site. No large industrial water usage exists in the area. Irrigation and stock watering account for the largest withdrawals of groundwater. Water from the shallow aquifer is used for irrigation by farmers growing vegetables and citrus fruits and by ranchers for pastureland, stock watering, and feed crops. Many of the artesian wells were originally drilled for irrigating vegetable crops. The total use of artesian water for irrigation may be about 10 million gallons per day during the dry season. During the rainy season most of these wells are not used. Chemical analyses of water samples taken from the wells on the mainland indicate the water from the shallow aquifer to have a lower mineral content than the artesian water.

PSL Units 1 and 2 receive water from the City of Fort Pierce and the Fort Pierce Utilities Authority for potable and service uses at the plant. This freshwater is derived from groundwater sources on the mainland, and plant operations do not involve any additional groundwater withdrawal. Current plant usage averages approximately 131,500 gpd with no restrictions on supply. Non-contact cooling water for PSL Units 1 and 2 is withdrawn from the Atlantic Ocean. Additional minor amounts of ocean water are used to enhance the growth of mangroves, assist in mosquito control, and for mariculture and related projects. (NRC 2003, Section 2.2.2)

The groundwater in the surficial aquifer beneath Hutchinson Island is brackish and not used as a source of drinking water. Groundwater below the FPL facility discharges predominantly into the intake canal on the southern and western sides of the site, with a slight discharge into Big Mud Creek near the northeastern corner of the site. Groundwater from the facility will not move under the canals or migrate beneath the Indian River toward the mainland because both the intake canal and Indian River serve collectively as a hydraulic boundary, which effectively capture or prevent westward movement of all shallow groundwater.

Residents on Hutchinson Island are provided drinking water from municipal sources located on the mainland, including Fort Pierce, Port St. Lucie, and Martin County, more than a mile west of the facility. The municipal sources withdraw water from the surficial aquifer, but as noted above, groundwater beneath the site will not flow to the mainland, where the net flow of groundwater in the surficial aquifer is toward the east, discharging into the Indian River.

Additional groundwater used for irrigation may be obtained from the upper Floridan aquifers, although this water is likely to be brackish. As explained in Section 3.6.2.1, the low permeability Hawthorn Group underlying the surficial aquifer and the positive hydraulic head in the deeper Floridan Aquifer preclude movement of groundwater in the surficial aquifer from moving downward.

The surficial aquifer is not used as a source of potable water on Hutchinson Island, but on the mainland, the Anastasia Formation production zone is the primary source of potable water in the surficial aquifer system. The inland extent of the saltwater interface in the surficial aquifer system is generally located along the east coast of the mainland of St. Lucie County, west of Hutchinson Island.

Municipal well fields extracting groundwater from the surficial aquifer include the Port St. Lucie well field, located approximately 6 miles west of PSL; the Martin County north well field, located approximately 6 miles south-southwest of PSL; and the Fort Pierce well fields, located approximately 7.5 miles north-northwest of PSL.

There are currently no discharges to groundwater from PSL requiring permits by regulatory agencies.

Drinking water for the portion of Hutchinson Island not owned by FPL is provided by offsite municipal water systems that draw water from the mainland. Therefore, there are no offsite drinking water users that are (or could be) impacted by groundwater at PSL.

There are no onsite water supply wells at PSL. Five recovery wells were owned and operated by PSL. These recovery wells were permitted as part of the former remediation system near the DTA, which was located west of the discharge canal. The permit expired on May 21, 2009. These wells were constructed to a depth of 30 feet bls and had a combined permitted pumping rate of 4.38 million gallons per year (MGY). According to the PSL baseline hydrogeological assessment, dated August 22, 2006, recovery wells RW-1 and RW-5 were historically used for pumping groundwater, and RW-3 was used for product recovery.

Since that time, pumping of these recovery wells has ceased and recovery wells RW-1 and RW-3 have been plugged and abandoned. The other remaining recovery wells RW-2, RW-4 and RW-5 are being monitored and sampled as part of the groundwater protection program.

FPL secured deed restrictions for this legacy (1992) diesel spill area. A 2017 engineering control maintenance plan (ECMP) provides a restrictive covenant for the Unit 1 and Unit 2 emergency diesel sites. This restrictive covenant allowed groundwater monitoring to be discontinued. Annual surveillance inspections are conducted by PSL site personnel to look for any disturbance of the cap over the affected soil and to ensure PSL is in compliance with the restrictions provided in the ECMP. Two other restrictive covenants were put in place for 1) the turbine lube oil (TLO) area (west of the DTA) in 2014; and 2) the former fuel facility, also labeled the mixed plume area to the south of the TLO in 2012.

In 2015, groundwater withdrawals in St. Lucie County were reported as 47.45 MGD with 1.06 MGD withdrawal for power generation, 29.37 MGD for public water supply, 15.14 MGD for irrigation, 1.52 for domestic, self-supplied water, 0.35 MGD for livestock, and 0.01 for aquaculture. Irrigation is reported as the largest consumer of groundwater for Indian River County, reported at 22.08 MGD with the next largest groundwater consumer reported at 16.94 MGD for public water supply. The largest consumer of groundwater in Martin County is public water supply, with a withdrawal of 15.61 MGD with 11.39 MGD for irrigation as the next largest groundwater consumer. (USGS 2021c) A summary of groundwater use in St. Lucie County is presented in Table 3.6-5.

No registered groundwater supply wells within a 2-mile band around the PSL property boundary were identified. A list of 25 offsite registered groundwater supply wells within a 5-mile band around the PSL property boundary is depicted on Figure 3.6-8 and presented in Table 3.6-6. These wells withdraw groundwater from the surficial aquifer and are primarily used for domestic purposes. The closest well to the PSL property (#272112080175801) is 3.2 miles from the PSL center point and is listed as a private drinking water well. (FDEP 2021c)

### 3.6.4 Water Quality

#### 3.6.4.1 Surface Water Quality

As presented in Section 3.6.1, PSL is located on Hutchinson Island and is bounded by Big Mud Creek to the north, the Atlantic Ocean to the east, Herman Bay to the south, and Indian River to the west of the island, separating the island from the mainland. Section 305(b) requires each state to report every two years to the EPA on the condition of its surface waters, and Section 303(d) requires each state to report on its impaired water bodies (those not meeting water quality standards). A review of the FDEP's 2020 303(d) list of impaired waters included the following impaired waters within a 6 mile radius (FDEP 2021d):

- St. Lucie – Loxahatchee, Water Body ID #3194, St. Lucie River (North Fork) Water Segment, Estuary, St. Lucie County – Copper, Enterococci (parameter is being added to the verified list and the department is requesting EPA add it to the 303(d) List).
- St. Lucie – Loxahatchee, Water Body ID #3194B, St. Lucie Water Segment, Estuary, St. Lucie County – Copper.
- St. Lucie – Loxahatchee, Water Body ID #3194C, Lake, St. Lucie County – Copper.

The known permitted discharges to the Atlantic Ocean are limited to those from the existing units. These sources and permitted discharge limits are described in the NPDES permit. (FDEP

2020b) PSL is in compliance with its NPDES permit, discussed in Section 3.6.1.2.1, and does not contribute to these impairments. In addition, as discussed in Section 9.5.3.2, the certification under the Florida PPSA constitutes a continuing certification from the State of Florida that any discharge into navigable waters will comply with applicable federal Clean Water Act (CWA) Section 401 requirements [33 USC 1341].

#### 3.6.4.2 Groundwater Quality

As mentioned in Section 3.6.3.2, the groundwater in the surficial aquifer beneath Hutchinson Island is brackish and is not used as a source of drinking water. Groundwater is generally very shallow at the PSL site, and typically is just a few inches above mean sea level. Recharge of freshwater is via infiltration of rainfall, and the depth of freshwater is only a foot or so below the water table. No groundwater is withdrawn from the site as part of plant operations. (NRC 2003, Section 2.2.3) As mentioned in Section 3.6.3.2, groundwater is no longer withdrawn from the site to remediate a diesel fuel spill that occurred in 1992.

PSL monitors groundwater for tritium as part of the Groundwater Protection Program (GWPP). Between 2016 to 2020, groundwater samples were collected from selected monitoring wells onsite and analyzed for radionuclides to detect potential impacts to groundwater from inadvertent leaks or spills. Samples are collected from 18 wells on an annual basis. (FPL 2016b; FPL 2017b; FPL 2018b; FPL 2019b; FPL 2020b; FPL 2021a)

As part of the PSL radiological groundwater monitoring program, groundwater samples are collected from selected onsite monitoring wells and analyzed for radionuclides to detect potential impacts to groundwater from inadvertent leaks or spills. Twenty-four groundwater monitoring wells (including all sentinel wells and wells inside the radiation control area) are sampled on a quarterly basis.

Historically, tritium has been detected in several locations across the site including the DTA, the TLO area, and mixed plume area. A review of tritium data (November 2016) indicates that the general distribution and magnitude of tritium in groundwater for the DTA has diminished from the initial conditions noted in 2006. Nevertheless, a pattern of slightly elevated tritium groundwater concentrations extended up-gradient of and encompassed the reactor buildings and protected area buildings. The plume continued downgradient to include the TLO area.

Tritium concentrations detected in the groundwater at the TLO area have been due to releases at the DTA and/or releases within the TLO areas (Units 1 and 2). However, the latter is unlikely as there are minimal potential tritium sources in the TLO area. The November 2016 tritium data suggested that a low-level tritium plume still existed, primarily within the TLO Unit 2 area.

In 2020, the highest concentrations of tritium were detected in Well MW-6 located in the DTA. The tritium concentrations ranged from 18,900 picocuries per liter (pCi/L) to below the detection limit for the DTA and 1,050 pCi/L (Well Unit 2 MW002) to below the detection limit for the TLO. All tritium concentrations detected in 2020 were below the 30,000 pCi/L reporting limit for PSL and below the EPA's 20,000 pCi/L safe drinking water standard. Tritium was not detected in the mixed plume area. (FPL 2021a)

Ten wells, utilized for radiological environmental sampling in support of the industry initiative, are on the "outside" perimeter of the protected area. Groundwater tritium concentrations detected over the last 5 years in two wells (H70 and H71) located north of the discharge channel at PSL are far below the 30,000 pCi/L reporting limit for PSL and below the EPA's 20,000 pCi/L safe drinking water standard. No tritium concentrations were detected above the detection limit for the remaining eight wells. (FPL 2016b; FPL 2017b; FPL 2018b; FPL 2019b; FPL 2020b; FPL 2021a) As discussed in Section 3.6.2.4, no plant-related gamma isotopes or hard-to-detect radionuclides have been detected.

Industrial practices at PSL that involve the use of chemicals are those activities typically associated with painting, cleaning of parts/equipment, refueling of onsite vehicles/generators, fuel oil and gasoline storage, and the storage and use of water treatment additives. The use and storage of chemicals at PSL are controlled in accordance with FPL procedures and site-specific spill prevention plans. In addition, as presented in Section 2.2.7, nonradioactive waste is managed in accordance with PSL's waste management procedure, which contains preparedness and prevention control measures.

##### *3.6.4.2.1 History of Radioactive Releases*

Low level radioactive gases, liquids, and solids are routine byproducts of nuclear power plant operation. Radioactive waste management systems, commonly called radwaste systems, collect, process, and either recycle or dispose of these radioactive materials. The design and operation of the radwaste systems are regulated by the NRC. As part of normal operation of the plant, radioactive material must sometimes be discharged to the environment. Such discharges are also regulated by the NRC and submittal of annual reports to the NRC detailing the amounts and compositions of radwaste discharged intentionally or accidentally from their facilities are required. The EPA has a separate regulation that limits the radioactivity of drinking water. This regulation sets a maximum allowed concentration for each radionuclide in drinking water including a maximum radioactivity concentration of 20,000 pCi/L for tritium, a radioactive form of hydrogen produced by power plants. Tritium levels discharged during normal, procedurally controlled, operations (outages, maintenance activities, normal discharges) into the Atlantic Ocean are below the 20,000 pCi/L tritium concentration (FPL 2016b; FPL 2017b; FPL 2018b; FPL 2019b; FPL 2020b; FPL 2021a). Since at least 2015, tritium has been measured in the groundwater at a range from non-detect to 18,900 pCi/L (Well MW-6), below the drinking water limit of 20,000 pCi/L, which is conservative, because no drinking water pathway exists at PSL and the reporting limit is 30,000 pCi/L. (FPL 2016b; FPL 2017b; FPL 2018b; FPL 2019b; FPL 2020b; FPL 2021a)

##### *3.6.4.2.2 History of Nonradioactive Releases*

Based on the review of site records from the 5 years from 2016–2020, there has been one inadvertent nonradioactive release that would be classified as an incidental spill.

On October 22, 2019, it was discovered that the lift pump located at the north lift station just east of the intake canal was not operational and untreated domestic wastewater had overflowed the sump and collected on the grass surrounding the area. This then drained onto the adjacent concrete and into a drainage culvert, which ultimately traveled into the intake canal. The estimated total volume of wastewater was 400 gallons, of which the majority was pooled on the grassy area. Per the NPDES permit, FL0002208 Section IX.19(a), oral notification to the FDEP was made within 24 hours as required. No formal written report was needed per the NPDES permit Section IX.19(c). Due to a written report being waived by the FDEP, no NRC notification was required. The wastewater on the grass was removed by FPL and but the wastewater that reached the intake canal was unrecoverable. The lift pump that caused the release was replaced by FPL and other similar lift pump stations were evaluated to make sure they were working properly.

**Table 3.6-1 FDEP Water Quality Monitoring Program (Sheet 1 of 3)**

| Outfall | Description | Parameter | Permit Requirement | Frequency |
|---|---|---|---|---|
| D-001 | Once-through non-contact cooling water and auxiliary equipment cooling water discharge to Atlantic Ocean | Flow rate | No limit, monitor and report daily maximum in MGD | 1/daily |
| | | Chlorination duration | 120 min. daily maximum | Daily; 24 hours |
| | | Oxidants, total residual | 0.10 mg/L maximum daily and maximum monthly average | Continuous |
| | | Temperature, water (during normal operation) | 115°F daily maximum | Hourly |
| | | Temperature, water (during maintenance activities) | 117°F daily maximum | Hourly |
| | | Temperature difference between intake and discharge (during normal operation) | 30°F daily maximum | Calculated hourly |
| | | Temperature difference between intake and discharge (during maintenance activities) | 32°F daily maximum | Calculated hourly |
| | | Nitrogen, ammonia, total (as N) | Report single sample mg/L maximum | Grab quarterly |
| | | Nitrogen, Kjeldahl, total (as N) | Report single sample mg/L maximum | Grab quarterly |
| | | Nitrogen plus nitrate, total (as N) | Report single sample mg/L maximum | Grab quarterly |
| | | Nitrogen, total | Report single sample mg/L maximum | Grab quarterly |

**Table 3.6-1 FDEP Water Quality Monitoring Program (Sheet 2 of 3)**

| Outfall | Description | Parameter | Permit Requirement | Frequency |
|---|---|---|---|---|
| D-001 (continued) | | Phosphorus, total (as P) | Report single sample mg/L maximum | Grab quarterly |
| | | Phosphate, Ortho (as PO4) | Report single sample mg/L maximum | Grab quarterly |
| | | Chronic whole effluent toxicity, 7-Day IC25 (Mysidopsis bahia) | 100 percent single sample minimum | Grab semi-annually |
| | | Chronic whole effluent toxicity, 7-Day IC25 (Menidia beryllina) | 100 percent single sample minimum | Grab semi-annually |
| | | Chlorine dioxide | Report daily maximum mg/L | Grab monthly |
| I-003 | Process wastewater and monitoring well sample purge water discharge to the onsite discharge canal | Flow rate | Report daily maximum monthly average max in MGD | Calculated per batch of process |
| | | Oil & grease | 15 mg/L monthly average, 20 mg/L daily maximum | Grab Annually |
| | | Solids, total suspended | 30 mg/L monthly average, 100 mg/L daily maximum | Grab per batch of process |
| I-005 | Steam generator blowdown discharge to the onsite discharge canal | Flow rate | Report daily maximum monthly average, daily max in MGD | Calculated weekly, when discharging |
| | | Oil & grease | 15 mg/L monthly average, 20 mg/L daily maximum | Grab weekly, when discharging, and quarterly |
| | | Solids, total suspended | 30 mg/L monthly average, 100 mg/L daily maximum | Grab weekly, when discharging, and quarterly |
| | | Hydrazine | 0.3 mg/L daily maximum | Grab weekly, when discharging |
| | | Carbohydrazide | Report daily maximum in mg/L | Grab weekly, when discharging |

**Table 3.6-1 FDEP Water Quality Monitoring Program (Sheet 3 of 3)**

| Outfall | Description | Parameter | Permit Requirement | Frequency |
|---|---|---|---|---|
| I-008 | Stormwater and water treatment plant reverse osmosis reject discharge to the intake canal | Flow rate | Report daily maximum monthly average max in MGD | Calculated weekly, when discharging |
| | | Solids, total suspended | 30 mg/L monthly average, 100 mg/L daily maximum | Grab weekly, when discharging |
| I-009 | Emergency discharge during extreme storm events consisting of stormwater associated with condensate pits and component cooling water to the intake and discharge canals. | Flow rate | Report daily maximum monthly average, daily max in MGD | Calculated per discharge |
| | | Oil & grease | 15 mg/L monthly average, 20 mg/L daily maximum | Grab per discharge |
| | | Solids, total suspended | 30 mg/L monthly average, 100 mg/L daily maximum | Grab per discharge |

(FDEP 2016a; FDEP 2020b)

**Table 3.6-2 PSL Groundwater Monitor Well Details (Sheet 1 of 3)**

| Well | Well Diameter[(a)] | Elevations (feet msl) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Top of Casing | Top of Filter[(b)] | Top of Screen[(b)] | Bottom of Screen[(b)] | Bottom of Filter[(b)] | Well Construction Material |
| MW-3 | 2 | 16.56 | -- | 4.56 | -5.44 | -5.44 | PVC |
| MW-4 | 2 | -- | -- | -- | -- | -- | PVC |
| MW-5 | 2 | 16.49 | -- | 4.49 | -5.41 | -5.41 | PVC |
| MW-6 | 2 | 16.51 | -- | 4.51 | -5.49 | -5.49 | PVC |
| MW-7 | 2 | 15.53 | -- | 2.53 | -7.47 | -7.47 | PVC |
| MW-15 | 2 | -- | -- | -- | -- | -- | -- |
| MW-16 | 2 | 15.83 | -- | 2.83 | -7.17 | -7.17 | PVC |
| MW-17 | 2 | -- | -- | -- | -- | -- | -- |
| MW-18d | 2 | 16.18 | -- | -23.82 | -28.82 | -28.82 | PVC |
| MW-19 | 2 | -- | -- | -- | -- | -- | PVC |
| MW-22d | 2 | 16.58 | -- | -18.58 | -23.42 | -23.42 | PVC |
| MW-26 | 2 | 16.6 | -- | 2.6 | -7.4 | -7.4 | PVC |
| MW-30 | 2 | -- | -- | -- | -- | -- | PVC |
| MW-31 | 2 | -- | -- | -- | -- | -- | PVC |
| MW-32 | 2 | -- | -- | -- | -- | -- | PVC |
| MW-33 | 2 | -- | -- | -- | -- | -- | PVC |
| RW-2 | 6 | -- | -- | -- | -- | -- | -- |
| RW-4 | 6 | -- | -- | -- | -- | -- | PVC |
| RW-5 | 6 | 15.91 | -- | 5.91 | -14.09 | -14.09 | PVC |
| S-MW-1 | -- | -- | -- | -- | -- | -- | -- |
| S-MW-4 | -- | 10.3 | -- | -14.71 | -19.7 | -19.7 | PVC |
| S-MW-6 | -- | 10 | -- | 2 | -8 | -8 | PVC |
| S-MW-7A | -- | 10.56 | -- | 2.56 | -7.44 | -7.44 | PVC |

**Table 3.6-2 PSL Groundwater Monitor Well Details (Sheet 2 of 3)**

| Well | Well Diameter[a] | Elevations (feet msl) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Top of Casing | Top of Filter[b] | Top of Screen[b] | Bottom of Screen[b] | Bottom of Filter[b] | Well Construction Material |
| S-MW-11 | -- | -- | -- | -- | -- | -- | -- |
| S-MW-15d | -- | -- | -- | -- | -- | -- | PVC |
| S-MW-16 | -- | -- | -- | -- | -- | -- | PVC |
| S-MW-16i | -- | -- | -- | -- | -- | -- | PVC |
| S-MW-17 | -- | -- | -- | -- | -- | -- | PVC |
| S-MW-18 | -- | -- | -- | -- | -- | -- | PVC |
| S-MW-19 | -- | -- | -- | -- | -- | -- | PVC |
| PSLED-2 | -- | 12.99 | -- | 2.99 | -7.01 | -7.01 | PVC |
| NB-MW-1 | -- | 10.81 | -- | 2.81 | -7.19 | -7.19 | PVC |
| NB-MW-2 | -- | 19.27 | -- | 5.27 | -4.73 | -4.73 | PVC |
| UNIT 1 MW001 | 4 | 16.19 | -- | 3.19 | -6.81 | -6.81 | PVC |
| UNIT 1 MW002 | 4 | 16.2 | -- | 3.2 | -6.8 | -6.8 | PVC |
| UNIT 1 MW003 | -- | -- | -- | -- | -- | -- | -- |
| UNIT 1 MW004 | 4 | -- | -- | -- | -- | -- | -- |
| UNIT 1 MW005 | 2 | -- | -- | -- | -- | -- | -- |
| UNIT 2 MW001 | 4 | 15.93 | -- | 1.93 | -8.07 | -8.07 | PVC |
| UNIT 2 MW002 | 4 | 16.47 | -- | 2.47 | -7.53 | -7.53 | PVC |
| UNIT 2 MW003 | 4 | 16.45 | -- | 2.45 | -7.55 | -7.55 | PVC |
| UNIT 2 MW004 | 2 | -- | -- | -- | -- | -- | -- |
| H70 (GIS-MW-Es) | 2 | -- | -- | -- | -- | -- | PVC |
| H71 (GIS-MW-Ei) | 2 | -- | -- | -- | -- | -- | PVC |
| H72 (GIS-MW-Si) | 2 | -- | -- | -- | -- | -- | PVC |
| H73 (GIS-MW-SWs) | 2 | -- | -- | -- | -- | -- | PVC |

**Table 3.6-2 PSL Groundwater Monitor Well Details (Sheet 3 of 3)**

| Well | Well Diameter[(a)] | Elevations (feet msl) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Top of Casing | Top of Filter[(b)] | Top of Screen[(b)] | Bottom of Screen[(b)] | Bottom of Filter[(b)] | Well Construction Material |
| H74 (GIS-MW-SWi) | 2 | -- | -- | -- | -- | -- | PVC |
| H75 (GIS-MW-Wi) | 2 | -- | -- | -- | -- | -- | PVC |
| H76 | 2 | -- | -- | -- | -- | -- | PVC |
| H77 | 2 | -- | -- | -- | -- | -- | PVC |
| H78 | 2 | -- | -- | -- | -- | -- | PVC |
| H79 | 2 | -- | -- | -- | -- | -- | PVC |

a. Measured in inches.

b. Approximate measurement.

Dashed cells indicate data were not reported.

**Table 3.6-3a PSL Yearly Surface Water Withdrawal Summary**

| Year | | 2016 | 2017 | 2018 | 2019 | 2020 | 2016–2020 |
|---|---|---|---|---|---|---|---|
| Monthly Maximum | MGM | 46,095.00 | 46,095.30 | 45,800.00 | 45,801.51 | 45,800.83 | 46,095.30 |
| | $gpm_a$ | 1,032,594.00 | 1,049,928.00 | 1,026,019.00 | 1,031,172.00 | 1,026,004.00 | 1,049,928.00 |
| Monthly Average | MGM | 42,191.42 | 44,573.75 | 41,362.50 | 42,280.92 | 43,362.53 | 42,754.22 |
| | $gpm_a$ | 960, 977.00 | 1,016,738.00 | 944,401.00 | 965,853.00 | 986,791.00 | 974,952.00 |
| Monthly Minimum | MGM | 22,630.00 | 35,397.76 | 25,701.00 | 33,458.90 | 33,992.71 | 22,630.00 |
| | $gpm_a$ | 506,944.00 | 877,921.00 | 594,931.00 | 749,527.00 | 801,629.00 | 506,944.00 |
| Yearly Total | MGY | 506,297.00 | 534,884.96 | 496,350.00 | 507,371.03 | 520,350.34 | 513,050.67 |
| | MGD | 1,387.12 | 1,461.43 | 1,359.86 | 1,390.06 | 1,425.72 | 1,404.08 |

MGY = millions of gallons per year

MGD = millions of gallons per day

MGM = millions of gallons per month

$gpm_a$ = average gallons per minute for the month

**Table 3.6-3b PSL Monthly Surface Water Withdrawal Summary (Sheet 1 of 2)**

| Month | Intake (MGM) | Total (gpm) |
|---|---|---|
| January-2016 | 45,800.00 | 1,025,985.66 |
| February-2016 | 41,430.00 | 992,097.70 |
| March-2016 | 46,064.00 | 1,031,899.64 |
| April-2016 | 43,276.00 | 1,001,759.26 |
| May-2016 | 46,095.00 | 1,032,594.09 |
| June-2016 | 44,324.00 | 1,026,018.52 |
| July-2016 | 45,800.00 | 1,025,985.66 |
| August-2016 | 44,016.00 | 986,021.51 |
| September-2016 | 41,449.00 | 959,467.59 |
| October-2016 | 22,630.00 | 506,944.44 |
| November-2016 | 39,613.00 | 916,967.59 |
| December-2016 | 45,800.00 | 1,025,985.66 |
| January-2017 | 45,800.00 | 1,025,985.66 |
| February-2017 | 35,397.76 | 877,920.63 |
| March-2017 | 46,063.00 | 1,031,877.24 |
| April-2017 | 45,356.90 | 1,049, 928.24 |
| May-2017 | 46,095.30 | 1,032,600.81 |
| June-2017 | 44,324.00 | 1,026,018.52 |
| July-2017 | 45,800.00 | 1,025,985.66 |
| August-2017 | 45,062.00 | 1,009,453.41 |
| September-2017 | 44,324.00 | 1,026,018.52 |
| October-2017 | 45,800.00 | 1,025,985.66 |
| November-2017 | 45,062.00 | 1,043,101.85 |
| December-2017 | 45,800.00 | 1,025,985.66 |
| January-2018 | 45,800.00 | 1,025,985.66 |
| February-2018 | 41,368.00 | 1,025,992.06 |
| March-2018 | 31,671.00 | 709,475.81 |
| April-2018 | 39,094.00 | 904,953.70 |
| May-2018 | 45,800.00 | 1,025,985.66 |
| June-2018 | 44,324.00 | 1,026,018.52 |
| July-2018 | 45,062.00 | 1,009,453.41 |
| August-2018 | 42,437.00 | 950,649.64 |

**Table 3.6-3b PSL Monthly Surface Water Withdrawal Summary (Sheet 2 of 2)**

| Month | Intake (MGM) | Total (gpm) |
|---|---|---|
| September-2018 | 25,701.00 | 594,930.56 |
| October-2018 | 44,980.00 | 1,007,616.49 |
| November-2018 | 44,313.00 | 1,025,763.89 |
| December-2018 | 45,800.00 | 1,025,985.66 |
| January-2019 | 45,783.27 | 1,025,610.86 |
| February-2019 | 41,368.32 | 1,026,000.00 |
| March-2019 | 45,8001.69 | 1,026,001.17 |
| April-2019 | 44,546.61 | 1,031,171.53 |
| May-2019 | 36,010.86 | 806,694.87 |
| June-2019 | 43,385.51 | 1,004,294.28 |
| July-2019 | 45,800.67 | 1,026,000.58 |
| August-2019 | 45,801.51 | 1,026,019.49 |
| September-2019 | 44,323.20 | 1,026,000.00 |
| October-2019 | 33,458.90 | 749,527.31 |
| November-2019 | 35,291.17 | 816,925.24 |
| December-2019 | 45,800.32 | 1,025,992.83 |
| January-2020 | 45,800.64 | 1,026,000.00 |
| February-2020 | 33,992.71 | 814,001.69 |
| March-2020 | 35,784.71 | 801,628.71 |
| April-2020 | 44,323.28 | 1,026,001.95 |
| May-2020 | 45,754.10 | 1,024,957.33 |
| June-2020 | 44,323.2 | 1,026,000.00 |
| July-2020 | 45,800.64 | 1,026,000.00 |
| August-2020 | 45,800.83 | 1,026,004.15 |
| September-2020 | 44,323.20 | 1,026,000.00 |
| October-2020 | 45,800.64 | 1,026,000.00 |
| November-2020 | 44,323.20 | 1,026,000.00 |
| December-2020 | 44,323.20 | 992,903.23 |

MG = millions of gallons

MGM = millions of gallons per month

gpm = average gallons per minute for the month

**Table 3.6-4 Surface Water Usage Summary in MGD, 2015**

| Category | St. Lucie County | Indian River County | Martin County |
|---|---|---|---|
| Public supply | 0.00 | 0.00 | 0.00 |
| Domestic, self-supplied | 0.00 | 0.00 | 0.00 |
| Industrial, self-supplied | 0.00 | 0.00 | 0.68 |
| Irrigation | 28.62 | 35.69 | 97.60 |
| Livestock | 0.00 | 0.00 | 0.00 |
| Aquaculture | 0.00 | 0.00 | 0.00 |
| Mining | 0.00 | 0.15 | 0.49 |
| Power generation (thermoelectric) | 1,482.93 | 2.19 | 25.90 |
| **Total** | **1,511.55** | **38.03** | **124.67** |

(USGS 2021c)

**Table 3.6-5 Groundwater Usage Summary in MGD, 2015**

| Category | St. Lucie County | Indian River County | Martin County |
|---|---|---|---|
| Public supply | 29.37 | 16.94 | 15.61 |
| Domestic, self-supplied | 1.52 | 0.20 | 0.45 |
| Industrial, self-supplied | 0.00 | 0.00 | 1.53 |
| Irrigation | 15.14 | 22.08 | 11.39 |
| Livestock | 0.35 | 0.25 | 0.16 |
| Aquaculture | 0.01 | 0.00 | 0.04 |
| Mining | 0.00 | 0.00 | 0.00 |
| Power generation (thermoelectric) | 1.06 | 0.00 | 0.28 |
| **Total** | **47.45** | **39.47** | **29.46** |

(USGS 2021c)

**Table 3.6-6 Offsite Registered Water Wells within 5 Miles of PSL Boundary (Sheet 1 of 2)**

| Map ID | FDEP Water Well ID | Distance[(a)] (miles) | Well Depth (feet) | Use Description | Aquifer Name |
|---|---|---|---|---|---|
| 1 | 272112080175801 | 3.2 | 60 | Private drinking water well | Surficial aquifer system |
| 2 | 271735080141601 | 3.8 | 55 | Private drinking water well | Surficial aquifer system |
| 3 | 272208080182401 | 4.0 | 63 | Private drinking water well | Surficial aquifer system |
| 4 | 271823080180301 | 4.4 | 126 | Private drinking water well | Surficial aquifer system |
| 5 | 272207080185601 | 4.5 | 63 | Private drinking water well | Floridan aquifer system |
| 6 | AAF4923 | 4.7 | NA | Public water system well | East coast surficial aquifer |
| 7 | 271924080190801 | 4.8 | 65 | Private drinking water well | Surficial aquifer system |
| 8 | 272240080190201 | 4.8 | 63 | Private drinking water well | Surficial aquifer system |
| 9 | AAH7903 | 4.8 | 80 | Public water system well | East coast surficial aquifer |
| 10 | AAH7902 | 4.8 | NA | Public water system well | East coast surficial aquifer |
| 11 | NA | 4.8 | NA | Public water system well | East Coast Surficial Aquifer |
| 12 | AAG3420 | 4.9 | NA | Public water system well | East Coast Surficial Aquifer |
| 13 | 272352080181701 | 4.9 | 105 | Private drinking water well | Surficial Aquifer System |
| 14 | AAH8285 | 4.9 | NA | Public water system well | East coast surficial aquifer |
| 15 | AAH8284 | 4.9 | NA | Public water system well | East coast surficial aquifer |
| 16 | 272404080182201 | 5.2 | 36 | Private drinking water well | Surficial aquifer system |
| 17 | AAH7808 | 5.4 | 113 | Public water system well | East coast surficial aquifer |
| 18 | 271745080200001 | 5.6 | 52 | Private drinking water well | Surficial aquifer system |

**Table 3.6-6 Offsite Registered Water Wells within 5 Miles of PSL Boundary (Sheet 2 of 2)**

| Map ID | FDEP Water Well ID | Distance[a] (miles) | Well Depth (feet) | Use Description | Aquifer Name |
|---|---|---|---|---|---|
| 19 | 272209080200701 | 5.6 | 63 | Private drinking water well | Surficial aquifer system |
| 20 | AAH7810 | 5.7 | NA | Public water system well | East coast surficial aquifer |
| 21 | AAH7809 | 5.7 | NA | Public water system well | East coast surficial aquifer |
| 22 | 271615080164101 | 5.7 | 63 | Private drinking water well | Surficial aquifer system |
| 23 | AAH8102 | 5.9 | NA | Public water system well | East coast surficial aquifer |
| 24 | 272323080195401 | 6.0 | 75 | Private drinking water well | Surficial aquifer system |
| 25 | 272213080202701 | 6.0 | 63 | Private drinking water well | Surficial aquifer system |

a. Distance is from the PSL center point and rounded to the nearest tenth of a mile. No water wells were listed within 2 miles of the PSL property boundary. Wells listed are within 2 to 5 miles of the property boundary.

(FDEP 2021c)


**Figure 3.6-1 Vicinity Hydrological Features**

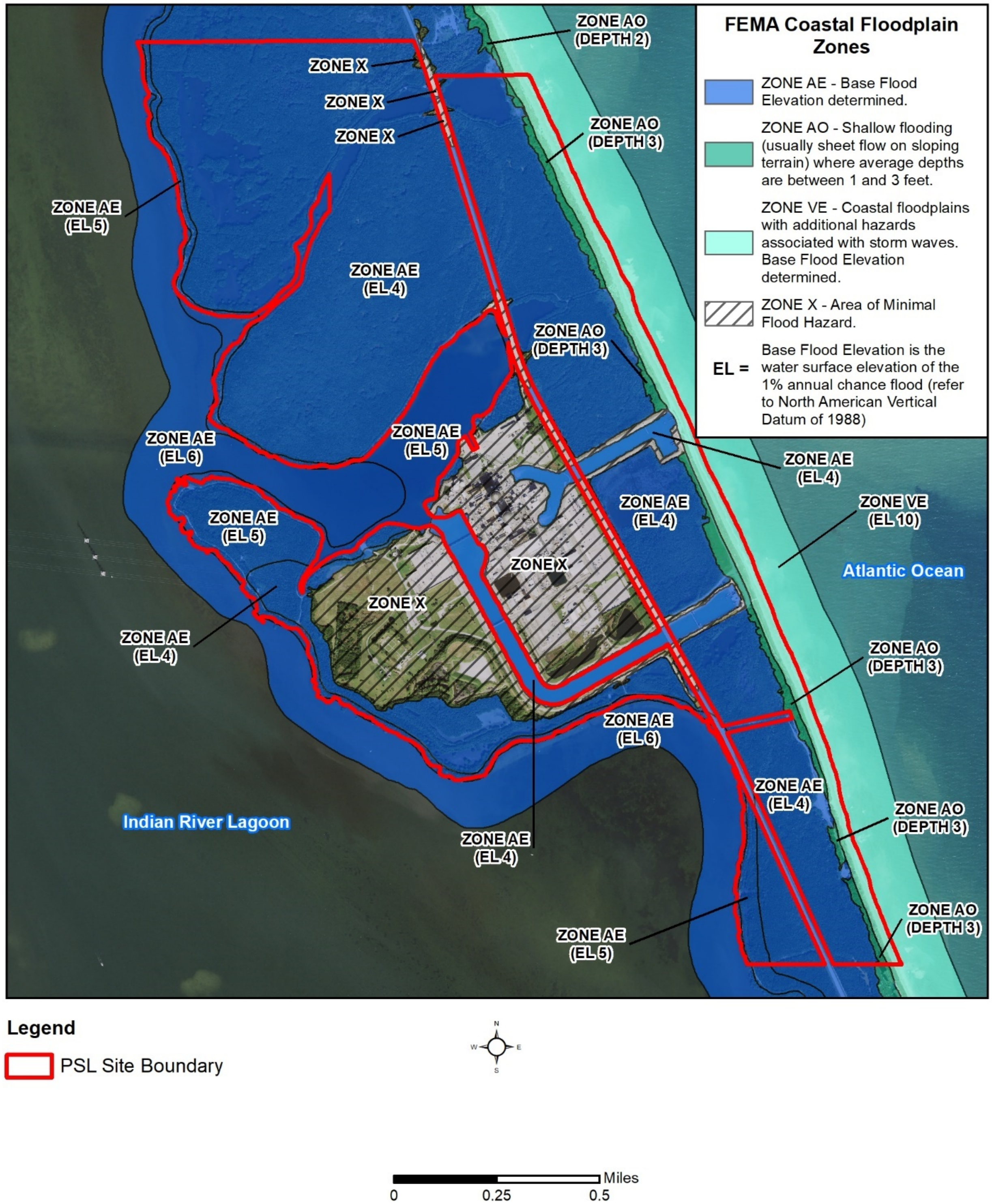



**Figure 3.6-2 FEMA Floodplain Zones at PSL**


**Figure 3.6-3 NPDES Outfalls**

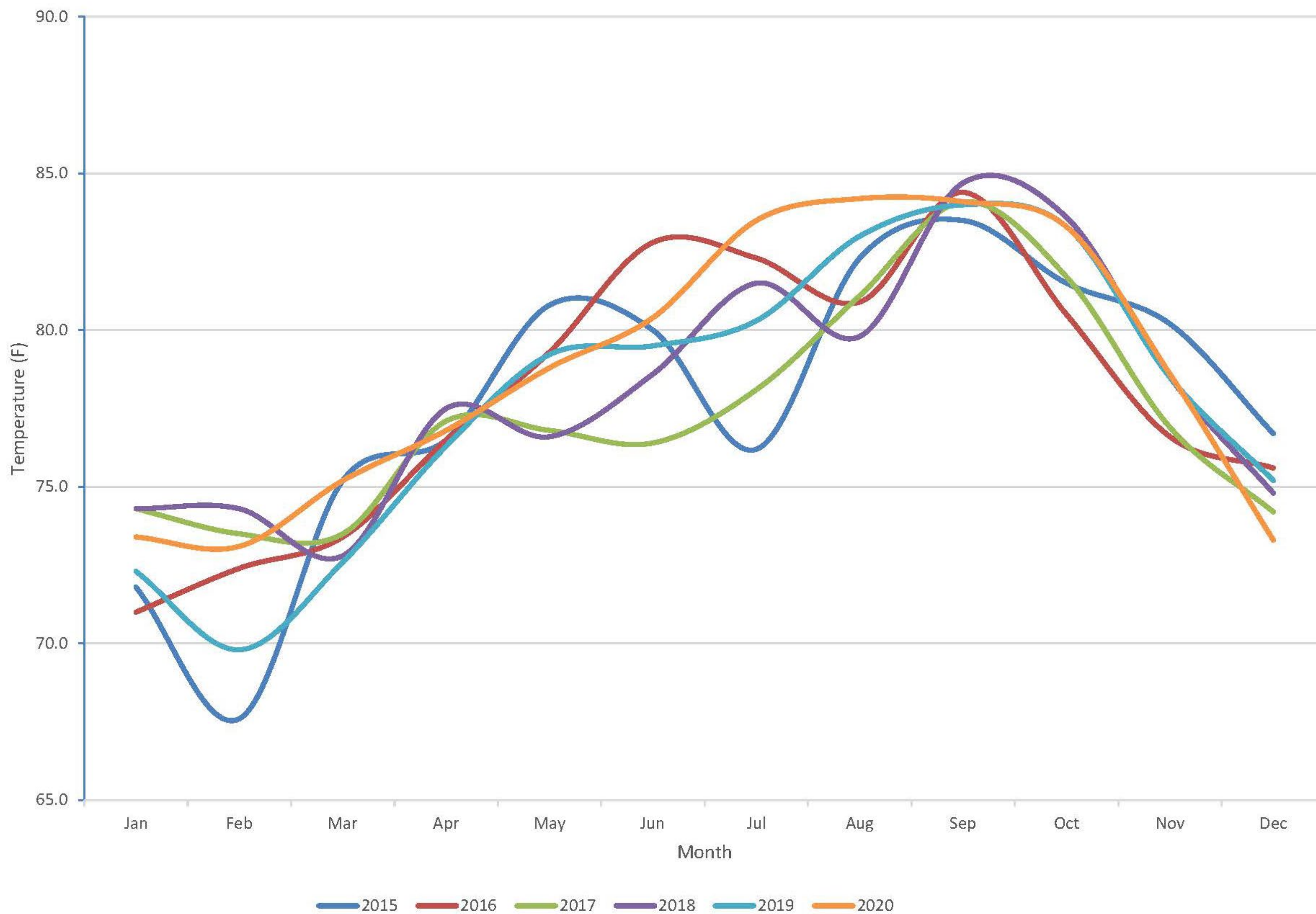



**Figure 3.6-4 Average Condenser Intake Temperatures**

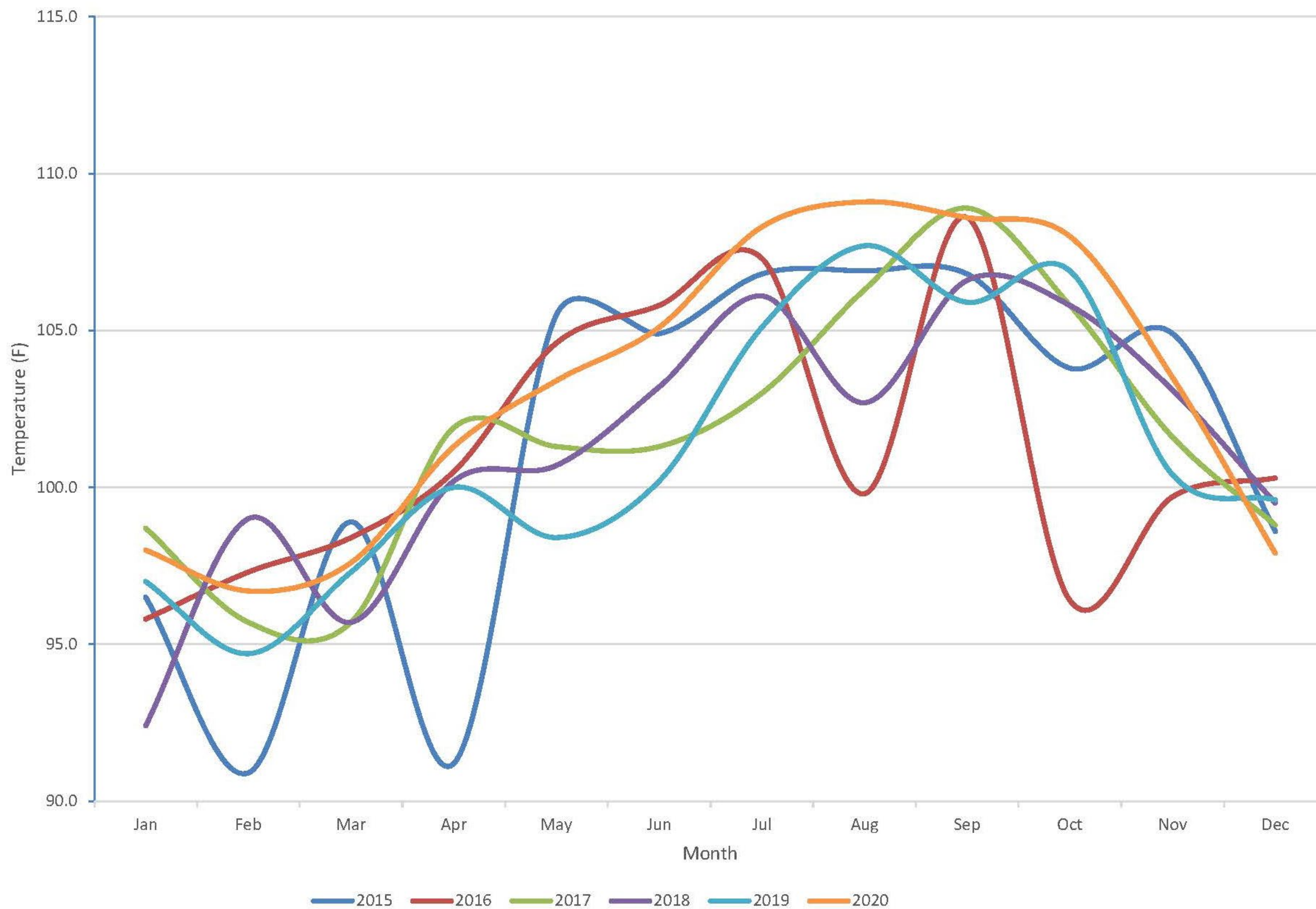



**Figure 3.6-5 Average Condenser Discharge Temperatures**


**Figure 3.6-6 Onsite Wells**

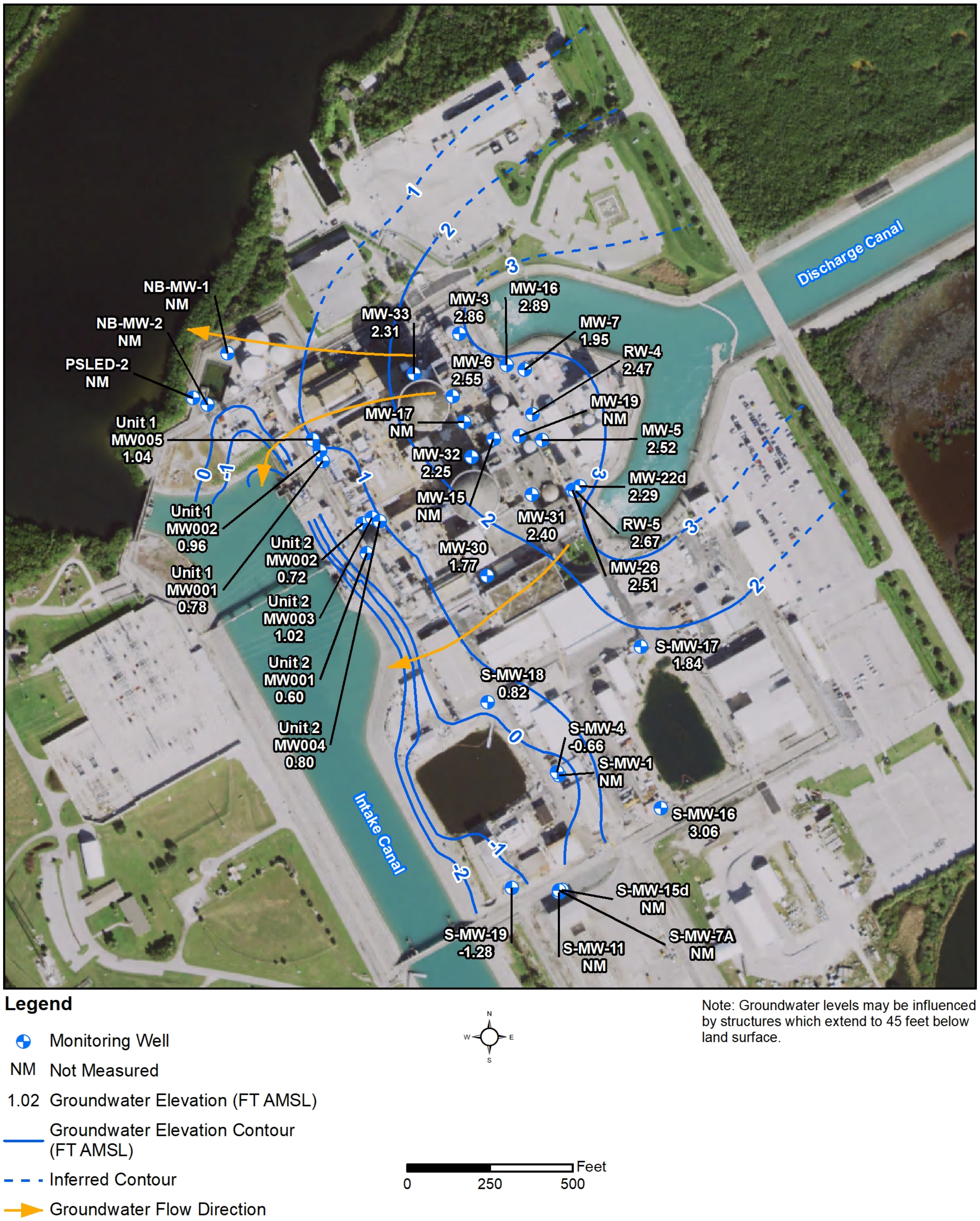



**Figure 3.6-7 November 2016 Potentiometric Map**

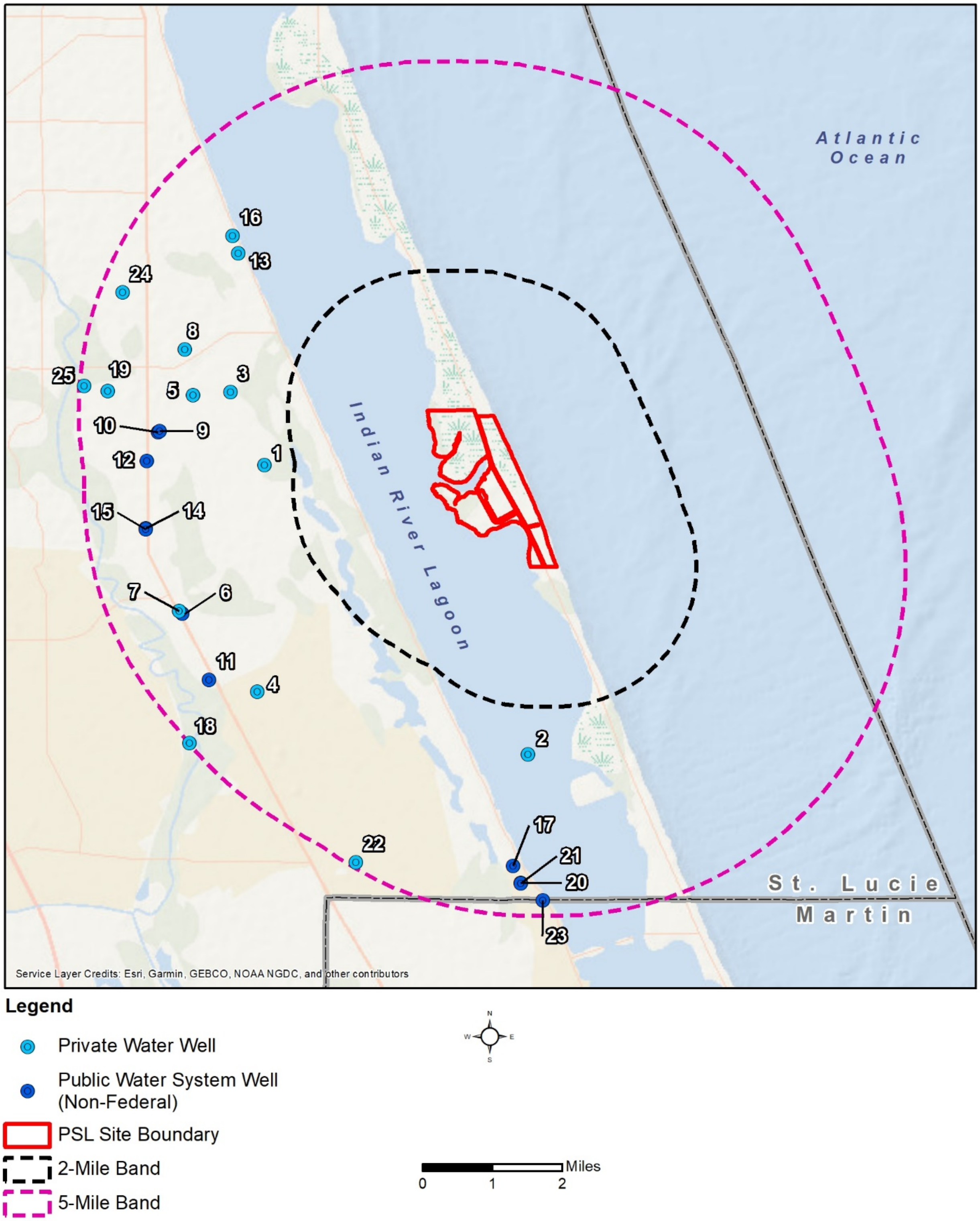



**Figure 3.6-8 Offsite Registered Water Wells within 5 Miles of PSL Boundary**

## 3.7 Ecological Resources

This section details the ecological resources of the PSL site, in-scope transmission lines, and surrounding landscape within a 6-mile radius.

### 3.7.1 Aquatic Communities

PSL Units 1 and 2 are located on Hutchinson Island, positioned between the Atlantic Ocean to the east and the Indian River Lagoon to the west. Blind Creek and Big Mud Creek, inlets off the Indian River Lagoon, are adjacent to the site to the north. Herman Bay, another inlet of the Indian River Lagoon, is adjacent to the site to the south. The Atlantic Ocean serves as PSL's source of both intake and discharge for the once-through cooling water system. (NRC 2003)

Water for the PSL system enters through three submerged intake structures located approximately 365 meters (approximately 1,200 feet) offshore. The intake structures are equipped with a velocity cap designed to reduce impingement of marine organisms by converting vertical flow into horizontal flow at the intake. The design takes into account that fish are able to detect and avoid a horizontal velocity, but not a vertical velocity. The location of the velocity caps at mid-depth also helps reduce entrainment, based on data demonstrating that plankton densities are much lower at mid-depth than at the ocean surface. Water passes through these structures into an approximately 1,500-meter (approximately 4,920 feet) long intake canal, and is transported to the plant. After passing through the plant, the heated water is discharged into an approximately 670-meter (approximately 2,200 feet) long canal that leads to two buried discharge pipelines. These pass underneath the dunes and along the ocean floor to the two submerged discharges. The plant is also equipped to withdraw water from the Indian River Lagoon via Big Mud Creek, but this withdrawal system is for emergency use and this pathway is closed during normal operation. (NRC 2003)

In addition, FPL has installed and maintains three barriers in the channel to reduce potential losses of marine life, particularly sea turtles, and to facilitate the return of turtles to the ocean. These include deployment of a 12.7-centimeter (5-inch) mesh barrier net across the channel approximately midway between SR A1A and the canal headwall, a 20.3-centimeter (8-inch) mesh barrier net immediately east of SR A1A, and installation of a rigid barrier across the north-south arm of the intake canal.

This section further details the aquatic environment and biota near the PSL site and additional areas potentially affected by the continued operation of PSL. It includes a description of the aquatic ecosystems at or near the site, a description of representative important species that are present or are expected to occur, and the location of critical habitats, or other areas carrying special designations.

#### 3.7.1.1 Atlantic Ocean

The Atlantic Ocean is the second largest ocean in the world. It covers approximately 29,637 million square miles and has approximately 69,510 miles of coastline. Located between the eastern and western hemispheres, it provides some of the most heavily trafficked sea routes in the world. (CIA 2020)

The Atlantic Ocean is home to a variety of natural, cultural, and economic resources. The Atlantic Ocean's coastal environment supports a plethora of aquatic resources and provides critical environments for a variety of plant and animal life ranging from valuable commercial resources, to rare, endangered, and threatened species (Florida Oceans and Coastal Council 2009). Seagrass, marshes, mangroves, and other coastal habitats are key for the survival of important fishery species for Florida. This coastline also provides habitat for essential fish and highly migratory essential fish species. Fisheries in the Atlantic supported 28 percent of the global catch in 2017 (CIA 2020). Further, NOAA data were reviewed from 2015–2019 and commercially important species common (greater than 1,000,000 pounds harvested) to Florida's east coast include marine shrimp, northern white shrimp, Spanish mackerel, rock shrimp, blue crab, king mackerel, striped mullet, and swordfish. (NOAA 2021a) The Atlantic Ocean adjacent to PSL is designated critical habitat for the loggerhead sea turtle. Loggerhead sea turtles are discussed further in Section 3.7.8.1.2.

To the east of Hutchinson Island, submerged coquinoid rock formations parallel the Atlantic coast, adjacent to the PSL site and just south of the PSL Units 1 and 2 intake canal. This notable formation is visible through the sand at Walton Rocks Park and colonized via encrusting tube-building marine polychaete worms (family Sabellariidae). It supports a variety of marine life throughout various life cycles. (NRC 2003)

Seasonal seawater temperatures along Hutchinson Island peak in the late summer/early fall and fall to their lowest in mid to late winter. In its humid-subtropical climate, water temperature can exceed 87°F and reach as low as 65°F. However, the size of the Atlantic mitigates much of the temperature variability in the water, whereas the Indian River Lagoon experiences more dramatic temperature fluctuations.

Prior to plant operation, the marine communities in the vicinity of PSL were studied to develop a baseline for the aquatic habitat. This baseline was used to evaluate potential effects, if any, of PSL on aquatic communities. From September of 1971 to November of 1972, phytoplankton were collected at five locations offshore of Hutchinson Island. The phytoplankton community within the Atlantic Ocean was dominated by diatoms, the most common of which were the genera *Nitzschia*, *Bellerochea*, and *Chaetoceros*, and the species *Thalassionema nitzschioides* and *Skeletonema costatum*. The zooplankton community was also sampled at the same locations and primarily contained neritic holoplanktonic species (species that spend their entire life cycle in the water column), dominated by Copepods, with the genera *Acartia, Paracalamis, Oithona, Temora, Undinula, Corycaeus, Euterpina,* and *Labidocera* the most common. Zooplankton density appeared to be broadly correlated with phytoplankton density. Table 3.7-1 lists the phytoplankton and zooplankton taxa documented as occurring within the vicinity of PSL. (FPL 1973)

Monitoring data indicate that there are three sub-tidal microhabitats offshore of the plant with sediment composition differing among these zones. Macroinvertebrate communities are largely influenced by the variations in sediment heterogeneity. Patterns of fish abundance and diversity are largely aligned with microhabitat boundaries. Baseline data include 127 species of arthropods and nearly 300 species of mollusks. Among species of direct commercial value, the Atlantic calico scallop (*Argopecten gibbus*) was the only mollusk recorded. Arthropods of potential commercial value included shrimp (of the family Penaeidae) and the blue crab (*Callinectes sapidus*). However, these species were generally collected infrequently and in small numbers. (FPL 1973)

Benthic studies conducted through 1984 produced remarkable databases for regional sediments, hydrology, and bottom-dwelling organisms. A total of 934 taxa of benthic macroinvertebrates, many species new to science, were identified. (FPL 1973)

Fisheries assessments were also carried out from September 1971–March 1972 in association with startup and operations of PSL Units 1 and 2 (FPL 1973). Bottom trawls collected 39 fish (13 species). Of those species, the sheepshead (*Archosargus probatocephalus*) was most abundant in these collections. Beach seines were also deployed over the same timeframe. The seines yielded a catch of approximately 1,600 fish. The majority of the catch consisted of Cuban and longnose anchovies (*Anchoa cubana* and *A. nasuta*) with 20 other less abundant species. Table 3.7-2 depicts the commonly identified marine and brackish species known to occur in the vicinity of PSL. (FPL 1973)

Studies and monitoring were conducted to determine population dynamics of phytoplankton and zooplankton from 1976–1982 until the requirement was deleted from the plant's environmental technical specifications after it was demonstrated that Unit 1 operations were not having a substantial, persistent, or widespread effect on densities and community composition within the receiving waterbody.

Since the original assessment, the PSL site has continually been studied to document potential impacts to aquatic resources in the Atlantic Ocean. The results of these studies have shown minimal impact to aquatic resources, and no documented indication of water quality issues such as beach closures, large-scale fish kills, or similar hazards at PSL. Studies and monitoring are discussed further in Section 3.7.7.

#### 3.7.1.2 Indian River Lagoon System

The Indian River Lagoon is a complex estuarine system. It is approximately 156 miles long and comprises about 40 percent of the eastern coast of Florida. The Indian River Lagoon consists of brackish water created by freshwater run-off, rain events, tributaries, and five inlets that connect the lagoon to the Atlantic Ocean. (St. Johns RWMD 2007)

The Indian River Lagoon contains approximately 27 percent of the state's eastern coastal salt marshes and is a high-usage biological area for a variety of wildlife. The lagoon basin contains over 2,200 known animal species, including the only known population of the Atlantic salt marsh snake. Of those 2,200 species, over 50 animal species are either federally and/or state-listed as threatened or endangered. (St. Johns RWMD 2007) Indian Creek Lagoon, including Big Mud Creek, which extends into the PSL site boundary is designated critical habitat for the West Indian manatee. The West Indian manatee is discussed further in Section 3.7.8.1.4.

Three sub-bodies of the Indian River Lagoon exist within the PSL site: Herman's Bay, Big Mud Creek, and Blind Creek. Herman's Bay is located just south of the PSL site. It is largely a tourist area with beaches and dunes separating the bay from the Atlantic Ocean. Herman's Bay is a predominantly open inlet of the Indian River Lagoon and likely supports the same water quality and species composition. Big Mud Creek is a backwater cove of the Indian River Lagoon. Big Mud Creek receives little tidal influence and so has minimal water exchange with the lagoon. This results in water stratification that creates anoxic conditions near the bottom of Big Mud Creek. During the winter months, the water masses turn over as the surface cools. Blind Creek is another inlet of the Indian River Lagoon, approximately 0.8 miles in length from the Indian River Lagoon to the bridge at SR A1A. Of ecological importance, several occurrences of invasive species are documented near Blind Creek. Invasive species are discussed further in Section 3.7.5. (NRC 2003)

The Indian River Lagoon's geographic location along the transition zone between warm-temperate and subtropical climates combined with its large size and diverse physical characteristics make it an estuary of extremely high biological productivity. The lagoon has one of the most diverse assemblages of plants and animals of any estuarine system in North America. Mangrove shorelines, expansive beds of seagrasses, and attached and drift algae afford nursery habitat for a variety of fish and shellfish, many of which are important components of local sport and commercial fisheries. Because of its biological significance, the Indian River Lagoon has been designated as an aquatic preserve by the State of Florida and as an "estuary of national significance" by the EPA. It is now part of the National Estuary Program. (St. Johns RWMD 2007)

Indian River Lagoon fisheries were important in the 1800s and the early 1900s. Large catches of snook, goliath grouper, redfish, and sawfish were reported. Today, however, sawfish and grouper are essentially gone from the lagoon. Further, the snook and spotted sea trout have also declined greatly due to overfishing and the loss of productive habitat. (St. Johns RWMD 2007) Other wildlife still remains abundant in the lagoon. Over 2,200 species of animals, including 685 species of fish, 68 species of reptiles and amphibians, 370 species of birds, and 29 mammal species are documented in the lagoon. Further, over 2,100 species of plant can be found within the lagoon and surrounding habitats. Over 50 federally and/or state-listed threatened and endangered species inhabit the lagoon. (St. Johns RWMD 2007)

Prior to startup of PSL Unit 1, a study was conducted to select the water source for PSL. It was determined that the biodiversity of the Indian River Lagoon was greater than that of the Atlantic Ocean and it would not be sustainable to utilize the lagoon for the plant's daily operations. Therefore, siting was moved to the Atlantic Ocean to protect important and imperiled species in the lagoon. (FPL 2001, Section 6.2)

## 3.7.2 Terrestrial and Wetland Communities

The PSL site consists of generation and maintenance facilities, laydown areas, parking lots, roads, and mowed grass. In addition, the site contains several red mangrove swamps, tropical hammock areas, beach and dunes, Blind Creek Pass Park, Walton Rocks Park, and a nature trail. This section identifies terrestrial and wetland ecological resources and describes species composition and other structural and functional attributes of terrestrial biotic assemblages that could be affected by the continued operation and maintenance of the facilities.

### 3.7.2.1 Physiographic Province

PSL is located within the Atlantic Coastal Ridge of the Midpeninsular Zone physiographic province of the United States. The Atlantic Coastal Ridge extends along the mainland coast of the Florida Peninsula and extends from the Georgia state boundary to Miami (White 1970). Further details of the Atlantic Coastal Ridge Province are discussed in Section 3.5.1.

### 3.7.2.2 Ecoregion

The PSL site is located entirely within the Southern Coastal Plain ecoregion. The Southern Coastal Plains are comprised largely of flat plains in conjunction with numerous swamps, marshes, and lakes. The Southern Coastal Plain experiences a mild, temperate climate and can support a number of tropical and semi-tropical forage plant species. This ecoregion is warmer, more heterogeneous, and has a longer growing season and coarser textured soils than the Middle Atlantic Coastal Plain. Historically, this region was dominated by beech (*Fagus grandifolia*), sweetgum (*Liquidambar styraciflua*), southern magnolia (*Magnolia grandiflora*), slash pine (*Pinus elliottii*), loblolly pine (*Pinus taeda*), white oak (*Quercus alba*), and laurel oak (*Quercus laurifolia*) forests. However, the region is now largely dominated by longleaf-slash pine forest, oak-gum-cypress forest in some low-lying areas, pasture for beef cattle, and urban development. It is underlain by limestone and has a sandy mantle of varying thicknesses. Sand hills reach over 200 feet in elevation and are typically nutrient poor. (EPA 2000a)

The Florida Natural Areas Inventory (FNAI) recognizes 81 natural communities to be found within the state. These community types help distinguish populations of plants, animals, fungi, and microorganisms naturally associated with each other and their physical environment. Data from the FNAI cooperative land cover map was used to determine state listed natural communities within 6 miles of the PSL site. (FNAI 2010)

A brief description of the state listed natural communities within this ecosystem, are provided below.

#### *3.7.2.2.1 Hardwood Forested Uplands*

The hardwood forested uplands community type consists of mesic or xeric forests that are dominated by shade tolerant, deciduous trees. These areas are typically sheltered from fire and occur on elevated, rolling terrain. Soils are generally well drained sandy clays or clayey sands that can contain organic and even calcareous components. Dominant species include southern magnolia, pignut hickory (*Carya glabra*), sweetgum, Florida maple (*Acer floridanum*), live oak

(*Quercus virginiana*), laurel oak, swamp chestnut oak (*Quercus michauxii*), southern hackberry (*Celtis laevigata*), white ash (*Fraxinus americana*), and loblolly pine. Typical understory species include American holly (*Ilex opaca*), red bay (*Persea borbonia*), American hornbeam (*Carpinus caroliniana*), gum bumelia (*Sideroxylon lanuginosum*), flowering dogwood (*Cornus florida*), winged elm (*Ulmus alata*) and basswood (*Tilla americana*). (FNAI 2010)

Within this natural community type, the 6-mile radius includes the mesic hammock sub-community type.

Mesic Hammock

Unlike its parent region, mesic hammock sites tend to be located on sandier soils. This sub-community type is characterized by well-developed evergreen hardwood and/or palm forest. Mesic hammock communities are rarely inundated. The canopy is typically closed and dominated by live oak in the canopy and cabbage palm (*Sabal palmetto*) in the subcanopy. Southern magnolia and pignut hickory may also flourish in the subcanopy. (FNAI 2010)

Rare plants occurring in mesic hammock include auricled spleenwort (*Asplenium erosum*), dwarf spleenwort (*Asplenium pumilum*), hammock rein orchid (*Habenaria distans*), Cooley's water-willow (*Justicia cooleyi*), Florida spiny-pod (*Matelea floridana*), pigmypipes (*Monotropsis odorata*), plume polypody (*Pecluma plumula*), terrestrial peperomia (*Peperomia humilis*), pinkroot (*Spigelia loganioides*), green ladies'-tresses (*Spiranthes polyantha*), Peters' bristle fern (*Trichomanes petersii*), Craighead's nodding-caps (*Triphora craigheadii*), and Rickett's nodding-caps (*Triphora rickettii*). (FNAI 2010)

Rare animals that commonly utilize mesic hammocks include eastern diamondback rattlesnake (*Crotalus adamanteus*), eastern indigo snake (*Drymarchon couperi*), Cooper's hawk (*Accipiter cooperii*), short-tailed hawk (*Buteo brachyurus*), crested caracara (*Caracara cheriway*), swallowtailed kite (*Elanoides forficatus*), Rafinesque's big-eared bat (*Corynorhinus rafinesquii*), Florida panther (*Puma concolor coryi*), southeastern weasel (*Mustela frenata olivacea*), Florida long-tailed weasel (*M. f. peninsulae*), southeastern bat (*Myotis austroriparius*), mangrove fox squirrel (*Sciurus niger avicennia*), and Florida black bear (*Ursus americanus floridanus*). (FNAI 2010)

##### *3.7.2.2.2 Coastal Uplands*

Coastal uplands are defined as mesic or xeric communities found near the shore and are restricted to barrier islands such as Hutchinson Island. They typically contain woody and herbaceous vegetation. Within this natural community type, the beach dune, coastal strand, and maritime hammock subcommunities are located within the 6-mile radius. (FNAI 2010)

Beach Dune

The beach dune community type contains wide-ranging coastal specialist plants on the vegetated upper beach and foredune. This community rarely sees fire. Beach dunes are usually built by seaoats (*Uniola paniculata*), a perennial rhizomatous grass, with stems that trap grains of sand. These stems build up the dune by growing upward to keep pace with sand burial. Other grasses that can generally tolerate sand burial include bitter panicgrass (*Panicum amarum*) and saltmeadow cordgrass (*Spartina patens*). Rare plant species found in the beach dune community include Godfrey's goldenaster (*Chrysopsis godfreyi*), Gulf Coast lupine (*Lupinus westianus* ), late flowering beach sunflower (*Helianthus debilis ssp. tardiflorus*), hairy beach sunflower (*Helianthus debilis ssp. vestitus*), Garber's spurge (*Chamaesyce garberi*), sand-dune spurge (*Chamaesyce cumulicola*), coastal vervain (*Glandularia maritima*), Atlantic Coast Florida lantana (*Lantana depressa var. floridana*), coastal hoary-pea (*Tephrosia angustissima var. curtissii*), burrowing four-o'clock (*Okenia hypogaea*), beachstar (*Cyperus pedunculatus*), and sea lavender (*Argusia gnaphalodes*). In addition, several animal species utilize beach dunes for foraging or nesting, including beach mice, shorebirds, and sea turtles. Many rare shorebirds use Florida beaches for nesting including the snowy plover (*Charadrius alexandrinus*), American oystercatcher (*Haematopus palliatus*), black skimmer (*Rynchops niger*), least tern (*Sterna antillarum*), and roseate tern (*S. dougallii*). (FNAI 2010)

<u>Coastal Strand</u>

An evergreen community type, coastal strand is located on stabilized coastal dunes in the peninsula of Florida. Coastal strand canopies are often smooth due to pruning by salt spray. It usually develops as a band between dunes along the immediate coast, and maritime hammock, scrub, or mangrove swamp communities further inland. This community type ranges from north to south along the Atlantic coast. Tropical species become more prevalent near PSL including seagrape (*Coccoloba uvifera*) nearest the coast, joined further inland by Florida swamp privet (*Forestiera segregata*), myrsine (*Rapanea punctata*), buttonsage (*Lantana involucrata*), white indigoberry (*Randia aculeata*), snowberry (*Chiococca alba*), Spanish stopper (*Eugenia foetida*), blolly (*Guapira discolor*), wild lime (*Zanthoxylum fagara*) Florida Keys blackbead (*Pithecellobium keyense*), coco plum (*Chrysobalanus icaco*), coinvine (*Dalbergia ecastaphyllum*), yellow necklacepod (*Sophora tomentosa var. truncata*), and gray nickerbean (*Caesalpinia bonduc*). (FNAI 2010)

Several rare species are found within the coastal strand community. Simpson's prickly apple (*Harrisia simpsonii*), coastal vervain, Atlantic coast Florida lantana, and beach jacquemontia (*Jacquemontia reclinata*) are observed on the Atlantic coast are some of the rare plant species. Among rare animals, gopher tortoises (*Gopherus polyphemus*) are common in this community and southeastern beach mice (*Peromyscus polionotus peninsularis*) may also use this community. (FNAI 2010)

<u>Maritime Hammock</u>

The third sub-community type, maritime hammock, is a largely evergreen hardwood forest located on stabilized dunes. Similar to coastal strand, maritime hammock changes in species composition from north to south, increasing its tropical species variability closer to the PSL site. Species found in the canopy include gumbo limbo (*Bursera simaruba*), false mastic (*Sideroxylon foetidissimum*), inkwood (*Exothea paniculata*), white stopper (*Eugenia axillaris*), strangler fig (*Ficus aurea*), seagrape (*Coccoloba uvifera*), Spanish stopper (*Eugenia foetida*), poisonwood (*Metopium toxiferum*), blolly (*Guapira discolor*), and Florida Keys blackbead (*Pithecellobium* *keyense*); tropical shrubs include myrsine (*Rapanea punctata*), Simpson's stopper (*Myrcianthes fragrans*), marlberry (*Ardisia escallonioides*), wild coffee (*Psychotria nervosa*), snowberry (*Chiococca alba*), and white indigoberry (*Randia aculeata*).(FNAI 2010)

Rare plant species found in maritime hammock include Biscayne prickly ash (*Zanthoxylum coriaceum*) and silver palm (*Coccothrinax argentata*) in the understory. Temperate and tropical maritime hammocks serve as crucial resting and foraging areas for songbirds on their fall and spring migrations to and from the tropics. Though not primary habitat, maritime hammocks are also often used by the gopher tortoise. (FNAI 2010)

#### *3.7.2.2.3 Pine Flatwoods and Dry Prairie*

The pine flatwoods and dry prairie community type consists of mesic or hydric pine woodland or mesic shrubland located on relatively flat, poorly drained, sandy soils. These soils may contain limestone substrates and often have a hardpan that impedes drainage. Within this community type the wet flatwoods, mesic flatwoods, scrubby flatwoods, and dry prairie subcommunities exist within the 6-mile radius. (FNAI 2010)

<u>Wet Flatwoods</u>

Wet flatwoods are pine forests with a sparse or absent midstory and a dense groundcover of hydrophytic grasses, herbs, and low shrubs. The pine canopy typically consists of one or a combination of longleaf pine (*Pinus palustris*), slash pine (*P. elliottii*), pond pine (*P. serotina*), or south Florida slash pine (*P. elliottii var. densa*). The subcanopy, if present, consists of scattered sweetbay (*Magnolia virginiana*), swamp bay (*Persea palustris*), loblolly bay (*Gordonia lasianthus*), pond cypress (*Taxodium ascendens*), dahoon (*Ilex cassine*), titi (*Cyrilla racemiflora*), and/or wax myrtle (*Myrica cerifera*). Shrubs include large gallberry (*Ilex coriacea*), fetterbush (*Lyonia lucida*), titi, black titi (*Cliftonia monophylla*), sweet pepperbush (*Clethra alnifolia*), red chokeberry (*Photinia pyrifolia*), and azaleas (*Rhododendron canescens, R. viscosum*). Saw palmetto (*Serenoa repens*) and gallberry (*I. glabra*) may be present. Wet flatwoods often occur between mesic flatwoods and shrub bogs, wet prairies, dome swamps, or strand swamps. (FNAI 2010)

Most rare plants are found in grassy wet flatwoods. In the Florida panhandle, these include pine-woods bluestem (*Andropogon arctatus*), southern milkweed (*Asclepias viridula*), Curtiss' sandgrass (*Calamovilfa curtissii*), wiregrass gentian (*Gentiana pennelliana*), panhandle spiderlily (*Hymenocallis henryae*), white birds-in-a-nest (*Macbridea alba*), bog tupelo (*Nyssa ursina*), Apalachicola dragon-head (*Physostegia godfreyi*), pinewoods wild petunia (*Ruellia pedunculata ssp. pinetorum*), and Florida skullcap (*Scutellaria floridana*). In the peninsula of Florida, these include purple honeycomb-head (*Balduina atropurpurea*), Bartram's ixia (*Calydorea coelestina*), hartwrightia (*Hartwrightia floridana*), lake-side sunflower (*Helianthus carnosus*), and cutthroat grass (*Panicum abscissum*). Found in both the panhandle and peninsula are St. John's blackeyed Susan (*Rudbeckia nitida*) and white-flowered wild petunia (*Ruellia noctiflora*). (FNAI 2010)

Mesic Flatwoods

Mesic flatwoods are the most widespread natural community in Florida. They cover the flat sandy terraces left behind by former high stands of sea level during the Plio-Pleistocene. The soils are largely acidic, nutrient-poor fine sands with upper layers darkened by organic matter. Mesic flatwoods are characterized by tall pines and a dense low ground layer. In southern Florida slash pine forms the canopy. (FNAI 2010)

Many rare plants endemic to Florida are found in mesic flatwoods. Peninsular mesic flatwoods support Canby's wild indigo (*Baptisia calycosa var. calycosa*), beautiful pawpaw (*Deeringothamnus pulchellus*), Rugel's pawpaw (*Deeringothamnus rugelii*), and variable-leaf crownbeard (*Verbesina heterophylla*). (FNAI 2010)

Rare animals in mesic flatwoods include the frosted flatwoods salamander (*Ambystoma cingulatum*), reticulated flatwoods salamander (*A. bishopi*), eastern diamondback rattlesnake (*Crotalus adamanteus*), timber rattlesnake (*Crotalus horridus*), Bachman's sparrow (*Aimophila aestivalis*), red-cockaded woodpecker (*Picoides borealis*), Sherman's fox squirrel (*Sciurus niger shermani*), Big Cypress fox squirrel (*Sciurus niger avicennia*), and Florida black bear (*Ursus americanus floridanus*). Rare invertebrates are the Arogos skipper (*Atrytone arogos arogos*), the Loammi skipper (*Atrytonopsis loammi*), and the dusky roadside skipper (*Amblyscirtes alternata*). (FNAI 2010)

Scrubby Flatwoods

Scrubby flatwoods have an open canopy of widely spaced pine trees and a low, shrubby understory dominated by scrub oaks and saw palmetto. often interspersed with areas of barren white sand. The principal canopy species is South Florida slash pine (*P. elliottii var. densa*). The shrub layer consists of one or more of the four scrub oaks, sand live oak (*Quercus geminata*), myrtle oak (*Q. myrtifolia*), Chapman's oak (*Q. chapmanii*), and scrub oak (*Q. inopina*). Grasses include wiregrass (*Aristida stricta var. beyrichiana*), broomsedge bluestem (*Andropogon virginicus*), and little bluestem (*Schizachyrium scoparium*). Bare sand openings are sometimes present but are generally small. (FNAI 2010)

Scrubby flatwoods occur on slight rises within mesic flatwoods and in transitional areas between scrub and mesic flatwoods. Soils of scrubby flatwoods are moderately well-drained sands with or without a spodic horizon. (FNAI 2010)

Florida goldenaster (*Chrysopsis floridana*), large-plumed beaksedge (*Rhynchospora megaplumos*a), and pine pinweed (*Lechea divaricata*) are the predominant rare plants in scrubby flatwoods. Other rare plants that occur in scrubby flatwoods include Carter's warea (*Warea carteri*) and nodding pinweed (*Lechea cernua*). Scrubby flatwoods are inhabited by many of the same rare animal species found in the scrub community type (Section 3.7.2.2.4). (FNAI 2010)

Dry Prairie

Dry prairie is a community of low shrubs and grasses. Common shrubs include saw palmetto (*Serenoa repens*), dwarf live oak (*Quercus minima*), gallberry (*Ilex glabra*), fetterbush (*Lyonia lucida*), shiny blueberry (*Vaccinium myrsinites*), netted pawpaw (*Asimina reticulata*), Atlantic St. John's wort (*Hypericum reductum*), dwarf wax myrtle (*Myrica cerifera var. pumila*), and dwarf huckleberry (*Gaylussacia dumosa*). The herbaceous layer is dominated by wiregrass (*Aristida stricta var. beyrichiana*), along with bottlebrush threeawn (*Aristida spiciformis*), hemlock witchgrass (*Dichanthelium portoricense*), broomsedge bluestem (*Andropogon virginicus*), lopsided indiangrass (*Sorghastrum secundum*), and cypress witchgrass (*Dichanthelium ensifolium*). (FNAI 2010)

Rare plants within the dry prairie community include many-flowered grass-pink (*Calopogon multiflorus*), beautiful pawpaw (*Deeringothamnus pulchellus*), and giant orchid (*Pteroglossaspis ecristata*). Rare animals include the Florida grasshopper sparrow (*Ammodramus savannarum floridanus*), Florida burrowing owl (*Athene cunicularia floridana*), crested caracara (*Caracara cheriway*), white-tailed kite (*Elanus leucurus*), and Florida sandhill crane (*Grus canadensis pratensis*). Dry prairie is also home to a very rare and declining species of butterfly, the arogos skipper (*Atrytone arogos arogos*) which inhabits grasslands in the eastern United States and the rare loammi skipper (*Atrytonopsis loammi*), endemic to Florida. (FNAI 2010)

#### *3.7.2.2.4 High Pine and Scrub*

The high pine and scrub community consist of hills with mesic or xeric woodlands or shrublands. Its canopy, if present, is open and consists of pine or a mixture of pine and deciduous hardwoods. Within this community type, scrub sub-communities exist with the 6-mile radius and onsite. (FNAI 2010)

Scrub

The scrub is a community composed of evergreen shrubs, with or without a canopy of pines, and is found on dry, infertile, sandy ridges. The most common form is oak scrub, dominated by three species of shrubby oaks: myrtle oak (*Quercus myrtifolia*), sand live oak (*Q. geminata*), and Chapman's oak (*Q. chapmanii*). Florida rosemary (*Ceratiola ericoides*) and sand pine (*Pinus clausa*) may also be present. Rosemary dominated scrubs tend to retain openings between the shrubs, even long after fire, in contrast to oak-dominated scrubs where vegetation tends to fill in openings with time since fire. (FNAI 2010)

Florida peninsular scrubs are home to four rare vertebrate animals, including the Florida scrub-jay (*Aphelocoma coerulescens*) and scrub lizard (*Sceloporus woodi*). Additional species endemic to scrub and other xeric habitats in Florida include the Florida mouse (*Podomys floridanus*) and the short-tailed snake (*Stilosoma extenuatum*). Scrub occurring near the coast (as well as coastal strand and xeric and maritime hammock) are important as refuges for endangered beach mice populations during and after storm events that destroy the foredunes. Scrub is also important for gopher tortoise. (FNAI 2010)

#### *3.7.2.2.5 Marine and Estuarine Vegetated Wetlands*

Marine and estuarine vegetation wetlands consist of the intertidal or supratidal zone and are dominated by herbaceous or woody halophytic vascular plants. These wetlands typically contain a salinity greater than 0.5 ppt. Within this community type the salt marsh and mangrove swamp communities exist within the 6-mile radius. (FNAI 2010)

<u>Salt Marsh</u>

The salt marsh community in southern Florida is closely related to the mangrove swamps, ecologically, but possesses the absence of tree forms. Salt marsh is a largely herbaceous community that occurs in the portion of the coastal zone affected by tides and seawater and protected from large waves. Salt marsh communities are typically variable and are dominated by a single species of grass or rush. Saltmarsh cordgrass (*Spartina alterniflora*), needle rush (*Juncus roemerianus*), Carolina sea lavender (*Limonium carolinianum*), perennial saltmarsh aster (*Symphyotrichum tenuifolium*), wand loosestrife (*Lythrum lineare*), marsh fimbry (*Fimbristylis spadicea*), and shoreline seapurslane (*Sesuvium portulacastrum*) are all common species. (FNAI 2010)

<u>Mangrove Swamp</u>

Mangrove swamp is a dense forest occurring along relatively flat, low wave energy, marine and estuarine shorelines. The dominant plants of mangrove swamp are red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), white mangrove (*Laguncularia racemosa*), and buttonwood (*Conocarpus erectus*). Red mangrove is often the dominant in deepwater zones, black mangrove in the intermediate zone, and white mangrove and buttonwood in the highest, least tidally influenced zone. Mangroves can range from trees more than 80 feet tall to dwarf shrubs of approximately 10 feet tall. Mangrove swamps often exist with no understory; however, shrubs such as seaside oxeye (*Borrichia arborescens, B. frutescens*) and vines including gray nicker (*Caesalpinia bonduc*), coinvine (*Dalbergia ecastaphyllum*), and rubbervine (*Rhabdadenia biflora*), and herbaceous species such as saltwort (*Batis maritima*), shoregrass (*Monanthochloe littoralis*), perennial glasswort (*Sarcocornia perennis*), and giant leather fern (*Acrostichum danaeifolium*). (FNAI 2010)

Rare plants occurring within mangrove swamps include golden leather fern (*Acrostichum aureum*), worm-vine orchid (*Vanilla barbellata*), and several epiphytes such as banded wild-pine (*Tillandsia flexuosa*), powdery catopsis (*Catopsis berteroniana*), dollar orchid (*Encyclia boothiana var. erythronioides*), clamshell orchid (*Encyclia cochleata var. triandra*), and ribbon fern (*Nevrodium lanceolatum*). (FNAI 2010)

#### *3.7.2.2.6 Lacustrine*

Lacustrine habitats are characterized as non-flowing wetlands of natural repressions. The typically do not contain persistent emergent vegetation except around their edges. Within this community type, natural lakes and ponds exist within the 6-mile radius. Lacustrine represents a larger, more diverse habitat type and therefore exact species assembles are not listed. (FNAI 2010)

##### *3.7.2.2.7 Riverine*

Riverine habitats within the region are described as natural, flowing waters. They are bounded by channel banks and typically flow from their source to the downstream limits of tidal influence. Riverine represents a larger, more diverse habitat type and therefore exact species assembles are not listed. (FNAI 2010)

##### *3.7.2.2.8 Marine and Estuarine*

Marine and estuarine communities are subtidal, intertidal, and supratidal zones of the sea. The distinction between the two communities is typically subtle and therefore they are categorized together. Marine communities are usually found near shallow bays and beach areas and are distinguished as meadow communities containing saltwater vegetation. Sea grass, turtle grass, ditch grass, and manatee grass are dominant. Within this community type, the mineral-based unconsolidated substrate sub community exists within the 6-mile radius. (FNAI 2010)

Mineral-based Unconsolidated Substrate (Sand Beach)

In general, the marine and estuarine unconsolidated substrate communities are the most widespread communities in the world. While these areas may seem relatively barren, the densities of faunal organisms in their subtidal zones can reach the tens of thousands per meter square. This makes these areas important feeding grounds for many bottom-feeding fish, such as red drum (*Sciaenops ocellatus*), southern flounder (P*aralichthys lethostigma*), spot (*Leiostomus xanthurus*), and sheepshead (*Archosargus probatocephalus*). The intertidal and supratidal zones are extremely important feeding grounds for many shorebirds and invertebrates. In addition, they support a variety of threatened and endangered wildlife such as loggerhead (*Caretta caretta),* green (*Chelonia mydas*), and leatherback (*Dermochelys coriacea*) sea turtles. (FNAI 2010).

#### 3.7.2.3 Wetlands

Wetlands are defined as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. (USACE 1999)

Thirteen functions and values typically considered by regulatory and conservation agencies when evaluating wetlands are used as part of the New England method. These include groundwater recharge/discharge; flood flow alteration; fish and shellfish habitat; sediment/toxicant/pathogen retention; nutrient removal/retention/transformation; production export (nutrient); sediment/shoreline stabilization; wildlife habitat; recreation (consumptive and non-consumptive); educational/scientific value; uniqueness/heritage/visual quality/aesthetics; and threatened or endangered species habitat. (USACE 1999)

The U.S. Fish and Wildlife Service (USFWS) maintains the National Wetlands Inventory (NWI), which integrates digital map data along with other resource information to produce current information on the status, extent, characteristics, and functions of wetland, riparian, and deep-water habitats in the United States.

- Based on a review of USFWS NWI maps of the PSL site (USFWS 2021a), there are approximately 53,979 acres of water features within a 6-mile radius of PSL, composed of the following types of wetlands (Figure 3.7-1):
- Estuarine and marine deep water covering 46,710 acres (86.53 percent of total wetland habitat)
- Estuarine and marine wetlands covering 2,857 acres (5.29 percent of total wetland habitat)
- Freshwater emergent wetlands covering 2,549 acres (4.72 percent of total wetland habitat)
- Freshwater forested/scrub wetlands covering 646 acres (1.20 percent of total wetland habitat)
- Freshwater ponds covering 550 acres (1.02 percent of total wetland habitat)
- Lakes covering 382 acres (0.71 percent of total wetland habitat)
- Riverine waters covering 285 acres (0.53 percent of total wetland habitat)

The PSL property is bound by the Atlantic Ocean to the east and the Indian River Lagoon on the west. Based on the NWI data (USFWS 2021a), a total of 805 acres of deep water, wetlands, ponds, and riverine waters are located on the PSL site (Figure 3.7-2).

Based on the NWI data, the following wetland water types are located on the PSL site:

- Estuarine and marine deep water covering 97 acres (12.08 percent of total wetland habitat)
- Estuarine and marine wetlands covering 691 acres (85.78 percent of total wetland habitat)
- Freshwater emergent wetlands covering 3 acres (0.34 percent of total wetland habitat)
- Freshwater ponds covering 14 acres (1.70 percent of total wetland habitat)
- Riverine waters covering 1 acre (0.10 percent of total wetland habitat)

#### 3.7.2.4 Terrestrial Animal Communities

The terrestrial community at PSL consists of sand beaches, mesic hammock, salt marshes, mangrove swamps, coastal uplands, and coast strand areas (FNAI 2010). Wildlife species found primarily on the PSL site are those typical of St. Lucie County and the surrounding ecosystems. Terrestrial species that are federally and/or state listed as endangered or threatened and known to occur in the vicinity of PSL are discussed in detail in Section 3.7.8. Table 3.7-3 includes representative terrestrial species known to occur in St. Lucie County.

Table 3.7-5 includes a list of federally and state-listed threatened and endangered species with the potential to occur in St. Lucie County.

There are no designated critical terrestrial habitats for endangered species within PSL Units 1 and 2 or the transmission corridor associated with the plant (Figure 3.7-3). However, the beaches adjacent to the site are designated critical habitat for the endangered loggerhead sea turtle. Additionally, the beach and dunes, mangrove, and tropical hammock habitats are important in that they represent important coastal ecosystems that support a variety of plant and animal life. Urbanization is the biggest threat to these communities as they have historically been reduced by development. (FNAI 2010)

Amphibians identified as commonly reported in the vicinity of PSL includes the southern toad (*Anaxyrus terrestris*), southern chorus frog (*Pseudacris nigrita*), Cuban tree frog (*Osteopilus septentrionalis*), pine woods tree frog (*Hyla femoralis*), green tree frog (*Hyla cinereal*), eastern narrow-mouthed toad (*Gastrophryne carolinensis*), southern leopard frog (*Lithobates sphenocephalus*), gopher frog (*Lithobates capito*), American bullfrog (*Lithobates catesbeianus*), eastern spadefoot (*Scaphiopus holbrookii*), eastern newt (*Notophthalmus viridescens*), greater siren (*Siren lacertina*), and southern dwarf siren (*Pseudobranchus axanthus*). (iNaturalist 2021)

Bird populations on the PSL site include year-round residents, seasonal residents, and transients (birds stopping briefly during migration) that are typical to the region. Waterbirds are documented as most common. Abundant resident species documented as occurring onsite in the 1973 site survey were cattle egret (*Bubulcus ibis*), common egret (*Ardea alba*), brown pelican (*Pelecanus occidentalis*), great blue heron (*Ardea Herodias*), snowy egret (*Egretta thula*), red-winged blackbird (*Agelaius phoeniceus*), cardinal (*Cardinalis cardinalis*), cedar waxwing (*Bombycilla cedrorum*), tree swallow (*Tachycineta bicolor*), and robin (*Turdus migratorius*). In addition, many migratory species pass through the area, such as several species of warbler (*Dendroica spp*), the spotted sandpiper (*Ambystoma maculatum*), common tern (*Sterna hirundo*), yellow-bellied sap sucker (*Sphyrapicus varius*), tree swallow (*Tachycineta bicolor*), catbird (*Dumetella carolinensis*), and the brown-headed cowbird (*Molothrus ater*). (FPL 1973)

From January 26, 1999, to June 25, 1999, a statewide aerial survey was conducted by Florida Fish and Wildlife Conservation Commission (FFWCC) to document waterbird breeding colonies. Data from FFWCC show that two wading bird rookeries exist within the 6-mile radius. One little blue heron rookery, denoted as fewer than 50 nests, is located south of the PSL site on the southernmost tip of Lake Eden in St. Lucie County. In addition, a great blue heron rookery containing 50–250 nests was also represented in the data and was located approximately 1,800 feet north of the little blue heron rookery on Lake Eden. (FFWCC 1999)

While there are resident bird populations, the region serves as a pass-through area for semi-annual migrations of neotropical birds that may range between South America and Canada, as well as seasonal migrations of waterfowl. The PSL site is located within the Atlantic flyway, a major migratory route for birds during the spring and fall. The Atlantic Americas flyway connects the Canadian Arctic Archipelago to Tierra del Fuego in South America. Numerous breeding birds, endemic to the Arctic, move south along the flyway for the northern winter. Migrating birds often fly these routes at night and land to rest early in the morning. Before dawn they seek out suitable habitat, called stopovers, in which to feed and avoid predators. Large natural barriers such as mountains and deserts, or large bodies of water create especially crowded stopovers. These stopovers are very important because flight over the barrier will mean a long stretch without any opportunity to stop for food, rest, or cover (BirdLife International n.d.)

Several invertebrate species are also known to occupy areas in the vicinity of PSL. Aquatic species such as the American crown conch (*Melongena corona*) and the Atlantic ghost crab (*Ocypode quadrata*) can be found in adjacent waters. Terrestrial species such as big-headed ants (*Pheidole megacephala*), common buckeye (*Junonia coenia*), eastern lubber grasshopper (*Romalea guttata*), little blue dragonlet (*Erythrodiplax minuscula*), monarch (*Danaus plexippus*), ox beetle (*Strategus aloeus*), polyphemus moth (*Antheraea polyphemus*), southern emerald (*Synchlora frondaria*), western honeybee (*Apis mellifera*) and the blue land crab (*Cardisoma guanhumi*) may frequent the site. (FPL 1973; iNaturalist 2021)

Many mammal species are documented onsite and within the vicinity of PSL. The most abundant are raccoon (*Procyon lotor*), opossum (*Didelphis virginiana),* and beach mouse (*Peromyscus polionotus*) (FPL 1973). In addition, the nine-banded armadillo (*Dasypus novemcinctus*), marsh rabbit (*Sylvilagus palustris*), eastern cottontail (*Sylvilagus flordanus*), eastern grey squirrel (*Sciurus carolinensis*), fox squirrel (*Sciurus niger*), black rat (*Rattus rattus*), white tailed deer (*Odocoileus virgininanus*), feral hog (*Sus scrofa*), bobcat (*Lynx rufus*), red fox (*Vulpes vulpes*), and eastern mole (*Scalopus aquaticus*) may all also frequent the site. (iNaturalist 2021)

Reptiles likely to inhabit the PSL site and its surrounding areas include the American alligator (*Alligator mississippiensis*), brown anole (*Anolis sagrei*), Peter's rock agama (*Agama picticauda*), brown basilisk (*Basiliscus vittatus*), green iguana (*Iguana iguana*), common garter snake (*Thamnophis sirtalis*), eastern ribbon snake (*Thamnophis sauritus*), brown watersnake (*Nerodia taxispilota*), Florida green watersnake (*Nerodia floridana*), banded watersnake (*Nerodia fasciata*), striped swampsnake (*Liodytes alleni*), and common slider (*Trachemys scripta*). (iNaturalist 2021)

In addition to the aforementioned species, several federally and state listed threatened and endangered species are commonly found onsite or in adjacent areas. These species and their habitat are documented in Section 3.7.8.

### 3.7.3 Potentially Affected Water Bodies

Two major water resources are directly adjacent to PSL, the Atlantic Ocean to the east and the Indian River Lagoon to the west. The site has been specifically designed to minimize impacts to the surrounding aquatic environment. The PSL plant uses a once-through cooling water system which draws water from the Atlantic Ocean. Thermal effluents are also discharged into the

Atlantic Ocean through a series of diffusers which are designed to jet disperse water for rapid dissipation of heat. (FPL 2001, Section 2.2)

A series of scientific studies have been conducted throughout the current life of the plant to help determine effects of PSL on the surrounding aquatic ecosystems. These studies have shown minor impacts to the surrounding waterbodies (FPL 2001, Section 2.2.1). An EPU was undertaken to increase the generating capacity and improve operating efficiency of Units 1 and 2 with a slight estimated increase (2°F; 1.11°C) in the temperature of cooling water discharges into the Atlantic Ocean. A biological study approved by FDEP in August 2011 was undertaken to determine how these elevated temperatures may have or may have not affected the aquatic biota in the Atlantic Ocean. The sampling was conducted under an FFWCC special activities license (most recently SAL-14-0071-SR) issued to Ecological Associates, Inc. Data collected during the biological POS showed a diverse and abundant fish and shellfish community that did not differ much from baseline studies. There were occasional statistically significant differences in faunal conditions between the discharge site and one of the controls; however, multiple controls were used, and the data were never statistically different from both at the same time. The conclusion of this study was that the EPU did not have a significant effect on local fish and wildlife populations in the vicinity of PSL.

In addition, PSL oversees bathymetric surveys of the intake and discharge canals to determine if dredging or maintenance activities are needed. The critical canal areas, intake wells, and Big Mud Creek areas are surveyed on a 2-year frequency, and the non-critical areas like the intake headwall and discharge canal are surveyed on a 4-year frequency. The results of these surveys determine what maintenance activities need to occur. The most recent dredging event occurred in 2019, following Hurricane Dorian, as a result of sediment build-up on the barrier and to correct the angle, as well as to ensure proper flow rates to the intake canal system. Dredging was completed in August 2019. Future dredging events will be planned on an as-needed basis.

### 3.7.4 Places and Entities of Special Ecological Interest

This section documents the occurrence, location, and description of communities and habitats of special ecological interest within the plant vicinity. Areas of scientific interest, public interest, or areas that may be ecologically sensitive are recorded below.

#### 3.7.4.1 County Preserves

St. Lucie County maintains a unit of environmental preserves managed by the St. Lucie County Environmental Resources Department. These preserves are part of a 20-million-dollar local bond program that started in 1994. The program aims to preserve, protect, and restore the natural communities of St. Lucie while providing a sustainable use to the public. These areas are managed to preserve wetland communities, utilize prescribe fire, and control non-native plant and animal species. (SLC 2012)

##### *3.7.4.1.1 Blind Creek Pass*

Blind Creek Pass Park is a 409-acre park located east of SR A1A, north of PSL. Recreational opportunities include fishing, a boat launch, and beach access. Within this park, a 108-acre beach focuses as an upland and wetland preserve. It's also an important nesting area for green and loggerhead sea turtles during the summer. This coastal barrier island site contains beach dune, coastal strand, maritime hammock, and estuarine tidal swamp. It is a designated critical habitat for the West Indian manatee. (SLC 2012)

##### *3.7.4.1.2 Ocean Bay*

Located along the Atlantic Ocean and Indian River Lagoon, Ocean Bay is approximately 53 acres and is divided by SR A1A. The eastern half is beach dune and coastal strand, while maritime hammock and mangrove swamp are found to the west. (FDEP 2016b)

##### *3.7.4.1.3 Walton Rocks*

Walton Rocks is located approximately 200 feet south of the plant's intake canal. The Walton Rocks beach and preserve is characterized as containing important biological communities such as the "worm rock" communities and support a rich and diverse association of other invertebrates, algae, and fishes.

#### 3.7.4.2 Aquatic Preserves

Aquatic preserves are state-owned protected lands (Florida Statues Chapter 258.39) designated as having exceptional biological, aesthetic, and scientific value. These lands are set aside for the benefit of future generations. The FDEP's Office of Resilience and Coastal Protection manages these lands. Currently, all aquatic preserves are also outstanding Florida waters (OFWs). Section 403.061(27) of the Florida statutes grants the FDEP the power to establish waterbodies as OFWs worthy of special protection because of their natural attributes. (FDEP 2016b; Florida Senate 2009)

##### *3.7.4.2.1 Jensen Beach to Jupiter Inlet Aquatic Preserve.*

The Jensen Beach to Jupiter Inlet Aquatic Preserve is approximately 22,000 acres and is 37 miles long. It extends from the southern corporate limits of Fort Pierce south to Jupiter Inlet, including the Peck Lake and Hobe Sound area. The preserve is largely bordered by unincorporated cities and is managed as part of the Indian River Lagoon Aquatic Preserves System Management Plan. (FDEP 2016b)

Jensen Beach to Jupiter Inlet Aquatic Preserve is connected to the Atlantic Ocean by the St. Lucie Inlet and the Jupiter Inlet. The preserve is underlain by the Anastasia formation, which occurs along isolated sections of the western shore of Jensen Beach to Jupiter Inlet Aquatic Preserve. Land use in the Jensen Beach to Jupiter Inlet Aquatic Preserve watershed is 19 percent urban, 37 percent agriculture, and 37 percent natural upland and wetlands. The remaining 7 percent is made up of disturbed areas and water. (FDEP 2016b)

##### *3.7.4.2.2 North Fork, St. Lucie River Aquatic Preserve*

North Fork, St. Lucie River Aquatic Preserve is located in southeastern Florida, approximately 5 miles from the PSL site. The preserve is approximately 2,972 acres and consists of seagrass beds, mollusk reefs, estuarine tidal swamps, freshwater tidal swamps, sloughs, and unconsolidated sand beaches. Because of its geographic location and tidal connection through the St. Lucie Inlet, the aquatic preserve supports high species diversity and serves as an important nursery ground for a variety of fish and wildlife. This diversity was the driver in the dedication of the preserve in 1972. (FDEP 2019)

#### 3.7.4.3 State Preserves

One state preserve, the Savannas Preserve State Park, is located in close proximity to the PSL site. This 6,695-acre park stretches for more than 10-miles and is located in St. Lucie and Martin counties. A notable feature of the park is an environmental education center. Ecologically, this preserve is the largest and most intact remnant of Florida's east coast savannas, or freshwater marshes. (FDEP 2016b)

### 3.7.5 Invasive Species

Florida's location, climate, and topography makes it a hot spot for invasive species in the United States. Because of this, there are a variety of resources and regulatory lists available to document the types and occurrences of invasive species in Florida. This section contains the occurrences of aquatic and terrestrial invasive species in the PSL vicinity, and management activities undertaken by the plant to control such species. Data collected for this section were pulled from known occurrences within a 6-mile radius of the PSL site from the EDDMapS system, which is maintained by the University of Georgia's Center for Invasive Species and Ecosystem Health and cross-referenced with information from the appropriate regulatory agency. (EDDMapS 2021)

Table 3.7-4 provides a comprehensive list of all invasive species documented with the 6-mile radius and their regulatory status.

#### 3.7.5.1 Terrestrial Plants

Florida's Exotic Pest Plant Council maintains a list of invasive plant species in the State of Florida. While this list isn't regulatory, it does provide a comprehensive overview of invasive plants that have adverse impacts on Florida's biodiversity and native plant communities based on current knowledge of distribution, ecological impacts, and management difficulty. The federal noxious weed list, Florida noxious weed list, and Florida prohibited aquatic plant list are the three regulatory lists in Florida. (FDCAS 2019a; FDCAS 2019b; FLEPPC 2019)

Exotic and invasive species protocol for terrestrial plants are outlined in the FDEP's conditions of certification for PSL Units 1 and 2 (FDEP 2008). This protocol states that "FPL shall maintain the switchyard expansion site and construction site, free from the invasion or establishment of the plants listed on the Florida Exotic Pest Plant Council's (FLEPPC) 2001 List of Florida's Most

Invasive Species." In addition, landscaping within the project site shall not include plants that are on the EPPC list. Aquatic invasives are managed through a special activity license.

The following plant species identified in Sections 3.7.5.1.1 through 3.7.5.4.4 were documented within a 6-mile radius of the PSL site and are either state or federally regulated.

##### *3.7.5.1.1 Air Potato*

The air potato (*Dioscorea bulbifera*) is a member of the yam family. This species was introduced from Africa in the early 1900s as an edible landscape plant. Since its cultivation, the air potato has adapted to a variety of landscapes in the state. The vines are extremely invasive and grow into large concentrations that outcompete native vegetation. It branches out in all directions as it grows (up to 60–70 feet long) and produces potato-like aerial tubers, or bulbils along the stem. The bulbils generally range from marble-sized to tennis-ball-sized, but they can occasionally be much larger. Freezing weather kills the above-ground portion of the plant and causes the bulbils drop to the ground where they eventually sprout in the springtime to form new vines. The FLEPPC maintains a species-specific management plan to educate stakeholders on protecting the native biodiversity from deterioration by the air potato. (FLEPPC 2008)

Air potato locations were documented within the 6-mile radius, but not within the PSL site (EDDMaps 2021).

##### *3.7.5.1.2 Australian Pine*

The Australian pine (*Casuarina equisetifolia*) is a rapidly growing evergreen species in the She-oak family, and are highly invasive to coastal areas in central and southern Florida. The Australian pine has the ability to alter coastal habitats due to its rapid growth, dense coverage, thick litter accumulation, and ability to increase beach erosion. The foliage is olive to green in color and diffuse with wide-spaced branches. Growth rates have been reported to be as rapid as 3 meters (10 feet) per year. The Australian pine reproduces by winged samaras that are typically wind dispersed. The establishment of Australian pine in the upper beach zone or foredune disrupts geomorphological and biological processes that create beaches and coastal plant communities important to a variety of wildlife and natural vegetation. The FLEPPC maintains a species-specific management plan that aims to educate stakeholders on protecting the native biodiversity from deterioration by the Australian pine. (FLEPPC 2013)

Several locations of Australian pine are documented in the northern portion of the PSL site near Blind Creek (EDDMaps 2021).

##### *3.7.5.1.3 Beach Naupaka*

Beach naupaka (*Scaevola taccada*) is a large, rounded bushy shrub native to southeastern Asia, eastern Africa, Australia, and the Pacific Islands, including Hawaii. It is a salt tolerant species distinguished by a white half flower and white clusters of fruit. The beach naupaka had begun selling in nurseries in the 1960s. During the 1970s and 1980s it was encouraged for use in beach stabilization projects. Beach naupaka escaped cultivation by the early 1980s and now forms dense stands on many beach dunes, coastal rock barrens, coastal strands, along saline shores, including mangroves, and in coastal hammocks. This species is difficult to control and threatens the endangered sea lavender (*Argusia gnaphalodes*), beach peanut (*Okenia hypogaea*), beach clustervine (*Jacquemontia reclinata*), and threatened inkberry (*Scaevola plumieri*). (Lockhart n.d.)

Several locations of beach naupaka are documented in the northern portion of the PSL site near Blind Creek (EDDMaps 2021).

#### *3.7.5.1.4 Brazillian Peppertree*

Brazilian peppertree, (*Schinus terebinthifolius*) is an incredibly aggressive, rapidly colonizing weed of disturbed habitats, natural communities, and conservation areas in southern California, Hawaii, Texas, and peninsular Florida. Native to Argentina, Brazil, and Paraguay, the Brazilian peppertree is believed to have been brought over as an ornamental in the late 1800s. This invasive shrub grows rapidly, tolerates a wide range of environmental conditions, and is a prolific seed producer. In Florida, Brazilian peppertree is a pioneer species of disturbed sites such as highways, canals, power line rights-of-way (ROWs), fallow fields, and drained wetlands. Once established, it quickly outcompetes native vegetation, often forming dense monocultures. In fact, the Brazilian peppertree is thought to be so invasive, that in the 1990s, a Brazilian peppertree task force (BPTF) was formed as a FLEPPC interagency working committee. The FLEPPC and the BPTF have developed a comprehensive management plan to help increase public awareness and implement site-specific management activities to protect native vegetation and eradicate the Brazilian peppertree in Florida. (Cuda et al. 2006)

Several locations of Brazilian peppertree are documented in the northern portion of the PSL site near Blind Creek and near the southern extent of the property (EDDMaps 2021).

#### *3.7.5.1.5 Cat's Claw Vine*

Cat's-claw vine (*Dolichandra unguis-cati*) is a neotropical, climbing perennial most noted for its large, showy, yellow flowers. The plant gets its common name from cat-like "claws" that help it climb. The vine has opposite leaves that are usually compound and composed of a pair of leaflets with a 3-pronged tendril between them. It is valued as an ornamental, particularly in dry areas, because it needs little water or care and can climb almost anything, covering fences and other structures with an attractive carpet of leaves and flowers. Unfortunately, the aggressive nature of the vine has made it a major weed in China, Australia, South Africa, and parts of the southeastern United States. (Proctor and Smith 2014)

Cat's claw vine locations were documented within the 6-mile radius, but not within the PSL site (EDDMaps 2021).

#### *3.7.5.1.6 Carrotwood*

Carrotwood (*Cupania anacardioides*), is a slender evergreen tree native to Australia. Carrotwood was introduced for landscaping in the 1960s. It was prized for its fast growth and adaptability, along with abundant white to greenish yellow flowers. However, its quick growth allows it to invade spoil islands, beach dunes, marshes, tropical hammocks, pinelands, mangrove and cypress swamps, scrub habitats, and coastal strands. It is typically dispersed by birds, and tends to be very tolerant of salt, poor soils, and poor drainage allowing it to compete with other invasive non-natives such as the Brazilian peppertree. Carrotwood is identified by its gray outer bark, orange inner bark, alternate, compound leaves with stalked oblong leathery yellow green leaflets, showy flowers, and bright fruits. (Langeland and Burks 1998)

Carrotwood locations were documented within the 6-mile radius, but not within the PSL site (EDDMaps 2021).

###### *3.7.5.1.7 Cogongrass*

Cogongrass (*Imperata cylindrica*) is a perennial grass with stout, creeping, scaly rhizomes, and sharp-pointed tips. Its leaf blades are erect, narrow, and pubescent at base, flat and glabrous above, with a whitish midvein noticeably off-center. Cogongrass is considered one of the top 10 worst weeds in the world. It was introduced from southeast Asia as packing material around 1911. Now its frequent along transportation and utility corridors throughout Florida. Cogongrass has invaded over 20 counties including habitats of federally listed endangered and threatened native plant species. It is fast-growing and thrives in areas of minimal tillage, such as orchards, lawns, and roadsides. (Langeland and Burks 1998)

Cogongrass was documented within the 6-mile radius, but not within the PSL site (EDDMaps 2021).

###### *3.7.5.1.8 Coral Ardisia*

Coral ardisia (*Ardisia crenata*) is a small upright shrub that is native from Japan to northern India. It was introduced as an ornamental plant that escaped cultivation in 1982, quickly dispersing into wooded areas. It has persistent red berries, dark glossy leaves, and can grow up to 6 feet tall. Its flowers are white to pink in stalked axillary clusters, usually drooping below the foliage. Coral ardisia prefers moist soils but is susceptive to fungal rot in flooded soils. Coral ardisia shades out native seedling and understory plants, preventing their growth and development and disrupting native plant communities. Mature plants have nearly a 90 percent germination rate, allowing them to outcompete valued native species. (Langeland and Burks 1998; UFIFAS 2021)

Coral ardisia locations were documented within the 6-mile radius, but not within the PSL site (EDDMaps 2021).

###### *3.7.5.1.9 Latherleaf*

Latherleaf (*Colubrina asiatica*) is a low scrambling evergreen shrub native to tropical Asia. It was brought over to Jamaica in the 1850s for use as a medicinal plant, fish poison, and a source of soap. Its leaves are alternate, 1.5-5.5 inches long, shiny, and broadly ovate. Its flowers are small and green to yellow that bloom in clusters. The seeds of latherleaf are fairly salt tolerant and are believed to have been introduced into Florida via ocean currents. Latherleaf thrives off of full sunlight and grows rapidly and aggressively, monopolizing resources and space. Latherleaf spreads into relatively undisturbed natural areas by seeds which are dispersed by ocean currents and tides, as well as by birds. In addition, it forms adventitious roots from branches that come into contact with soil and it vigorously resprouts from cut stems. (Langeland and Burks 1998; UFIFAS 2021)

Latherleaf locations were documented within the 6-mile radius, but not within the PSL site (EDDMaps 2021).

##### *3.7.5.1.10 Leadtree*

The leadtree (*Leucaena leucocephala*) is a shrub or small tree that can grow up to 16 feet in height. It has bipinnate leaves roughly 10 inches long. Its flowers are white, turning brown with maturity, and grow clustered on the end of branches. Lead tree was originally introduced as an ornamental but most likely was continued to be distributed because of its multipurpose uses such as for fuel wood, lumber, animal fodder, and green manure. In addition, it still has several ornamental uses such as windbreaks, shade trees, and erosion control. Lead tree is a prolific seed producer and when it spreads, can form dense thickets that outcompete native vegetation. (UFIFAS 2021)

Leadtree locations were documented within the 6-mile radius, but not within the PSL site (EDDMaps 2021).

##### *3.7.5.1.11 Melaleuca*

Melaleuca (*Melaleuca quinquenervia*) trees are also known as punk trees or paperbark tea trees. They are approximately 80 feet tall and have spongy white peeling bark. Its leaves are alternate and evergreen, with white flowers that are small and crowded at branch tips. This species is native to Australia where it is well-known, planted in parks, valued by beekeepers, attractive to birds and bats. In fact, because of development, melaleuca trees in some parts of Australia are the subject of conservation efforts. In other places, there are dense forests of melaleuca, just as there were when Europeans first arrived there. However, in Florida, they are considered a pest species which invade and outcompete native vegetation. Since its introduction into the state, melaleuca has taken over hundreds of thousands of acres of Everglades, threatening the existence of its biodiversity and ecosystem stability. (Langeland and Burks 1998; UFIFAS 2021)

Melaleuca locations were documented within the 6-mile radius, but not within the PSL site (EDDMaps 2021).

##### *3.7.5.1.12 Old World Climbing Fern*

Old world climbing fern (*Lygodium microphyllum*) is an invasive exotic vine in Florida, native to Asia and Australia. This species is a freely branching, leaf (frond) which may become as much as 100 feet long. This fern is known for climbing into trees and shading out native vegetation in hundreds of acres in east-central Florida. Old world climbing fern has the ability to "resprout" from its leaves. Dense growth of the plant can also be a fire hazard, frequently enabling small ground fires to reach into tree canopies where it can kill the growing branches. Invasive exotics can thus change the effects of physical processes in plant communities. (Langeland and Burks 1998; UFIFAS 2021)

Old world climbing fern locations were documented within the 6-mile radius, but not within the PSL site (EDDMaps 2021).

##### *3.7.5.1.13 River She-oak*

River she-oak (*Casuarina cunninghamiana*) is another species of Australian pine considered invasive in Florida. Salt tolerant and commonly used as a windbreak, river she-oak is often mistaken for Australian pine (Section 3.7.5.1.2). Its foliage is coarser and more upright, and its shape is round to conical with evergreen needle-like leaves, blueish-green to gray-green in color. It is fairly drought tolerant and can be found on loamy or sandy soils. Like the Australian pine, river she-oak grows quickly and can out-compete important native species.

River she-oak locations were documented within the 6-mile radius, but not within the PSL site (EDDMaps 2021).

##### *3.7.5.1.14 Rosary Pea*

Rosary pea (*Abrus abrus*) is a high-climbing, twining, or trailing woody vine with slender herbaceous branches. It has alternate leaves, even-pinnately compound with 5-15 pairs of oval to oblong leaflets. Its flowers are small and shaped like pea flowers with a white to pink or reddish hue. Its fruit is a short, oblong pod, splitting before falling to reveal 3-8 shiny scarlet hard seeds. It was introduced to Florida as an ornamental around 1932. It is a deeply rooted species noted for its ability to quickly take full possession of young forests. It has invaded undisturbed pinelands and hammocks, including the globally imperiled pine rocklands of Dade County. (Langeland and Burks 1998)

Rosary pea locations were documented within the 6-mile radius, but not within the PSL site (EDDMaps 2021).

##### *3.7.5.1.15 Shoebutton Ardisia*

The shoebutton ardisia is an evergreen glabrous shrub to small tree. It is native to India, China, and southeast Asia and was introduced as an ornamental in 1900. Common in East Indies, naturalized in Hawaii, the Caribbean, and Florida, herbarium specimens now recorded for naturalized populations in Dade, Monroe, and St. Lucie counties. The shoebutton ardisia is identified by its smooth stems, and new foliage which is often red in hue. Its leaves are alternate, oblong to oval, fleshy, leathery, gland-dotted below, with margins entire. Its flowers are star shaped with mauve-colored petals. Its fruit a rounded drupe, 6 mm (< 1 inch) wide, red turning to black when ripe, with white juicy flesh. (Langeland and Burks 1998)

Shoebutton ardisia locations were documented within the 6-mile radius, but not within the PSL site (EDDMaps 2021).

### 3.7.5.2 Terrestrial Animals

Non-native fish and wildlife are regulated by FFWCC. FFWCC identifies invasive species as those that negatively impact native fish and wildlife, cause damage that is costly to repair, or pose a threat to human health and safety. Currently there is no specific protocol for terrestrial animal invasive species at PSL. Species occurrences are dealt with on a case-by-case basis.

#### *3.7.5.2.1 Argentine Black and White Tegu*

The Argentine black-and-white tegu (*Salvator merianae*) is a large lizard native to South America. The black and white tegu was brought to Florida for the pet trade and has become established in Miami-Dade County, Charlotte County, and Hillsborough County. Individual lizards have been captured across the Florida peninsula, including St. Lucie County. Argentine black-and-white tegus prey on native reptiles and their eggs, as well as the eggs and young of ground-nesting birds. In addition, they have been documented eating the eggs of alligator species and may impact the American crocodile. (Johnson and McGarrity 2010)

In southern Florida, tegus inhabit densely vegetated areas along canals and roadsides. Tegus may dig their own burrows but also invade the burrows of native species, such as gopher tortoises, particularly in the winter months. (Johnson and McGarrity 2010).

Argentine black-and-white tegu locations were documented within the 6-mile radius, but not within the PSL site (EDDMaps 2021).

#### *3.7.5.2.2 Cane Toad*

The cane toad (*Rhinella marina*) is a large predatory toad native to Central and South America. It is tan to reddish-brown, dark brown, or gray toad with dark spots on its back. Cane toads are often found in urbanized habitats and agricultural lands, but also in some natural areas, including floodplain and mangrove swamps. They breed along vegetated edges of freshwater habitat, including ponds (natural and manmade), lakes, canals, and ditches. They prey on native frogs, lizards, snakes, and small mammals. Cane toads contain a toxin that irritates human skin and eyes and can be harmful to pets. (Johnson 2020)

Cane toad locations were documented within the 6-mile radius, but not within the PSL site (EDDMaps 2021).

#### *3.7.5.2.3 Feral Hog*

The feral hog (*Sus scrofa*) is not native to Florida, but is believed to have been in the state since 1539. Feral hogs are a nuisance species that heavily disturb the soil to "root" or search for food. Rooting can damage sensitive ecological resources as well as damage property and other resources. Feral hogs occur in all 67 counties of Florida. They inhabit a variety of habitats but tend to prefer oak-cabbage palm hammocks, freshwater marshes and sloughs, pine flatwoods, and agricultural areas. (FFWCC 2021a)

Feral hog locations were documented within the 6-mile radius, but not within the PSL site (EDDMaps 2021).

##### *3.7.5.2.4 Green Iguana*

The green iguana (*Iguana iguana*) is a large invasive reptile that are native to Central America, the tropical parts of South America, and some eastern Caribbean islands. Green iguanas cause damage to vegetation and are often considered a nuisance by property owners. In addition, they can damage infrastructure by digging burrows that erode and collapse sidewalks, foundations, seawalls, berms, and canal banks. Green iguanas can be found in a variety of habitats including suburban developments, urban areas, small towns, and agricultural areas. They are excellent swimmers, tolerating both salt and freshwater and can submerge themselves for up to four hours at a time. (FFWCC 2021a)

Green iguanas typically feed on a wide variety of vegetation, including shoots, leaves, blossoms, and fruits of plants. However, adult iguanas can also feed on bird eggs and dead animals. Green iguanas are typically green to brown-black in color and have a row of spikes down the center of the neck, back, and upper portion of the tail, and have dark black rings on the tail. Mature male iguanas develop heavy jowls and a throat fan (or dewlap) that are much larger than those of female iguanas. (FFWCC 2021a)

Green iguana locations were documented within the 6-mile radius, but not within the PSL site (EDDMaps 2021).

##### *3.7.5.2.5 Nile Monitor*

The Nile monitor (*Varanus niloticus*) is a semi-aquatic lizard native to the Nile River delta in sub-Saharan Africa. Nile monitors are typically olive green to a darker black in color and have light-cream colored or yellow stripes along the mouth and head. In addition, they have bands or spots along their back. Adept swimmers, their tails are usually 1.5 times the length of their bodies and are shaped like a rudder. Nile monitors are often observed on rocks basking in the sun or near water. They are mostly active during the day and may sleep on branches or submerged in water when the weather is warm. Nile monitors can hold their breath under water for up to 12–15 minutes. (FFWCC 2021a)

Nile monitors are generalists when it comes to their diet feeding on crabs, crayfish, mussels, snails, slugs, termites, caterpillars, beetles, spiders, grasshoppers and crickets, fish, frogs, toads, lizards, turtles, snakes, young crocodiles, other reptiles, birds and their eggs, and small mammals. The ability for the Nile monitor to easily adapt between water and land, its diet, and its reproductive habits make it easy to establish itself in unwanted locations. (FFWCC 2021a)

Nile monitor locations were documented within the 6-mile radius, but not within the PSL site (EDDMaps 2021).

### 3.7.5.3 Aquatic Plants

Based on a location search for a 6-mile radius of the PSL site, the following invasive aquatic plants are known to occur. PSL does not currently have a specific procedure for monitoring aquatic plants. Species occurrences will be dealt on a case-by-case basis.

#### *3.7.5.3.1 Alligatorweed*

Alligatorweed (*Alternanthera philoxeroides*) is an obligate wetland plant that forms sprawling mats over deep rivers or along shorelines and can also be found sprawling on land. Native to South America, alligatorweed was accidentally introduced in 1894 via ballast water of ships. It now can be found growing throughout the state. Thick mats of alligatorweed can prevent drainage waterways from emptying rapidly during periods of inundation that can cause serious flooding. In addition, they can increase mosquito habitat and can impact recreational fishing and swimming. If mats break loose, they create obstructions on bridges, dams, and sharp bends in waterways. (FFWCC 2021a; UFIFAS 2021)

Alligator weed is distinguished by smooth, hollow stems and white papery flowers. The stems have nodes from which other stems and roots grow and alligator weed then creates the dense mats. Its leaves are elliptical, simple, opposite, and have smooth margins. (FFWCC 2021a; UFIFAS 2021)

Alligatorweed locations were documented within the 6-mile radius, but not within the PSL site (EDDMaps 2021).

#### *3.7.5.3.2 Water Hyacinth*

Native to South America, water hyacinth (*Eichhornia crassipes*), is one of the fastest growing aquatic plant species known. The water hyacinth is a prolific seeder, spreading via runner stems or seed dispersal. In Florida, water hyacinth populations can double their size in as little as two weeks. The water hyacinth was introduced into Florida in the 1880s and had spread to over 120,000 acres of public lakes and navigable rivers by the early 1960s. From the 1960s onward, the FDEP and the U.S. Army Corps of Engineers (USACE) have joined efforts to reduce its occurrence to just 2,000 acres statewide. (FFWCC n.d.)

If unmanaged, water hyacinth can block waterways and limit boat traffic, recreation, flood control, and wildlife use. It out-competes submerged plant species by forming a dense mat that shades out species important to wildlife and biodiversity. In addition, their mats lower dissolved-oxygen concentrations which is damaging to fish populations. Similar to alligatorweed, water hyacinth mats provide ideal breeding environments for mosquitoes. (FFWCC n.d.)

Water hyacinth has showy lavender blue flowers with a distinctive yellow blotch. Its leaves are glossy and green, roundish to elliptic and form into a rosette. They are spongy, usually inflated or bulbous, especially near the base. Its fruit is a 3-celled capsule with many small, ribbed seeds that form in submerged, withered flowers. (FFWCC n.d.)

Water-hyacinth locations were documented within the 6-mile radius, but not within the PSL site (EDDMaps 2021).

### 3.7.5.4 Aquatic Animals

Invasive aquatic animals are sometimes encountered in the intake canal onsite. Based on a location search of the PSL site, the following invasive aquatic animals are known to occur within a 6-mile radius. FPL maintains coordination with FFWCC as part of their special activities license regarding the euthanization of invasive aquatic animals.

#### *3.7.5.4.1 Blue Tilapia*

Blue tilapia (*Oreochromis aureus*) are native to North Africa and the Middle East. They are a freshwater fish commonly found in lakes, ponds, rivers, streams, and canals. They are, however, tolerant of saltwater and found in some near-shore marine habitats such as the St. Lucie River. Young blue tilapia are characterized as a nondescript gray color with a black spot on the rear of dorsal fin. Adults are generally blue-gray and transition to white on their belly. Their dorsal fins have red to pink borders. They feed primarily on plankton and small organisms living in or on the bottom detritus. (FFWCC 2021a)

Spawning occurs when the water temperature exceeds 68°F. Males dig large circular nests with their mouths in shallow water over a sandy bottom where reproduction occurs. The females then place the eggs in their mouth until they hatch (mouth-brooding). The spawn grow rapidly for the first few months and then peak at about 5–6 pounds between ages 3–5. (FFWCC 2021a)

Blue tilapia locations were documented within the 6-mile radius, but not within the PSL site. One reported location was directly across the Indian River Lagoon in a canal at the Savannas Reserve State Park (EDDMaps 2021).

#### *3.7.5.4.2 Brown Hoplo*

The brown hoplo (*Hoplosternum littorale*) is a freshwater fish species native to South America. The species is dark brown to black in color and is typically less than a foot long. It has bony armor consisting of two rows of large hard scales forming plate-like shields along each side. (FFWCC 2021a)

The brown hoplo occurs in a variety of freshwater habitats including slow-moving rivers, streams, side channels, ponds, marshes, and man-made waterways such as ditches and borrow pits. They were first documented in 1995 in the Indian River Lagoon. They now are more widely distributed throughout the state. (FFWCC 2021a)

Brown hoplo locations were documented within the 6-mile radius but not within the PSL site. One reported location was found directly across the Indian River Lagoon southeast at the Savannas Reserve State Park (EDDMaps 2021).

#### *3.7.5.4.3 Lionfish*

The lionfish (*Pterois volitans*) is an invasive species native to the Indo-Pacific and Red Sea. The two species of lionfish are distinct-looking in that they have a zebra-like pattern that is primarily red, brown, and white; however, about 97 percent are red lionfish. Lionfish are a predatory reef fish that stalk and kill native fish. Lionfish also compete for food with native predatory fish such as grouper and snapper. (FFWCC 2021a)

Lionfish grow to about 12–15 inches in length; however, they can reach up to 18 inches in some habitats. In addition, they have 18 venomous spines that are used defensively against predators. Thirteen long venomous spines are located along the front of the dorsal fin which is located on the top of the fish. Two short venomous spines are located on the pelvic fins (one on each side), which is located on the bottom of the fish closest to the fish's head. Three additional venomous spines are located along the front edge of the anal fin, which is located on the bottom of the fish nearest the tail. The large and featherlike pectoral fins and the tail fin do not contain venomous spines. The FFWCC encourages people to remove and humanely euthanize lionfish from Florida waters to help limit negative impacts to native marine life and ecosystems. (FFWCC 2021a)

Several lionfish locations were documented within the intake canal at the PSL site as well as in the adjacent Atlantic Ocean beachfront (EDDMaps 2021). Further, from 2014–2017, 31 lionfish were captured and euthanized at the PSL site as part of the FFWCC special activities license.

#### *3.7.5.4.4 Walking Catfish*

The walking catfish (*Clarius batrachus*) is a species native to south Asia. It was imported by tropical fish dealers to Florida in the early 1960s.The walking catfish is a smooth, scale-less fish that is typically a uniform shade of gray to gray-brown with many small white spots along their sides. Similar to other catfish species, the head of the walking catfish is flat with small eyes and numerous small teeth on both the upper and lower jaws. (Brogan 2003)

The walking catfish has four pairs of barbels and has a lengthy dorsal and anal fin that each connect near the caudal fin. They also have pectoral fins on each side which they use to flex its body back and forth to "walk." The walking catfish is easy to distinguish from many of the other North American catfish because it doesn't have an adipose fin. (Brogan 2003)

The walking catfish is an opportunistic predator and largely active at night. They inhabit freshwater lakes and rivers, but can be found in brackish waters or warm, stagnant waters, such as muddy ponds, canals, ditches, swamps, and flooded prairies. Walking catfish threaten aquaculture farms by eating large amounts of the fish. They also can carry the disease enteric septicemia caused by the bacterium *Edwadsiella ictaluri*. Wild walking catfish could infect farmed catfish with the disease. (Brogan 2003)

Walking catfish locations were documented within the 6-mile radius, but not within the PSL site. (EDDMaps 2021).

### 3.7.6 Procedures and Protocols

FPL relies on administrative controls and other regulatory programs to ensure that wildlife and their habitats are protected as a result of a change in plant operations. PSL maintains an environmental control program to ensure that all site activities comply with applicable environmental regulations (i.e., water withdrawal increase, NPDES discharge point, thermal effluents, wastewater discharge increase, air emissions increase), or prior to ground-disturbing activities. The administrative controls, as presented in Section 9.5, involve reviewing the change, identifying effects, if any, on the environmental resource area (i.e., habitat and wildlife), establishing BMPs, modifying existing permits, agency consultations, or acquiring new permits as needed to minimize impacts.

Existing regulatory programs that the site is subject to, as presented in Chapter 9, also ensure that habitats and wildlife are protected. These are related to programs such as the site environmental management program which establishes environmental review procedures, provides direction on regulatory and environmental awareness training for site personnel, outlines environmental inspections and assessments, and denotes the responsibilities of the environmental governance team. Additional programs include a chemical control program, BMPs as part of the SWPPP, USACE permitting, and a groundwater protection program.

In the occurrence of an unplanned environmental event, FPL maintains a procedure to guide the steps in reporting to the agencies of concern as per state and federal environmental regulations, the plant's environmental permits and the environmental protection plan (Appendix B of the plant operating license).

### 3.7.7 Studies and Monitoring

Studies, monitoring, and reporting for wildlife, surrounding habitats, and important resources is conducted routinely, and as needed to maintain compliance with all local, state, and federal agencies.

#### 3.7.7.1 Impingement and Entrainment Monitoring

The intake cooling water system for PSL Units 1 and 2 is a once-through cooling system. Up to 1,032,600 gpm or 1,487 MGD are pumped from the Atlantic Ocean using intake cooling water pumps. This non-contact cooling water is pumped through heat exchangers to provide cooling for a wide variety of plant equipment and is discharged to the discharge canal. (FPL 2001, Section 3.1.3.2)

The intake structures are located approximately 1,200 feet offshore where the water is nearly 23 feet deep. The designs of the structures feature a large concrete base with a vertical cylindrical opening in the center and a concrete velocity cap supported by columns extending approximately 6 feet from the base. The velocity cap configuration was designed to reduce impingement of marine organisms by converting vertical flow into horizontal flow at the intake. The design takes into account that fish are able to detect and avoid a horizontal velocity, but not a vertical velocity. The location of the velocity caps at mid-depth also helps reduce entrainment, based on data demonstrating that plankton densities are much lower at mid-depth than at the ocean surface. Water withdrawn from the structures is conveyed through separate buried pipes, beneath the beach and dune system, to the intake canal. Inside diameters of the pipes, which correspond to those of the vertical cylindrical openings in the concrete bases of the structures, are 16 feet for the large intake and 12 feet for the small intakes. (FPL 2001, Section 3.1.3.2)

In addition, FPL has installed and maintains three barriers in the intake canal to reduce marine life residence time in the canal, particularly sea turtles, and to facilitate the return of turtles to the ocean. These include deployment of a 12.7-centimeter (5-inch) mesh barrier net across the channel approximately midway between SR A1A and the canal headwall, a 20.3-centimeter (8-inch) mesh barrier net immediately east of SR A1A, and installation of a rigid barrier across the north-south arm of the intake canal. (FPL 2001, Section 3.1.3.2)

##### *3.7.7.1.1 Impingement*

Impingement studies were conducted from 1976–1978 at the request of the NRC for PSL Unit 1's OL. Annual fish impingement was estimated to be between 34,000 (1978) and 131,000 (1976); annual shellfish impingement was estimated at 26,000 (1976) to 37,000 shellfish (1978). The mean number of fish impinged per 24-hour period was 222, and the mean number of shellfish was 82. The dominant taxa impinged included anchovy (Anchoa spp.), grunt (Haemulidae), jack (Carangidae), croaker (Micropogonias spp.), mojarro (Gerreidae), shrimp (Panaeidae), and blue crab (*Callinectes sapidus*). In 1979, the NRC granted an amendment to the operating license for Unit 1 which discontinued the monitoring requirement, stating that impingement losses were insignificant when compared to the fish populations in the site vicinity and the number of commercially harvested shrimp on Florida's east coast.

When Unit 2 was added, it was acknowledged that the impingement impacts would double with the doubling of the intake flow. However, the NRC estimated, that even with the doubling in weight of impinged organisms, impingement would still only be equal to less than half of 1 percent of the commercial catch of fish and shellfish in either St. Lucie or Martin counties. Therefore, the NRC concluded the combined estimates for impingement of the two units would still be insignificant.

##### *3.7.7.1.2 Entrainment*

Entrainment studies were conducted from 1977–1983. Paired bongo nets were used to collect ichthyoplankton in the intake canal and nearshore habitats. Six ocean stations, as well as one station in the intake canal, and one station in the discharge canal were sampled twice a month during the day using paired 20-centimeter, 505-micron mesh bongo nets. The offshore station's nets were towed for 15 minutes just below the surface. A mid-depth sample was taken near the intake, and oblique tows were taken in the canals.

Sample analysis showed the mid-water samples near the intake had lower densities of ichthyoplankton than the surface samples, the intake canal had lower densities than the ocean, and the discharge canal had lower densities than the intake canal. It was also noted that most of the larval fish collected in the intake canal were damaged. The most common larval fish collected were herrings and anchovies, suggesting unidentifiable eggs collected were likely the same species. Blennies, gobies, mojarras, drums, and jacks were also dominant. It was determined that approximately 0.4 percent of the fish eggs and larvae passing the intake would be subject to entrainment.

Additional entrainment studies were conducted in January 2006 to October 2007 in response to the release of the Phase II rule to characterize the biological community in the vicinity of PSL. However, in 2007 the Phase II rule was suspended. The results were utilized as part of a 2010 biological characterization report to determine the most appropriate water source for PSL. The original compliance strategy was to demonstrate that the design, technology, and operational measures already implemented for the plant, including relocation of the plant cooling water intake structures (CWIS) from the Indian River Lagoon (Big Mud Creek), as proposed in the original plant design, to the marine offshore environment (Atlantic Ocean), and the use of velocity caps at the three intakes, meet the national performance standards for best technology available (BTA).

Dominant fish collected in the ocean trawls were anchovies (especially *Anchoa hepsetus* and A. lamprotenia), comprising approximately 89 percent of the catch, followed by herrings (Clupeidae) at approximately 5 percent. Shellfish densities were low (less than one per 100 cubic meters) throughout the study and were dominated by commercial shrimp (Penaeidae) and swimming crabs (Portunus spp.).

Plankton samples were collected by pumping intake water as it is drawn into the intake canal through a 1-meter diameter plankton net with 30-micron mesh. Densities in the intake canal were low throughout the study. A high percentage of the catch in the intake canal was unidentifiable (74.5 percent) due to developmental stage (35 percent undeveloped), damaged (24 percent), or otherwise unidentifiable (15 percent). Drums (9.5 percent) and anchovies (4 percent) were the most commonly identified. Densities of shellfish in the intake canal were also low throughout the study and dominated by brachyuran crabs (Brachyura, 64 percent), sergestid shrimp (Sergestoidea, 9 percent), and caridean shrimp (Caridea, 7 percent).

As part of the current 316(b) demonstration, and in response to IWFP No. FL0002208, issued on November 4, 2016, a 2017 entrainment study was completed for the PSL site which supplements the data found in the Phase II demonstration (2006–2007 data mentioned above). Data collected within this sampling program will be used to identify species and life stages affected, characterize temporal trends in entrainment rates (both diel and seasonal), and support the site-specific determination of BTA for entrainment. The reports required under the final rule at 40 CFR 122.21(r), which encompass compliance with both impingement and entrainment standards, were submitted with the NPDES permit renewal application in May 2021.

In addition, entrainment and monitoring of marine life and consultations with National Marine Fisheries Service (NMFS), NRC, and FPL have been part of the studies and monitoring programs at PSL. Sea turtle monitoring is discussed in Section 3.7.7.5.

#### 3.7.7.2 Thermal Effluents Monitoring

Section 316(a) of the CWA establishes a process whereby a thermal effluent discharger can demonstrate that thermal discharge limitations are more stringent than necessary and, using a variance, obtain alternative facility-specific thermal discharge limits [33 USC 1326].

As presented in Section 2.2.3, PSL has a once-through heat dissipation system. Prior to startup of Units 1 and 2, extensive thermal plume modeling studies were conducted. Potential interaction of the thermal plume with benthic, planktonic, and nektonic (fish and sea turtles) communities was evaluated and projected to be minimal. No detectable impact was predicted due to scouring of the benthic community, plume entrainment of plankton (including fish eggs and larvae), or heat shock to adult fish or turtle hatchlings. (FPL 2001)

In 2010, FPL submitted a request to modify the NPDES permit to increase the maximum heated water temperature at the point of discharge for Outfall D-001. The revision, which became effective on December 23, 2010, allows for a minor increase in effluent temperatures, 2°F (1.11°C) under normal operating conditions, resulting from an EPU for Units 1 and 2 at the plant.

Previous benthic studies demonstrated only minimal impacts to the benthic environment near PSL, both in scope and severity. The thermal modeling conducted as part of this study indicates there will be no measurable change in thermal exposure of benthic organisms in the vicinity of the discharges because the plume is buoyant and is expected to float away from the sediments as it mixes.

Following the request to modify the NPDES permit, a biological plan of study was conducted to determine the impacts of the EPU on the aquatic environment. Baseline monitoring commenced in August 2011 and continued through October 2012. The EPU was completed in December 2012 and the first post-EPU sampling was conducted in January 2013. Post-EPU monitoring continued through February 2015. Sampling was performed every other month for a total of eight baseline sampling events and 12 post-EPU events.

Collectively, data collected during the plan of study indicate that a diverse assemblage of fish and shellfish exist in the nearshore waters of the Atlantic Ocean offshore from PSL. These faunal communities, as well as the monitored water quality parameters, exhibit considerable spatial and temporal variability.

Similar to the results of the 316(a) monitoring effort at PSL in the 1970s, data collected during the current biological POS provide no evidence that the EPU has affected the abundance or composition of faunal communities in the vicinity of the plant. Based on the huge capacity of the receiving water body (Atlantic Ocean) to dissipate heat, the effectiveness of the offshore discharge pipes in diffusing heated cooling water, the limited spatial area historically affected by thermal discharges, and the small change in discharge temperatures resulting from the EPU, the absence of any detectable EPU effects on faunal communities is not unexpected.

### 3.7.7.3 Radiological Environmental Monitoring

PSL submits annual environmental operating reports which document radiological impacts on environmental factors such as broadleaf vegetation, fish and invertebrates, surface water, and shoreline sediment via plant effluents. This monitoring is done in compliance with the ODCM. The results of these studies and impacts on environmental resources are discussed in Section 3.10.3.

### 3.7.7.4 Avian Monitoring

Required studies and monitoring occur at PSL prior to any construction activities. Avian monitoring includes completing species-specific nesting surveys during the nesting season prior to any land-disturbing activities, mortality monitoring and reporting as an occurrence of normal operations, and nest monitoring and removal as a part of regular maintenance activities.

FPL maintains specialty permits from the USFWS and FFWCC that aid in avian protection and reporting. Avian mortalities that occur during normal plant operations are recorded and submitted to USFWS as part of a specialty permit. Any additional monitoring or surveys to protect avian species occur as needed to comply with federal, state, and local regulatory requirements as directed by the agencies and generally prior to new projects.

### 3.7.7.5 Federally Listed Threatened and Endangered Species Monitoring

Sea turtles nest on Florida's Atlantic coast typically from March through September. South Hutchinson Island is an important rookery for loggerhead, green, and leatherback sea turtles. Further, the coast of Hutchinson Island is designated as critical habitat for the loggerhead. FPL and PSL have committed to monitoring and minimizing the potential take of the five federally listed sea turtle species known to commonly occur on Hutchinson Island: the loggerhead (*Caretta caretta*), green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), Kemp's ridley (*Lepidochelys kempii*) and hawksbill (*Eretmochelys imbricate*). The Olive ridley (*Lepidochelys olivacea*) is also known to occur but is significantly less common (i.e., a capture in 2019 was the first since the plant's operation).

PSL employs a number of protection programs onsite including the documentation of nesting at the site and vicinity and the planting of a light screen along the beach to minimize hatchling disorientation. Since 1971, PSL has sponsored the monitoring of sea turtles and their nests in both Martin and St. Lucie counties. Additional activities include intake canal monitoring and turtle relocation, participation in the Sea Turtle Stranding and Salvage Network, and conducting public service turtle walks during the nesting season. When the plant became operational in 1976, turtles entrained in the intake canal have been systematically captured, measured, weighed, and tagged. Healthy sea turtles are returned to the ocean the same day of capture. Sick or injured sea turtles may be held for observation or transported to an approved rehabilitation facility. Injuries and mortalities are identified as either causal to power plant operations or non-causal to power plant operations, and are made in consultation with FFWCC and/or a qualified veterinarian.

NRC issued the first OL for PSL Unit 1 in 1976, but no Endangered Species Act (ESA) Section 7 consultation was conducted. However, sea turtle takes occurred when operation began in 1977. In 1978, a barrier was constructed in the intake canal east of A1A to confine entrapped turtles to the easternmost section of the canal where capture techniques are the most effective. Another net was completed in 1986. This net constrains turtles not confined by the A1A barrier. A small mesh barrier was erected east of the A1A barrier in 1996 in an effort to better constrain the large numbers of small green turtles encountered in the intake canal. However, the integrity of this net was often compromised by incursions of seaweed, drift algae, jellyfish, and siltation. As a result, water velocities around the net increased dramatically, creating an insufficient net slope that caused several sea turtle mortalities. To address this design problem and further alleviate mortalities, the intake canal was dredged to reduce velocities and a new barrier was erected in 2002. The new net was designed with stronger mesh and more reinforcements so that it could withstand the incursion events that caused the design failure of the old barrier. The new barrier is considered effective at limiting the passage of sea turtles through the intake canal, since 99.6 percent of all turtles entrapped in the canal in 2003 were captured east of the A1A bridge.

In 1982, Section 7 consultation began, and the 1982 biological opinion (BO) documented that the operation of Unit 2 was not likely to jeopardize the continued existence of any listed species under NMFS jurisdiction, but the BO lacked anticipated annual incidental take estimates. (NMFS 2016)

Following the 1982 BO, an increase in turtle takes resulted in a reinitiation of consultation in 1995. FPL implemented several mitigation measures, and NMFS issued a BO in 1997. The 1997 BO reached the conclusion that the operation of PSL was not likely to jeopardize the continued existence of any ESA-listed species under NMFS jurisdiction, and anticipated annual incidental take was identified for the loggerhead, Kemp's ridley, green, leatherback, and hawksbill sea turtles. (NMFS 2016)

In 1999, FPL exceeded its anticipated incidental take limit for green sea turtles established by the 1997 BO set forth by NMFS. This required re-initiating consultation under Section 7 of the ESA. These actions led to the development of the 2001 BO, which served PSL until the next BO was issued in 2016.

In the 2001 BO, there were a number of changes, most importantly in the incidental take statement. It stated that FPL would exceed its take limits for a calendar year if any of the following occurred: 1) more than 1000 sea turtles are captured; 2) more than 1 percent of the total number of loggerhead and green turtles (combined) are injured/killed due to plant operation; 3) more than two Kemp's ridley sea turtles are injured/killed due to plant operation; or 4) if any hawksbill or leatherback sea turtles are injured/killed due to plant operation. When the

1 percent of the combined loggerhead and green turtle captures is not a whole number, it is rounded up (e.g., 520 combined captures = take limit of 6). Under Section 7 of the ESA, a new consultation with NMFS is required if FPL meets or exceeds the take limits specified in the incidental take statement.

In 2005, a non-lethal take of a smalltooth sawfish, which was listed subsequent to the 2001 BO, resulted in the NRC reinitiating consultation with the NMFS. Additionally, in 2006, FPL exceeded its sea turtle take limit at PSL and reinitiating a Section 7 consultation was required. PSL entrained a total of 662 green and loggerhead turtles, of which 29 were dead or injured causally related to plant operations, which exceeded the 1 percent limit. This was largely a result of the events on October 25 and 26, 2006, when a total of 21 loggerhead hatchling mortalities and 3 injuries occurred at the PSL intake screens after an undetected turtle nest was laid on an intake canal bank. A shoreline hardening project was completed in 2009, which removed suitable nesting habitat from the canal banks. In 2007, FPL conducted a video reconnaissance of the intake structure for the NMFS and the NRC, which revealed the existence of an abandoned pipe segment that trapped a green sea turtle during the scheduled outage of the plant. This turtle eventually traveled into the intake canal and was later released into the wild by FPL personnel.

To reduce injury to sea turtles that enter the intake pipes, FPL attempted in November 2007 to clean all debris from the three intake pipes identified during the April 2007 video inspection. The dead-end section of the southern 12-foot diameter intake pipe was capped and the debris was removed from this pipe. A portion of the internal debris was removed from the northern 12-foot diameter intake pipe by September 30, 2009.

Communication among FPL, NRC, and NMFS remained active through the following years and a new BO was established in 2016. The incidental take statement (ITS) in the most recent BO (2016) states that FPL will exceed its take limits for a calendar year if any of the following occur: 1) more than 623 loggerheads, 500 green turtle, seven hawksbills, eight Kemp's ridleys, or five leatherbacks are captured annually; 2) more than seven green turtles or three loggerheads are documented with severe causal injuries annually; 3) more than five green turtles or three loggerhead are documented as causal mortalities annually; 4) more than one hawksbill, Kemp's ridley, or leatherback are documented with either a severe causal injury or is a causal mortality every 2 years; and 5) more than one smalltooth sawfish is captured every 5 years or any smalltooth sawfish are ever killed. Should FPL exceed any threshold established in the ITS, a formal Section 7 of the ESA between the NMFS and the NRC will be required.

Further, the 2016 BO required FPL to install barriers at the ocean intake velocity caps to avoid entraining egg-bearing adult sea turtles. In December of 2016, FPL commenced barrier testing in which a total of ten turtles (eight loggerheads and two green) were exposed to the test barrier. During the test, the tenth turtle became wedged between the barrier and mock velocity cap. The test was immediately suspended and the turtle was freed. After consulting with four experts on the test results, two options were evaluated: 1) barrier redesign, and 2) maintain current programs while identifying and minimizing negative impacts associated with entrainment and intake piping. FPL determined that the excluder device would introduce a new impingement risk and prevent the capture and rehabilitation of non-causal sick or injured sea turtles that have been routinely and successfully removed from the intake canal. Thus, option two would be the most beneficial to sea turtles in the vicinity of PSL.

Between 2015 and 2019, sea turtle captures from the intake canal ranged from 435 to 508 annually. The percent of sea turtles captured alive and returned to the ocean ranged from 92.8 to 95.4. The percent of sea turtles transported to rehabilitation facilities for treatment of injuries or disease ranged from 2.8 to 5.3. The percent found dead ranged from 1.0 to 1.9.

Following the 2016 BO, three smalltooth sawfish were found in the intake canal (two in 2017 and one in 2019). In addition, FPL has exceeded its take limit since the 2016 BO because there were more non-lethal captures of Kemp's ridleys than allowable under the latest BO (nine individuals in 2018 and 10 in 2019), green sea turtle causal mortality exceeded the ITS limit (six in 2018), the three smalltooth sawfish captures, and two giant manta rays captured in September 2020 and October 2020. In addition, the NRC has requested that the NMFS consider scalloped hammerhead sharks based on the capture of two individuals in 1997 and 2012, prior to being listed as threatened under the ESA.

In 2019, the NRC requested re-initiation of consultation under Section 7 of the ESA. The BO is pending. Following completion of the Section 7 consultation process, FPL will comply with the terms and conditions set forth in the BO.

#### 3.7.7.6 As-Needed Monitoring

In addition to the above monitoring, additional studies and monitoring events are conducted at PSL as needed to comply with federal, state, and local regulatory requirements as directed by the agencies, generally prior to new projects. All monitoring is consistent with agency policies and procedures and performed under the guidance of the coordinating agency.

In addition to studies and monitoring, staff biologists receive several species-specific trainings as part of their compliance with the FFWCC. Annual sea turtle monitoring training occurs as part of the annual environmental operating reports. Further, PSL staff received smalltooth sawfish handling training by the FFWCC on June 2, 2016. Sea turtle monitoring is discussed in Section 3.7.7.5.

### 3.7.8 Threatened, Endangered, and Protected Species, and Essential Fish Habitat

The USFWS South Florida Ecological Services Office maintains current lists of federally threatened or endangered species on its website (USFWS 2021b). The USFWS federal endangered and threatened species listing and the FFWCC state endangered and threatened species listings were reviewed (FAC 2020; FFWCC 2018). Known species occurrences from onsite assessments, the FNAI biodiversity matrix, the Smithsonian's Indian River Lagoon inventory, and the USFWS Information for Planning and Consultation (IPaC) were utilized to determine which species had the potential to occur on the PSL site. Federal and state threatened, endangered, or species of conservation concern that have the potential to occur within a 6-mile radius of PSL are listed in Table 3.7-5. Consultation letters with state and federal agencies are included in Attachment C.

The following species are protected under the federal ESA and have been documented on the PSL site: wood stork (*Mycteria americana*), green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta caretta*), Kemp's ridley sea turtle (*Lepidochelys kempii*), hawksbill sea turtle (*Eretmochelys imbricata*), olive ridley sea turtle (*Lepidochelys olivacea*), eastern indigo snake (*Drymarchon corias couperi*), West Indian manatee (*Trichechas manatus*), giant manta ray (*Manta birostris*), scalloped hammerhead shark (*Sphyrna lewini*), and the smalltooth sawfish (*Pristis pectinate*). Additionally, the loggerhead sea turtle and West Indian manatee have critical habitat within 6 miles of PSL. Critical habitat for the loggerhead sea turtle includes beach and Atlantic Ocean habitat adjacent to the PSL site. Critical habitat for the West Indian manatee includes the Indian River Lagoon adjacent to the PSL site, as well as Big Mud Creek, which extends inside the PSL site boundary (Figure 3.7-3). (Foster and Wheeler 2001)

The following are listed as threatened species by the state of Florida and have been documented at the PSL site: least tern (*Sterna antillarum*), black skimmer (*Rynchops niger*), American oystercatcher (*Haematopus palliateus*), Florida sandhill crane (*Antigone canadensis pratensis*), little blue heron (*Egretta caerulea*), reddish egret (*Egretta rufescens*), gopher tortoise (*Gopherus polyphemus*), southeastern American kestrel (*Falco sparverius paulus*), large flowered rosemary (*Conradina grandiflora*) and coastal vervain (*Glandularia maritima*) (Foster and Wheeler 2001)

### 3.7.8.1 Federally Listed Species

Fifty-seven federally listed threatened or endangered species have the potential to occur within the PSL site or within a 6-mile radius (USFWS 2020a; NOAA 2021b). The ecological requirements for these species are summarized below. Of importance, most species that are federally listed and the responsibility of the USFWS are also state listed, as FFWCC works in partnership with the USFWS to protect imperiled species. (FFWCC 2021a)

Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practiced by FPL for the licensed life of PSL. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to any special status and protected species.

#### *3.7.8.1.1 Fish Species*

Six federally listed threatened or endangered fish species are listed as either occurring or having the potential to occur within 6 miles of the PSL site. The Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) and the smalltooth sawfish (*Pristis pectinate*) are listed as endangered. The giant manta ray (*Manta birostris),* Nassau grouper (*Epinephelus striatus*), oceanic whitetip shark (*Carcharhinus longimanus*), and scalloped hammerhead shark (*Sphyrna lewini*) are listed as threatened. (FAC 2020; FFWCC 2018)

Atlantic Sturgeon

The Atlantic sturgeon inhabits rivers from Maine to Florida. They are characterized by five rows of bony plants known as scutes that run along their body. In addition, they have four slender barbels and a shark-like tail. Atlantic sturgeon can grow up to 14 feet and live to be nearly 60. Originally prized for their high-quality eggs to eat as caviar, Atlantic sturgeon populations quickly declined, placing them on the endangered species list in 2012 (NOAA 2021c).

Atlantic sturgeon are anadromous fish. Born in freshwater, they migrate to the sea as juveniles and back again to freshwater to spawn. Most juveniles remain in their river of birth (natal river) for at least several months before migrating out to the ocean. (NOAA 2021c)

No Atlantic sturgeon have been observed on the PSL site. The species is documented by the FNAI as occurring in St. Lucie County (FNAI 2021).

Giant Manta Ray

The giant manta ray is the world's largest ray. Recognized for its large diamond-shaped body, giant manta rays can grow up to 23 feet in length and can have a wingspan of 29 feet. Listed in 2018, the biggest threat to the giant manta ray is commercial fishing. (NOAA 2021c)

The giant manta ray is a migratory species whose migration is dependent on zooplankton concentrations, seasonal temperature, current circulation, tide patterns, and seasonal upwelling. Manta rays have among the lowest fecundity of elasmobranchs, typically giving birth to only one pup every two to three years. (NOAA 2021c)

In September 2020 and October 2020, two giant manta rays were entrained in the intake canal at PSL. The rays were not injured and were returned to the Atlantic Ocean and monitored. In 2019, the NRC requested re-initiation of consultation under Section 7 of the ESA and the BO is pending. The BO is expected to address potential effects to the giant manta ray.

Nassau Grouper

The Nassau grouper is the most common grouper in the United States. They prefer coral reef or rocky bottom habitats. Commercial fishing has severely threatened the population of this species. Fishing pressure in the twentieth century led to the commercial extinction of the species in the U.S. Caribbean by the mid-1980s; Florida populations declined from the 1950s to very low levels in the early 1990s. Currently, Nassau groupers are considered overfished in Florida, and fishing for this species is prohibited within U.S. waters. This species is a solitary, diurnal predator found from inshore water to depths of about 100 meters in waters of the South Atlantic Ocean and Caribbean Sea, and is known to occur in Biscayne Bay. Nassau groupers reach maturity at about 5 years of age and may live several decades, reaching a maximum size of about 39 inches (100 centimeters). Prey items include a wide variety of fish and invertebrates. This species is primarily gonochoristic (exhibiting separate sexes) and is known to congregate in very large numbers at specific nearshore locations to spawn. (NOAA 2021c)

The Nassau grouper is considered a reef fish, but it transitions as it grows through a series of shifts in both habitat and diet. As larvae they are planktonic. As juveniles they are found in nearshore shallow waters in macroalgal and seagrass habitats. They shift to predominantly reef habitat (forereef and reef crest) as they grow. Nassau groupers are mostly absent from the continental United States, except Florida, where larger juveniles and adults have been recorded. No larval Nassau grouper or juveniles smaller than 20 inches in length have been collected or observed in Florida waters. However, sampling along shoreline habitats of the Florida Keys has been limited to date. (NOAA 2021c)

No Nassau groupers have been documented on the PSL site (Foster and Wheeler 2001). Range data for this species suggest that they may possibly inhabit waters adjacent to the site; however, sampling has been limited and therefore it is unknown (NOAA 2021c). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Oceanic Whitetip Shark

Oceanic whitetip sharks are large sharks found in tropical and subtropical oceans throughout the world. Oceanic whitetip sharks are long-lived, late maturing, and have low to moderate productivity. They have a distinctive pattern of mottled white markings on the tips of their dorsal, pectoral, and tail fins. These markings are why they are called "whitetip" sharks. Further, the color of their bodies varies depending on where they live. Generally, they are grayish-bronze to brown, while their undersides are whitish, with some individuals having a yellow tinge. (NOAA 2021c)

The oceanic whitetip shark is a pelagic species, generally remaining offshore in the open ocean, on the outer continental shelf, or around oceanic islands. They live from the surface of the water to at least 498 feet deep. Oceanic whitetip sharks have a strong preference for the surface mixed layer in warm waters above 20°C and are therefore a surface-dwelling shark. (NOAA 2021c)

No oceanic whitetip sharks have been documented in the vicinity of PSL. Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Scalloped Hammerhead Shark

Scalloped hammerhead sharks are moderately large sharks with a global distribution. They are distinguished by their hammer-shaped head. The largest threat they face is commercial fishing, mainly for the shark fin trade. Two distinct population segments of the scalloped hammerhead shark are listed as endangered and two are listed as threatened under the ESA. The southeast region where PSL is located has a designated threatened population.

Two occurrences of scalloped hammerhead sharks have occurred onsite, one in 1997 and one in 2012. Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species. In 2019, the NRC requested re-initiation of consultation under Section 7 of the ESA and the BO is pending. The BO is expected to address potential effects to the scalloped hammerhead shark.

Smalltooth Sawfish

The smalltooth sawfish is a tropical marine species that prefers shallow coastal waters and sometimes enter the lower reaches of freshwater river systems. The smalltooth sawfish belongs to a group of fish called elasmobranchs that includes rays, skates, and sharks. The smalltooth sawfish gets its name from its long flat snout, which resembles a saw.

Smalltooth sawfish populations have declined dramatically due to habitat loss associated with coastal development and accidental capture in fisheries. The largest populations in the United States are south and southwest of Florida. Further, peninsular Florida has the largest number of capture records within U.S. waters and probably contained the largest historic populations. Primary threats to this species are incidental catch in commercial and recreational fisheries and habitat loss or degradation. (NOAA 2021c)

In 2005, a smalltooth sawfish was captured in the intake canal, resulting in re-initiation of formal consultation. No additional smalltooth sawfish were captured between the capture in 2005 and 2016. In 2017, FPL exceeded its current incidental take limit with two captures in the intake canal (September 17, 2017, and November 2, 2017). On September 7, 2019, FPL captured a third smalltooth sawfish in the intake canal. In 2019, the NRC requested re-initiation of consultation under Section 7 of the ESA and the BO is pending.

*3.7.8.1.2 Reptiles*

Nine federally listed threatened or endangered reptile species are listed as either occurring or having the potential to occur within 6 miles of the PSL site. The American alligator (*Alligator mississippiensis)*, American crocodile (*Crocodylus acutus)*, Atlantic salt marsh snake (*Nerodia clarkii taeniata)*, eastern indigo snake (*Drymarchon corais couperi)*, and loggerhead sea turtle are federally listed as threatened. The green sea turtle (*Caretta caretta)*, hawksbill sea turtle (*Eretmochelys imbricata)*, Kemp's ridley sea turtle (*Lepidochelys kempii)*, and leatherback sea turtle (*Dermochelys coriacea)* are listed as endangered. The gopher tortoise (*Gopherus* *polyphemous*) is listed as a federal candidate species but is also state designated as threatened. (FAC 2020; FFWCC 2018)

American Alligator

The American alligator is listed as threatened due to the similarity of appearance with the American crocodile. The American alligator is found in swamps, rivers, streams, lakes, and ponds throughout the southeastern United States where fresh or brackish water is present. Alligators are opportunistic feeders, eating fish, turtles, wading birds, snakes, frogs, and small mammals. Threats to this species include habitat loss, pollution, and interactions with humans. (FFWCC 2021a)

American alligators have been observed on the PSL site in ponds and in the intake canal and have been documented in the Smithsonian's Indian River Lagoon inventory (SMS 2011). The high salinity in the section of the Indian River Lagoon near the PSL site is not ideal for the American alligator. Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

American Crocodile

American crocodiles are commonly found in coastal areas throughout the Caribbean Sea in both brackish and saltwater habitats, including ponds, coves, creeks, and mangrove swamps. Crocodiles are opportunistic feeders, eating a variety of fish, snails, crustaceans, crabs, turtles, snakes, birds, and mammals. Southern Florida is considered the northern edge of their range. Optimum nesting requirements include the presence of elevated, well-drained substrate near water greater than one meter deep, salinity ranging from 10 to 20 ppt, and locations protected from wind and wave action and free from human disturbance and predators. (USGS 2019)

The current distribution of American crocodiles does not include St. Lucie County. Therefore, they are unlikely to occur at PSL (FFWCC 2021a; USGS 2019). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Atlantic Salt Marsh Snake

The Atlantic salt marsh snake inhabits brackish coastal marshes predominantly vegetated with glasswort (Salicornia spp.) and salt grass (*Distichlis spicata*). It is a partially striped salt marsh snake that reaches a maximum length of 32 inches, although it is typically less than 26 inches in length. The pattern consists of a gray to pale olive background with black to dark brown stripes anteriorly, the stripes breaking up into rows of spots posteriorly. The extent of the striping is variable, but most individuals from the coastal marshes of Volusia County are striped on at least the anterior 30 percent of the body. Its range includes a narrow coastal strip from southern Texas, east along the Gulf coast, around the Florida peninsula, and up the eastern coast of

Florida at least as far as the Halifax River, Volusia County. It is also known to inhabit the northern coast of Cuba. (USFWS 1993)

No Atlantic salt marsh snakes have been documented on the PSL site; however, habitat is present along the coastal marsh areas near PSL. Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species. (USFWS 1993)

Eastern Indigo Snake

The eastern indigo snake is a large, black, non-venomous snake found primarily in upland habitats. They have also been found in pinelands, tropical hardwood hammocks, and mangrove forests. The eastern indigo snake needs a mosaic of habitats to complete its annual cycle. In extreme southern Florida (the Everglades and Florida Keys), eastern indigo snakes are found in tropical hardwood hammocks, pine rocklands, freshwater marshes, abandoned agricultural land, coastal prairie, mangrove swamps, and human-altered habitats. (FFWCC 2021a) The eastern indigo snake has not been observed on the PSL site (Foster and Wheeler 2001).

While the eastern indigo snake has not been observed onsite, it has been seen on Hutchinson Island. They are assumed to be present at or near the site because of their history on Hutchinson Island and the presence of many gopher tortoise burrows onsite, which the eastern indigo snake uses for habitat. Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species. (Foster and Wheeler 2001).

Green Sea Turtle

The green sea turtle is the largest of the hard-shelled turtles and unique among sea turtles in that adults are exclusively herbivorous. The species is found in the open ocean and in coastal areas, and nests on beaches. General threats to green sea turtles are loss of habitat associated with anthropogenic or natural stressors, harvest of eggs, and mortality associated with incidental capture or entanglement in fishing nets and gear. (NMFS 2009a) In Florida, green sea turtles primarily nest from June through late September. (FFWCC 2021a).

Green sea turtles have been documented as nesting on the beach at PSL, and have been entrained in the intake canal. Between 2015 and 2019, 1,028 green sea turtles were documented in the PSL intake canal. During the same timeframe, 24 of the green removed from the canal were dead; however, only 15 of those were causal deaths. Green sea turtles are protected by staff at the PSL site and actively managed, which includes protocols on systematic capture, transport to rehabilitation facilities, and nest protection. These monitoring commitments for sea turtles and sea turtle take numbers addressed in the 2016 BO are discussed in Section

3.7.7.5. In 2019, the NRC requested re-initiation of consultation under Section 7 of the ESA and the BO is pending.

Hawksbill Sea Turtle

The hawksbill sea turtle is a medium-sized sea turtle most commonly found in coral reef systems, where the ledges and caves provide shelter. Hawksbill sea turtles are less common in the Atlantic Ocean; however, a small amount of nesting occurs on beaches in southeastern Florida and the Florida Keys. Nesting typically occurs between May and October. (FFWCC 2021a; NMFS 2009a)

The main threat to the hawksbill sea turtle is accidental capture (bycatch) in shrimp and fishing nets such as longlines, finfish trawls, beach seines, and drift and set gill nets. When captured in these nets, the sea turtle cannot escape and will usually drown. Increased development will bring an increase in lighting in the area, which is detrimental to sea turtles as hatchlings will migrate towards light instead of the ocean. The potential for eggs and hatchlings to be crushed or disturbed is increased with the increase of human presence along beaches. (NMFS 2009a)

While less common in the Atlantic Ocean, hawksbill sea turtles have been documented on the PSL site. Between 2015 and 2019, eight were documented in the PSL intake canal. No mortalities were documented during this timeframe. Hawksbill sea turtles are protected by staff at the PSL site and actively managed, which includes protocols on systematic capture, transport to rehabilitation facilities, and nest protection. These monitoring commitments for sea turtles and sea turtles take numbers addressed in the 2016 BO are discussed in Section 3.7.7.5. In 2019, the NRC requested re-initiation of consultation under Section 7 of the ESA and the BO is pending.

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle is the smallest species of sea turtle and is the most endangered turtle in the world. The diet of Kemp's ridley sea turtle consists primarily of crabs and other crustaceans. Kemp's ridley sea turtles develop nests in sand along beaches. The nesting season is typically between April and July. Nesting females are mainly found on the beaches of Rancho Nuevo, Mexico; however, they can be found on beaches in Texas and Florida as well. Kemp's ridley sea turtles inhabit marine waters of the Gulf of Mexico and the western North Atlantic Ocean. (FFWCC 2021b; NMFS 2009a)

The main threat to the Kemp's ridley sea turtle is accidental capture (bycatch) in shrimp and fishing nets such as longlines, finfish trawls, beach seines, and drift and set gill nets. When captured in these nets, the sea turtle cannot escape and will usually drown. Increased development will bring an increase in lighting in the area, which is detrimental to sea turtles as hatchlings will migrate towards light instead of the ocean. The potential for eggs and hatchlings to be crushed or disturbed is increased with the increase of human presence along beaches. (NMFS 2009a)

Kemp's ridley sea turtles have been documented on the PSL site. Between 2015 and 2019, 38 Kemp's ridleys were documented in the intake canal. No mortalities occurred during this timeframe. Kemp's ridley sea turtles are protected by staff at the PSL site and actively managed, which includes protocols on systematic capture, transport to rehabilitation facilities, and nest protection. These monitoring commitments for marine turtles and take numbers addressed in the 2016 BO are discussed in Section 3.7.7.5. In 2019, the NRC requested re-initiation of consultation under Section 7 of the ESA and the BO is pending.

Leatherback Sea Turtle

The leatherback sea turtle is the largest sea turtle in the world, reaching an adult weight of 2,000 pounds and a total length exceeding 6 feet. This species is unique in that it lacks a hard, bony shell. Leatherback turtles are common in open-ocean environment, but also forage in coastal waters, eating soft-bodied prey. They are known to nest in Florida, typically between March and October. (FFWCC 2021a; NMFS 2009a)

The main threat to leatherback sea turtles is accidental capture (bycatch) in shrimp and fishing nets such as longlines, finfish trawls, beach seines, and drift and set gill nets. When captured in these nets, the sea turtle cannot escape and will usually drown. Increased development will bring an increase in lighting in the area, which is detrimental to sea turtles as hatchlings will migrate towards light instead of the ocean. The potential for eggs and hatchlings to be crushed or disturbed is increased with the increase of human presence along beaches. (NMFS 2009a)

Between 2015 and 2019, four leatherback sea turtles were captured in the intake canal. No mortalities occurred during this period. Leatherback sea turtles are protected by staff at the PSL site and actively managed, which includes protocols on systematic capture, transport to rehabilitation facilities, and nest protection. These monitoring commitments for marine turtles and take numbers addressed in the 2016 BO are discussed in Section 3.7.7.5. In 2019, the NRC requested re-initiation of consultation under Section 7 of the ESA and the BO is pending.

Loggerhead Sea Turtle

The loggerhead sea turtle is commonly found at PSL. The loggerhead's large head and powerful jaws enable the turtle to feed on hard-shelled prey, including whelks and conchs. A circumpolar species, loggerheads occur throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian oceans, and loggerheads make extensive migrations between feeding and nesting grounds. In the southeastern United States, approximately 80 percent of nesting occurs in six Florida counties, typically from April to September. Critical habitat has been designated for the loggerhead sea turtle immediately adjacent to the PSL site (Figure 3.7-3) (FFWCC 2021a; NMFS 2009a)

The main threat to loggerhead sea turtles is accidental capture (bycatch) in shrimp and fishing nets such as longlines, finfish trawls, beach seines, and drift and set gill nets. When captured in these nets, the sea turtle cannot escape and will usually drown. Increased development will bring an increase in lighting in the area, which is detrimental to sea turtles as hatchlings will migrate towards light instead of the ocean. The potential for eggs and hatchlings to be crushed or disturbed is increased with the increase of human presence along beaches. (NMFS 2009a)

Between 2015 and 2019, 1,312 loggerhead sea turtles were captured in the PSL intake canal. During that timeframe, seven mortalities were documented; however, only four were determined to be causal. Loggerhead sea turtles are protected by staff at the PSL site and actively managed, which includes protocols on systematic capture, transport to rehabilitation facilities, and nest protection. These monitoring commitments for marine turtles and take numbers addressed in the 2016 BO are discussed in Section 3.7.7.5. In 2019, the NRC requested re-initiation of consultation under Section 7 of the ESA and the BO is pending.

<u>Olive Ridley Sea Turtle</u>

The olive ridley is mainly a pelagic (open ocean) sea turtle, but they are known to inhabit coastal areas. Olive ridleys are globally distributed in tropical regions of the Atlantic, Pacific, and Indian Oceans. In the Atlantic Ocean, they are found along the coasts of West Africa and South America. (NOAA 2021d)

The primary threat to olive ridley sea turtles is bycatch in fishing gear, which can result in drowning or cause injuries that lead to death or debilitation. Other causes of decline are attributed to harvest of turtles and eggs, loss and degradation of nesting habitat, predation of eggs and hatchlings, vessel strikes, and ocean pollution. (NOAA 2021d new reference)

The olive ridley sea turtle is considered rare at PSL. A capture in 2019 was the first since the plant began operation. The olive ridley was released back to the ocean. The NRC was notified of the unusual capture of the olive ridley via FPL letter L-2019-115.

As with other sea turtles common to PSL, olive ridley sea turtles are protected by PSL staff at the site; training includes protocols on systematic capture, transport to rehabilitation facilities, and nest protection. These monitoring commitments for marine turtles and take numbers are addressed in the 2016 BO and are discussed in Section 3.7.7.5. In 2019, the NRC requested re-initiation of consultation under Section 7 of the ESA and the BO is pending.

#### *3.7.8.1.3 Birds*

Twelve federally listed threatened or endangered bird species either occur or have the potential to occur within 6 miles of the PSL site. The Audubon's crested caracara (*Polyborus plancus audubonii*), Florida scrub jay (*Aphelocoma coerulescens*), piping plover (*Charadrius melodus*), roseate tern (*Sterna dougallii*), wood stork (*Mycteria americana*) and rufa red knot (*Calidris canutus rufa*) are all listed as federally threatened. The everglade snail kite (*Rostrhamus sociabilis plumbeus*), ivory-billed woodpecker (*Campephilus principalis*), Kirtland's warbler (*Setophaga kirtlandii*), red cockaded woodpecker (*Leuconotopicus borealis*) and Florida grasshopper sparrow (*Ammodramus savannarum floridanus*) are listed as federally endangered. The whooping crane (*Grus americana*) is listed as endangered for the experimental population introduced into Florida in 1993. (FAC 2020; FFWCC 2018)

Audubon's Crested Caracara

The caracara is a resident, diurnal, and non-migratory species that occurs in Florida and parts of the southwestern United States. The Florida population commonly occurs in dry or wet prairie areas with scattered cabbage palms (*Sabal palmetto*) or in lightly wooded areas. Caracaras prefer to nest in cabbage palms surrounded by open habitats with low ground cover and a low density of tall or shrubby vegetation. Observation and radiotelemetry suggest there are three congregation areas in south-central Florida: one along the Kissimmee River north of SR 98, one north of US 27 in Glades County, and one in the vicinity of Eagle Island Road in northern Okeechobee County. (USFWS 1999)

There are no known observations in the area; they are primarily found in the western portions of St. Lucie County. Caracaras have not been observed at the PSL site. (NRC 2003). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Everglade Snail Kite

The everglade snail kite is a medium-sized raptor that is a subspecies of a wide-ranging New World raptor found primarily in lowland tropical freshwater marshes in Central and South America. In the United States, it is restricted to peninsular Florida in the watersheds of the Everglades, lakes Okeechobee and Kissimmee, and the upper St. Johns River. The Everglade snail kite was first listed as endangered in 1967, when the entire population was estimated to number in the dozens. Population estimates approached 300 individuals in the late 1970s and 1,000 individuals in 1994. Recent Everglade snail kite population modeling indicates the population may have peaked at approximately 3,500 individuals in the late 1990s. More recently, the entire Florida population has been dramatically decreasing in size and last estimated to number approximately 700 individuals in 2008. (USFWS 1999)

No everglade snail kites have been documented on the PSL site. In addition, it might use the scattered freshwater marshes in the vicinity for foraging (NRC 2003). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Florida Scrub Jay

The Florida scrub jay is a relict species of fire-dominated oak scrub habitat that occurs on well-drained sandy soils in peninsular Florida. Scrub jays are extremely habitat-specific, sedentary, and territorial. Florida scrub jays form family groups; fledglings remain with their parents in their natal territory as helpers. The Florida scrub jay was listed as threatened in 1987 because of the loss, fragmentation, and degradation of scrub habitats throughout Florida, due primarily to urbanization, agriculture, and fire suppression. During the last 10 to 12 years, the population has declined by an estimated 25 to 50 percent, and they have been extirpated from seven counties statewide. The most recent estimate of the scrub jay population (1993) is 11,000 birds. (USFWS 1999)

No Florida scrub jays have been documented on the PSL site. Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Ivory-Billed Woodpecker

The ivory-billed woodpecker is the largest woodpecker in North America. It is characterized as having a glossy, black plumage with a purplish cast. A white stripe is visible on each cheek and continues down each side of their necks to their back, where the two stripes curved to meet in the middle of their backs. The outer halves of their secondaries are white, along with the ends of their inner, primary feathers. The white feathers on the trailing edge of their wings are visible even when their wings are folded. They prefer mature old-growth forests and occur throughout the Florida peninsula and the Florida panhandle east of the Apalachicola River. Ivory-billed woodpeckers feed mostly on wood-boring larvae burrowed between the bark and sapwood of dead trees; but fruits, nuts, and seeds are occasionally eaten. (USFWS 1999)

No ivory-billed woodpeckers have been recorded on the PSL site. While habitat is present in old-growth forests adjacent to the site, all evidence leads to the conclusion that the ivory-billed woodpecker has been extirpated in the United States; therefore, the continued operation of PSL will not affect this species. (USFWS 1999)

Kirtland's Wood Warbler

The Kirtland's warbler is one of the rarest warblers. They have an extremely limited nesting range in a relatively small area of central Michigan, preferring to nest in young jack-pine (*Pinus banksiana*) forests exclusively. Its migratory pattern brings it to the east coast of Florida in the fall and spring. Migrating warblers passing through Florida favor woodlands, scrub, fencerows, and vegetated yards, but prefer dense vegetation less than 1.5 meters in height. (USFWS 1999)

No Kirtland's warblers have been observed on the PSL site. The migratory nature of this species and patterns of sightings do not suggest that this species would utilize the site as stopover habitat. The continued operation of PSL would not likely impact this species, as individuals of the species have only been documented during migration in Palm Beach, Alachua, and Duval counties. (USFWS 1999)

Piping Plover

The piping plover is a migratory shorebird that breeds only in three geographic regions of North American. Piping plovers do not breed in Florida, but individuals from all three breeding populations do winter there and have been documented in St. Lucie County. Winter habitats include beaches, mudflats, and sandflats as well as barrier island beaches and spoil islands. They feed on marine, freshwater, and terrestrial invertebrates. (USFWS 1999)

Piping plovers seem to prefer landforms that provide tidal flats for foraging and open beaches for roosting within close proximity of each other. The migration pattern of piping plovers is not well documented, but birds should appear in Florida any time after late July through September and leave from late February to early April. (USFWS 1999)

No piping plover have been documented on the PSL site. Marginal habitat on beach dunes is present. The lack of documentation on the site and the marginal habitat present make the PSL site unlikely to have adverse impacts on the piping plover. (Foster and Wheeler 2001)

Red-Cockaded Woodpecker

The red-cockaded woodpecker is one of 22 species of woodpeckers native to North America. Its historic range included eastern Texas and Oklahoma to New Jersey. Throughout the twentieth century, however, the species distribution within its historic range has become fragmented, and its total population numbers have decreased drastically due to the destruction of its habitat. The red-cockaded woodpecker was federally listed as endangered in 1970, and currently is classified as threatened by the State of Florida. The primary threat to the species continues to be destruction or degradation of its habitat as a result of timbering and other land-clearing activities. They have large, conspicuous white cheek patches, a black cap and neck, and black-and white barred back and wings. Two known active clusters exist in St. Lucie County including one at Campbell Property and one at The Reserves. (USFWS 1999)

No red-cockaded woodpeckers have been observed on the PSL site. The continued operation of PSL will not likely have adverse impacts on red-cockaded woodpeckers due to lack of habitat onsite to support this species. (Foster and Wheeler 2001)

Roseate Tern

The roseate tern is a medium-sized, colonial-nesting, marine waterbird with a deeply forked tail. They are found across a variety of coastal habitats worldwide. The North American subspecies is divided into two separate breeding populations, one in the northeastern United States and Nova Scotia, and one in the southeastern United States and Caribbean. Wintering areas are concentrated along the north and northeastern coasts of South America. It is not known if these two populations winter in proximity to each other. This species is considered migratory throughout the PSL area. The roseate tern was listed in 1987 in response to nesting habitat loss, competition from expanding gull populations, and increased predation. Although both populations experienced severe population declines, it is believed that the northeastern breeding population is under greater threat. (USFWS 1999)

No roseate terns have been documented on the PSL site. Breeding populations are located on the southernmost tip of the Florida peninsula and are not commonly documented along Florida's Atlantic coast in general. The continued operation of PSL will not likely have adverse impacts on roseate terns due to lack of habitat on site to support these species and current documented range. (USFWS 1999)

Rufa Red Knot

Red knots are showy sandpipers that inhabit shorelines along the coasts. Their most prominent nesting sites are in the high Arctic. Non-breeding populations inhabit shorelines along the eastern and western coasts of the United States. As of 2008, the rufa subspecies is thought to have three biogeographically distinct populations, one of which winters in the southeastern United States including Georgia, South Carolina, and Florida. Approximately 550 red knots were observed during the winter of 2007–2008 along a portion of the west coast of Florida between Anclote Key and Cape Romano. More than 3,000 red knots were counted in Florida in 2006, and more than 1,000 were counted again in 2011. (USFWS 2014)

Coastal beaches, tidal mudflats, salt marshes, peat banks, and mangrove and brackish-water lagoons are utilized by red knots in the winter. Roosting habitat that provides areas above the highest tides and is free from excessive human disturbance may also be important. Shorelines are important habitats for breeding and feeding (USFWS 2014)

The shoreline at PSL may provide marginal habitat for red knots. No red knots have been observed at the PSL site. The continued operation of PSL will not likely have adverse impacts on red knot due to the rarity of documented occurrences in St. Lucie County. (USFWS 1999)

Whooping Crane

The whooping crane is the tallest American bird, reaching nearly 5 feet in height. It is a snowy white, long-necked bird with long legs. Whooping cranes are biannual migrants, traveling across the Great Plains of the United States in the spring and fall of each year between a summer habitat in central Canada and wintering grounds on the Texas coast. Its black primary feathers show only during flight. Adults have a red crown and a patch of black feathers below the eye. Young are whitish overall with a rusty-colored head and neck. Currently, the whooping crane is listed for a non-essential experimental population in the eastern United States, which was introduced in 1993. (USFWS 2011b)

No whooping cranes have been observed on the PSL site. The continued operation of PSL will not likely have adverse impacts on the whooping crane due to the distance from known populations of whooping crane. (USFWS 2011b)

Wood Stork

Wood storks are one of two species of storks that breed in North America. They inhabitant marshes, cypress swamps, and mangrove swamps. They breed in colonies with great egrets, snowy egrets, white ibises, and many other species. Their unique feeding method, tactolocation, gives it specialized habitat requirement. Tactolocation, or grope feeding, is when a foraging wood stork wades through the water with its beak immersed and partially open. When it touches a prey item, a wood stork snaps its mandibles shut, raises its head, and swallows what it has caught.

The habitats on which wood storks depend have been disrupted by changes in the distribution, timing, and quantity of water flows in southern Florida. The population declines that accompanied this disruption led to its listing as an endangered species and continue to threaten the recovery of this species in the United States. (USFWS 1999)

No wood storks have been documented on the PSL site, although sightings have occurred on Hutchinson Island and within the vicinity of the plant. Onsite wetlands and mangrove areas provide feeding habitat for the wood stork (Foster and Wheeler 2001). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Florida Grasshopper Sparrow

The Florida grasshopper sparrow is a small bird that can reach a length of 5 inches with a wingspan of 8 inches. This species is drab colored with a pale median stripe on top of its flattened head and a light brown breast. Grasshopper sparrows breed throughout the year and inhabit dry open prairies that contain bunch grasses, low shrubs, and saw palmetto. (FFWCC 2021a)

The main threats to the Florida grasshopper sparrow are habitat destruction, degradation, and fragmentation. Overgrown vegetation and encroaching woody species degrade open prairie habitat suitable for the Florida grasshopper sparrow, and therefore prescribed burning plays a large role in protecting their habitat. Further, changes in hydrological regimes (i.e., excessive water) also threatens their reproduction during the nesting season. (FFWCC 2021a)

No Florida grasshopper sparrows have been documented on the PSL site. Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

##### *3.7.8.1.4 Mammals*

Thirteen federally listed threatened or endangered mammal species are listed as either occurring or having the potential to occur within 6 miles of the PSL site. The southeastern beach mouse (*Peromyscus polionotus niveiventris*) and the West Indian manatee (*Trichechus manatus*) are listed as threatened. The Anastasia island beach mouse (*Peromyscus polionotus phasma*), blue whale (*Balaenoptera musculus*), Florida panther (*Puma concolor coryi*), finback whale (*Balaenoptera physalus*), Florida salt marsh vole (*Microtus pennsylvanicus dukecampbelli*), humpback whale (*Megaptera novaeangliae*), sperm whale (*Physeter macrocephalus*), sei whale (*Balaenoptera borealis*), North Atlantic right whale (*Eubalaena glacialis*), and gray bat (*Myotis grisescens*) are listed as endangered. The puma (all other species besides the Florida panther) is listed as threatened for its similarity of appearance with the Florida panther. (FAC 2020; FFWCC 2018)

Anastasia Island Beach Mouse and Southeastern Beach Mouse

The Anastasia Island beach mouse and the Southeastern beach mouse are two of six existing coastal subspecies of the oldfield mouse (*Peromyscus polionotus*). The oldfield mouse is a wide-ranging species in the southeast. One of the largest beach mice, the Anastasia Island beach mouse is much paler than most inland races of the oldfield mouse. This beach mouse has a light buff colored back, pure white underparts, and indistinct, white markings on its nose and face. The southeastern beach mouse is the largest beach mouse. Although it is darker than the Anastasia Island beach mouse, it is still lighter than most inland subspecies of the oldfield mouse. (USFWS 2005a)

Both mouse species inhabit sand dunes vegetated by sea oats and dune panic grass. Little specific information exists about these species' burrowing habits, although they are presumed to be similar to those of beach mice on the Gulf Coast. Sometimes beach mice use the former burrows of ghost crabs, but usually they dig their own. Burrow entrances are generally found on the sloping side of a dune at the base of a clump of grass. The burrows are used for nesting and food storage as well as a refuge. (USFWS 2005a)

The Anastasia beach mouse and southeastern beach mouse have not previously been documented on the PSL site (Foster and Wheeler 2001). Dunes adjacent to the PSL site provide suitable habitat for both species to burrow. Construction is not planned for areas near the dunes. Regular maintenance activities should not impact either beach mouse species. Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Florida Panther

A small population of the Florida panther (120 to 230 individuals) in southern Florida represents the only known remaining wild population of this subspecies. Panthers are wide ranging, secretive, and occur at low densities. They require large contiguous areas to meet their social, reproductive, and energetic needs. Panther habitat selection is related to prey availability (i.e., habitats that make prey vulnerable to stalking and capturing are selected). Dense understory vegetation provides some of the most important feeding, resting, and denning cover for panthers. Telemetry monitoring and ground tracking indicate that panthers select forested habitat types interspersed with other habitat types that are used in proportion to their availability. (USFWS 2008)

Limiting factors for the Florida panther are habitat availability, prey availability, and lack of human tolerance. Habitat loss, degradation, and fragmentation is the greatest threat to panther survival, while the lack of human tolerance threatens panther recovery. (UWFWS 2008)

Known occurrences of the Florida panther are largely concentrated in the southwestern extent of the Florida peninsula, but it is not unheard of for panthers to travel up the eastern coast of the peninsula. Their habitat preferences include large tracts of undeveloped land with considerable scrub and middle story cover. While there is marginal habitat present, the continued operation of PSL will not likely have adverse impacts on Florida panther due to the rarity of documented occurrences in St. Lucie County. (USFWS 2008) Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Gray Bat

Gray bats are distinguishable for the unicolored fur on their back. Their wing membrane connects to its ankle instead of at the toe, where it is connected in other species of Myotis. With rare exceptions, gray bats live in caves year-round. During the winter, gray bats hibernate in deep vertical caves. In the summer, they roost in caves scattered along rivers. These caves are in the limestone karst areas of the southeastern United States. They do not use houses or barns. Gray bats eat a variety of flying aquatic and terrestrial insects present along rivers or lakes. (USFWS 1997)

No gray bats have been documented on the PSL site. There is no known habitat within the vicinity of PSL and therefore the continued operation of the plant will not likely adversely affect gray bat species (USFWS 1997).

West Indian Manatee

The West Indian manatee is a large marine mammal found in coastal and freshwater systems on both coasts of Florida. Manatees are general herbivores able to feed on a variety of vegetation types. They are tolerant of changes in salinity, but sensitive to temperature variations because they lack a thick insulating layer of blubber common to other marine mammals. Several anthropogenic activities pose threats to manatees. Deaths are attributable to the management of water-control structures and navigational locks, loss of habitat associated with coastal development, and several other activities. Manatees have been spotted in the Indian River lagoon and on the PSL site. (USFWS 1999)

Five occurrences of manatees entering the intake canal have happened since the startup of PSL. Although preferred habitats are in the Indian River Lagoon and other inland waterways where food sources are abundant, they do occasionally travel up and down the coast near the shore (USFWS 1999). Manatees are known to congregate in the warm water effluents of power plants during winter months; however, PSL is not known as a regular congregation site for the West Indian manatee. All five of the manatee captures were coordinated with FWS and FDEP. No manatee deaths have occurred at PSL (NRC 2003). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species

Florida Salt Marsh Vole

The Florida salt marsh vole is a small, short-tailed rodent with a blunt head and short ears. Its color is distinguished as black-brown dorsally and dark gray ventrally. It is closely related to the meadow vole but can be distinguished by its larger size, darker coloration, relatively small ears, and by certain skull characteristics. (USFWS 2005b)

The Florida salt marsh vole is found at only one site in Florida in a transitional high salt marsh zone. It appears to be restricted to areas near the edge of patches of black rush (*Juncus roemerianus*), in patches of seashore saltgrass (*Distichlis spicata*) and appears to avoid areas dominated by smooth cordgrass (*Spartina alterniflora*). (USFWS 2005b)

No Florida salt marsh vole have been observed on the PSL site and potential habitat is not present (Foster and Wheeler 2001). The continued operation of PSL will not have adverse impacts to this species due to lack of habitat on site to support this species and its confined range.

Puma

The only species of puma known to occur in Florida is the Florida panther (USFWS 2018); however, the puma is listed on the IPaC for St. Lucie County. See Section 3.7.8.1.4 for habitat requirements and information on the Florida panther.

Atlantic Whale Species

The blue whale, finback whale, humpback whale, north Atlantic right whale, sperm whale, and sei whale are all documented with the potential to occur in the ocean area adjacent to the site.

*Blue Whale*

The blue whale is the largest of the whales and may range in size to over 30 meters (100 feet). Blue whales are entirely bluish-gray in color, except for the white undersides of the flip. They are members of the family Balaenopteridae, all of which have fringed baleen plates rather than teeth. Baleen whales graze through swarms of small crustaceans known as krill and capture the krill in their baleen as water is filtered through. Like most balaenopterids, blue whales exhibit no well-defined social or schooling structure, and in most of their range they are generally solitary or found in small groups. Blue whales are found in all oceans and undertake extensive north-south migrations each year, traveling from winter grounds in low latitudes to summer feeding grounds in the Arctic or Antarctic high latitudes (Mizroch et al. 1984a).

*Finback Whale*

The finback whale is the second largest member of the Balaenopteridae family and is characterized by its fast swimming speed and streamlined body. Finbacks have asymmetrical pigmentation on the lower jaw which is distinguished as dark on the left and light on the right. Finback whales are associated with low surface temperatures and oceanic fronts during summer months. They are found from close inshore to well beyond the shelf break. Finback whales prey on euphausiids and small schooling fish. The most significant direct threats are ship strikes and entanglement in fishing gear. (COSEWIC 2005)

*Humpback Whale*

Humpback whales are found in tropical, temperate, and sub-polar waters worldwide. Humpbacks have long been considered a coastal species; however, some individuals do use offshore areas during periods when they are not expected to be migrating. Humpback whales exhibit seasonal migrations from high-latitude feeding areas in summer to low-latitude breeding and calving areas in winter. (COSEWIC 2003)

Historically in the North Atlantic there were two breeding areas, in the West Indies and off the Cape Verde Islands, off western Africa. Today most humpbacks from both the western and eastern North Atlantic appear to use the West Indies for calving/breeding, though small numbers (most likely from the eastern Atlantic) may breed in the Cape Verdes. Potential threats to humpback whales include a reduction in prey, incidental mortality in fisheries, ship strikes, and disturbance or injury in association with vessel traffic. (COSEWIC 2003)

*North Atlantic Right Whale*

The right whale is a slow swimmer that frequents coastal and shelf habitats. It feeds in temperate or high latitudes in summer, and calves in warmer water in winter. The North Atlantic population is generally thought to consist of two relatively discrete stocks in the eastern and western portions of this ocean basin, although the eastern population is functionally extinct. Right whales suffer significant anthropogenic mortality. The principal anthropogenic factors preventing recovery and growth of the population are ship strikes and entanglements in fishing gear. (NMFS 2009b)

Historically, right whales were found in coastal waters throughout the North Atlantic in a range that extended from Florida (and perhaps further south) to Greenland in the west, and from western Africa to Norway in the east. However, intensive exploitation has greatly reduced the range of this animal. In the western North Atlantic, the remaining population is largely confined to U.S. and Canadian waters, spending summers feeding in the Gulf of Maine and on the Scotian Shelf. In winter, pregnant females migrate to give birth in the coastal waters of Georgia and Florida. (NMFS 2009b)

*Sperm Whale*

Sperm whales are the largest of the toothed whales. The head is blunt, with a small underslung jaw. Its body is dark, brownish gray that is wrinkled in appearance. They inhabit all oceans in the world, but females, calves, and juveniles are found in the warmer waters of the Atlantic year-round. Their main source of food is deep water squid; however, they also feed on fish, skate, octopus, and smaller squid. Threats to the population include incidental mortality in fisheries and selective killing of males. (ACS 2004)

*Sei Whale*

The sei whale is the third largest whale in the family Balaenopteridae. They are gray with a variable white area extending from the chin to the umbilicus. Sei whales have fringed baleen plates instead of teeth, and feed on swarms of small zooplankton. Sei whales, like other baleen whales, do not have a well-defined school or social structure, and are generally found in small groups or as solitary individuals. Similar to sperm whales, sei whales are found in all oceans; however, they prefer more temperate waters and have a more restrictive range. Threats to sei whales are similar to those species above. (Mizroch et al. 1984b)

Only the humpback and North Atlantic right whales have been observed in relatively close proximity to the shore in the immediate vicinity of PSL (NRC 2003). While these species can travel close to shore, their size limits the possibility of entrainment in the intake canal and PSL. The continued operation of PSL is not likely to adversely affect any of the Atlantic whale populations.

##### *3.7.8.1.5 Insects*

Four insects are listed as threatened or endangered with the possibility of occurring on or within 6 miles of the PSL site. The Cernus blue butterfly (*Hemiargus ceraunus*) and the Cassius blue butterfly (*Leptotes cassius*) are both listed as threatened due to the similarity in appearance to the Miami blue butterfly. The Florida leafwing (*Anaea troglodyte*) and Miami blue butterfly (*Cyclargus thomasi bethunebakeri*) are listed as federally endangered. (FAC 2020; FFWCC 2018)

Cassius Blue Butterfly

The cassius blue is a beautiful tiny butterfly that is locally common throughout peninsular Florida, particularly along the coasts. It is resident in southern peninsular Florida, but occasionally it strays to more northern areas. It is cold sensitive and cannot survive even the winters of northern Florida. The mechanism by which individuals arrive at more northern localities is not known. Perhaps some are carried by wind. The larval hosts of the cassius blue are a variety of vines, shrubs, and trees in the pea family (Fabaceae) and leadworts (Plumbaginaceae). (Hall and Butler 2009)

No cassius blue butterflies have been documented on the PSL site; however, cassius butterflies do occur in St. Lucie County and suitable habitat is onsite (Foster and Wheeler 2001). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Ceraunus Blue Butterfly

The ceraunus blue butterfly is a widespread neotropical butterfly common in southern portions of the United States. It is common in various open, sunny habitats including roadsides, fallow agricultural land, weed lots, utility corridors, scrubs, open woodlands, yards, and parks. The ceraunus blue occurs across much of the extreme southern United States southward through Mexico, Central America, and the West Indies to South America; however, it occasionally strays northward. In Florida, it can be found in all 67 counties. The ceraunus blue butterflies are small and easy to overlook. The upper surface of the wings is lavender-blue in males with a narrow black margin and a single black hindwing spot. Females are somewhat darker with blue scaling limited to the wing bases. Hosts include a variety of herbaceous legumes including rosary pea, partridge pea, sensitive pea, and indigo. (Daniels 2009)

No ceraunus blue butterflies have been documented on the PSL site; however, ceraunus butterflies do occur in St. Lucie County and suitable habitat is located onsite (Foster and Wheeler 2001). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Florida Leafwing

The Florida leafwing is a medium-sized butterfly approximately 2.75 to 3 inches in length. The upper-wing (or open wing) surface color is red to red brown, the underside (closed wings) is gray to tan, with a tapered outline, cryptically looking like a dead leaf when the butterfly is at rest. The Florida leafwing exhibits sexual dimorphism, with females being slightly larger and with darker coloring along the wing margins than the males. The Florida leafwing occurs only within pine rocklands that retain its hostplant, pineland croton. Pineland croton, a subtropical species of Antillean origin, is the only known host plant for the leafwing. Therefore, the leafwing is restricted to pine rocklands that contain pineland croton. (USFWS 2012).

No Florida leafwing have been documented on the PSL site. The Florida leafwings current range does not include the PSL site (USFWS 2012). Further, appropriate habitat does not exist on the site. The continued operation of PSL will not affect leafwing populations due to the lack of suitable habitat and their limited range.

Miami Blue Butterfly

The Miami blue butterfly is a small butterfly that is bright blue on the back with a gray underside. Males have narrow black margins, while females have a wide black margin and an orange eyespot near the hindwing outer angle. On the underside of the hindwing, the Miami blue has four black basal spots, and a wide white submarginal band on both the hindwing and forewing. They inhabit tropical hardwood hammocks, tropical pine rocklands, and beachside scrub in Florida. The Miami blue was thought extinct until it was rediscovered in 1999 in Bahia Honda State Park in the Lower Florida Keys. Although subject to significant fluctuations, the Bahia Honda population persisted until 2010, when it disappeared, perhaps due to a combination of drought, cold temperatures, and predation by non-native green iguanas. However, additional populations of Miami blues had been discovered in Key West National Wildlife Refuge in 2006, and these are the focus of current surveys and conservation action. (FFWCC 2021a)

No Miami blue butterflies have been documented on the PSL site. The Miami blue's current range does not include the PSL site although suitable habitat does exist (FFWCC 2021a). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

#### *3.7.8.1.6 Fungi*

Florida Perforate Cladonia

Florida perforate cladonia is commonly called the reindeer lichens. It is restricted to the high, well-drained sands of rosemary scrub in Florida. It was listed as endangered because of the significant loss of scrub habitat in Florida. This species is known to occur on approximately 27 sites in Florida; all but two sites are in the south Florida ecosystem. Sixteen of the sites are protected, and others are proposed for acquisition in the future. It is easily recognized in the field by the conspicuous holes or perforations below each dichotomous branch point and its wide, smooth, yellowish gray-green branches. (USFWS 1999)

No Florida perforate cladonia have been documented on the PSL site. The range of Florida perforate cladonia does not include St. Lucie county (USFWS 1999). The continued operation of PSL is not likely to adversely affect Florida perforate cladonia populations due to the lack of suitable habitat and their limited range.

#### *3.7.8.1.7 Plants*

Six plants are listed as either federally endangered or threatened. Johnson's seagrass (*Halophila johnsonii*) and Florida bully (*Sideroxylon reclinatum* subsp. *Austrofloridense)* are listed as threatened. The four-petal pawpaw (*Asimina tetramera*), fragrant prickly apple (Harrisia fragrans), Lakela's mint (*Dicerandra immaculata*), and tiny polygala (*Polygala smalli*) are listed as endangered. (FAC 2020; FFWCC 2018)

Four Petal Pawpaw

Found on the south Atlantic coastal ridge, four petal pawpaw is a deciduous shrub 3-15 feet tall, with one to several arching stems. Its leaves are 2-5 inches long, yellow-green, leathery, alternate, wider above the middle, and have pointed tips. Its flowers are 0.5-1 inches across, nodding on long stalks in the angle between new leaves and the stem, and foul-smelling. Its known range is currently restricted to private land in counties adjacent to St. Lucie County. (FNAI 2000)

The four-petal pawpaw has not been documented on the PSL site. The scrub habitat onsite has the potential to support its cultivation (Foster and Wheeler 2001). However, the species is currently endemic to Martin and Palm Beach counties south of the site (FNAI 2000). The continued operation of PSL will not likely adversely affect the four-petal pawpaw.

Fragrant Prickly Apple

Fragrant prickly apple is a rare, slender, columnar cactus restricted to 11 small disjunct sites in eastern St. Lucie County. Habitat loss and fragmentation remain a serious threat for plants on private lands. On public lands this species is protected from destruction, but it is experiencing a precipitous decline in many areas. They have one to eight, spiny, cane-like, stout, and succulent stems. Stems may be erect, or for longer stems, the plant may recline over neighboring vegetation. The branching can be extensive, and the roots of this cactus are coarse, fibrous, and shallow. They also have initial flower buds that are 1 centimeter long, white, and exceedingly hairy. (USFWS 1999)

No fragrant prickly apple has been documented on the PSL site. Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Johnson's Seagrass

Johnsons seagrass is a submerged sea grass with long, delicate stems embedded in coastal sediments. It has vase-shaped female flowers and fruits at nodes, with three long, curving styles. Johnsons seagrass inhabits tidal deltas inside inlets, sandy shoals, and mouths of canals. It is found in the Indian River Lagoon, often near inlets. It is endemic to 120 miles of southeast Florida coastline from Sebastian Inlet in Brevard County to north Biscayne Bay in Dade County. Because of its small size and lack of sexual reproduction, Johnson's seagrass is especially vulnerable to disturbance. (FNAI 2000)

While this species is known to occur near PSL, it has never been documented on the site. Turbulence and sediment instability decrease the likelihood of finding Johnsons seagrass in the nearshore waters of PSL. Continued operation of PSL will not likely adversely affect Johnsons seagrass populations.

Lakela's Mint

Lakela's mint is a small, fragrant shrub that has a spotless, lavender-rose colored flower. Its range is limited to a very small portion of Florida, including St Lucie County. This species faces a high risk of extinction because so much of its habitat has been destroyed and its populations have become so fragmented. No protected sites exist within its historic range, and the sites at which it occurs are likely to have degraded habitat. (USFWS 1999)

While this species is known to occur in St. Lucie County, it has never been documented on the PSL site. Habitat was observed during a site survey in disturbed dry sandhills and in sand pine scrub (Foster and Wheeler 2001). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Tiny Polygala

Tiny polygala is a species in the milkwort family. Recent surveys have extended its range to southern St. Lucie County. It is a short-lived plant that inhabits the sand pockets of pine rocklands, open sand pine scrub, slash pine, high pine, and well-drained coastal spoil. Within these habitats, it requires high light levels and open sand with little to no organic litter accumulation. The survival and recovery of tiny polygala is threatened by habitat loss from urban development, fire suppression, and exotic plant infestation. (USFWS 1999)

While tiny polygala is known to occur in St. Lucie County, there are no documented occurrences of tiny polygala within the PSL site or the transmission line ROW. Habitat was documented onsite in sandy disturbed areas in the 2001 site survey (Foster and Wheeler 2001). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Florida Bully

The Florida bully is endemic to Florida, found in only 14 counties in the northern and west-central Florida peninsula, including St. Lucie County. The bully prefers sandy upland habitats that experience frequent fires. It can also inhabit powerline rights-of-way, where regular mowing (instead of periodic fires) keeps the competition down. The Florida bully is highly clonal and forms patches of low-growing, thorny shrubs less than 3 feet tall that are interconnected by horizontal underground stems. The young twigs have a dense covering of fine wooly, red-brown hairs and its leaves are glossy green, variably shaped, and have a rounded tip. (FDACS 2018)

While Florida bully is known to occur in St. Lucie County, there are no documented occurrences of it within the PSL site or the transmission line ROW. Habitat is potentially present in sandy areas on site or within mowed areas (FDCAS 2018). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

##### *3.7.8.1.8 Corals*

Six federally threatened coral species are documented with the possibility of occurring in the Atlantic Ocean adjacent to the PSL site: boulder star coral (*Orbicella* franksi), lobed star coral (*Orbicella annularis*), mountainous star coral (*Orbicella faveolate*), pillar coral (*Dendrogyra cylindricus*), rough cactus coral (*Mycetophyllia ferox*), and staghorn coral (*Acropora cervicornis*). (FAC 2020; FFWCC 2018)

It is unknown whether these species are currently located near PSL. Recent benthic surveys conducted near the site stopped at Martin County; however, FPL sited the PSL intake and discharge structures specifically to avoid local reefs and other hard-bottom habitats (FFWCC 2021c; NRC 2003).

#### 3.7.8.2 State Listed Species

Thirty-five state threatened species are listed as either occurring or having the potential to occur within 6 miles of the PSL site. Those species that have a state listing as a response to the federal listing (both state and federally listed) are addressed in Section 3.7.8.1. The ecological requirements for these species are summarized below. Similar to federally listed species, all regulatory requirements associated with protected species will continue to be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to any special status and protected species

##### *3.7.8.2.1 Reptiles*

Two reptiles are listed as state threatened with the possibility of occurring on or within the vicinity of the PSL site. The Florida pine snake (*Pituophis melanoleucus mugitus*) and the gopher tortoise (*Gopherus polyphemus*) are listed as state threatened. (FFWCC 2018)

<u>Florida Pine Snake</u>

The Florida pine snake is a large snake that can grow up to 7.5 feet in length. The Florida pine snake typically has a light brown to ivory background color with large brown or black blotches down the length of the body and a uniformly ashy gray belly with no spots. They dig both hibernacula and summer dens and therefore prefer sandier soils. The Florida pine snake is fossorial, meaning they spend a good portion of their life in burrows, including gopher tortoise burrows. Potential threats include habitat loss due to conversion for agriculture, silviculture, mining, and commercial/residential development. They prefer longleaf pine habitat which has been greatly reduced both in extent and in quality. (USFWS 2019)

The Florida pine snake has been documented in St. Lucie County and the site does possess marginal habitat in scrub areas. No Florida pine snake have been documented on the PSL site. Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

<u>Gopher Tortoise</u>

The gopher tortoise is listed as threatened by the state of Florida. The animal itself and its burrows are protected. The gopher tortoise is a moderate-sized, terrestrial turtle, averaging 9–11 inches in length when fully grown and is identifiable by its stumpy, elephantine hind feet and flattened, shovel-like forelimbs covered in thick scales. The shell of an adult gopher tortoise is generally tan, brown, or gray in coloration. Adult male and female tortoises can be differentiated by the presence or absence of a concavity on their lower shell (plastron); mature males will exhibit this concavity, whereas females will have a flat lower shell. (FFWCC 2021a)

The gopher tortoise is one of five North American tortoise species and is the only tortoise naturally found east of the Mississippi River. Gopher tortoises occur in parts of all 67 Florida counties. They prefer well-drained, sandy soils in longleaf pine habitat, scrub, pine flatwoods, coastal dunes, and dry prairies. Gopher tortoise burrows and sufficient food have been observed onsite. (Foster and Wheeler 2001; FFWCC 2021a) Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

#### *3.7.8.2.2 Birds*

Ten birds are listed as state threatened with the possibility of occurring on or within the vicinity of the PSL site. The American oystercatcher (*Haematopus palliates*), black skimmer (*Rynchops niger*), burrowing owl (*Athene cunicularia*), least tern (*Sternula antillarum*), little blue heron (*Egretta caerulea*), reddish egret (*Egretta rufescens*), roseate spoonbill (*Platalea ajaja*), Florida sandhill crane (*Grus canadensis*) southeastern American kestrel (*Falco sparverius Paulus*), and the tricolored heron (*Egretta tricolor*) are all listed as state threatened. (FFWCC 2018)

American Oystercatcher

The American oystercatcher inhabits beaches, sandbars, spoil islands, shell rakes, salt marsh, and oyster reefs. Oystercatchers range on the coasts of the northeastern United States down to Florida's Gulf Coast. Florida is home to both a resident breeding population and a large wintering population of American oystercatchers. The American oystercatcher is one of a few bird species that feed primarily on mollusks, although they will also eat jellyfish, worms, and insects. Because of their preference for mollusks, oystercatchers inhabit coastal areas that support intertidal shellfish.

Many factors threaten the Florida population of American oystercatchers. Coastal development and shoreline armoring have resulted in widespread habitat loss, leaving few suitable breeding sites. Where breeding occurs, nests are vulnerable to disturbance by beachgoers, boaters, pets, predators, and severe weather events. When breeding adults are disturbed, they will fly from their nest, leaving eggs and chicks vulnerable to the elements and predators. American oystercatchers are largely dependent on marine mollusks, which are particularly sensitive to changes in water quality. Oil spills and pollutants can affect distribution and abundance of mollusks, which subsequently affects prey availability for oystercatchers. (FNAI 2001)

American oystercatchers have been observed nesting along the intake shoreline (NRC 2003). No ground-disturbing activities are currently planned for the shoreline near the intake; however, nesting surveys will be completed prior to any ground disturbing activities. Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Black Skimmer

The black skimmer is a coastal waterbird with a red, black tipped bill and red legs. Their bill has a much longer upper than lower mandible and is compressed like a knife. The top of their head, back, and most of upper sides of wings are black in adults and mottled dingy brown in juveniles. They also have white forehead, cheeks, and underparts are white. The black skimmer inhabits coastal waters, including beaches, bays, estuaries, sandbars, tidal creeks (foraging), and also inland waters of large lakes, phosphate pits, and flooded agricultural fields. They nest primarily on sandy beaches, small coastal islands, and dredge spoil islands. They have also been documented to nest on gravel rooftops. (FNAI 2001)

Black skimmers have been reported as nesting on site along the intake shoreline (Foster and Wheeler 2001). No ground-disturbing activities are currently planned for the shoreline near the intake; however, nesting surveys will be completed prior to any ground disturbing activities. Further, compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Burrowing Owl

The burrowing owl is a small, ground-dwelling owl with long legs, white chin stripe, round head, and stubby tail. The adults are boldly spotted and barred with brown and white. The juveniles are plainer above with less spotting, and buffy below with little or no brown barring. The burrowing own prefers high, sparsely vegetated, sandy ground. Their natural habitats include dry prairie and sandhill.

The current range of burrowing owl includes St. Lucie County; however, in a previous site survey habitat was determined to be not present (Foster and Wheeler 2001). No burrowing owls have been documented on the PSL site; therefore, the continued operation of PSL will not affect this species.

Least Tern

The least tern inhabits areas along the coasts of Florida, including estuaries and bays, as well as areas around rivers in the Great Plains. In Florida, the least tern can be found throughout most coastal areas during the breeding season. Its diet consists primarily of fish, but they will also feed on small invertebrates. (USFWS 2011a)

The least tern faces many threats as the human population increases along the coasts. The main threat to the least tern population is habitat loss attributed to coastal development, which causes damage to least tern habitat because of the building on the coasts, human traffic on the beaches, and recreational activities. Increased numbers of predators due to the larger amounts of available food and trash for scavenging are also a threat to the least tern. Predators can cause destruction to breeding colonies while they are nesting by destroying nests and eating chicks and eggs. Global climate change is also an impending threat to the least tern. Rising sea levels and more frequent and stronger storms also damage and destroy least tern nests and habitat. Spring tides can also cause flooding of least tern nests. (USFWS 2011a)

Least terns are found along the open beaches along the PSL site. They have been found nesting on building rooftops as well as open sand and pebble areas. There have been two incidents, one in 1991 and one in 1998, in which juvenile least terns were washed by stormwater from nests built on the roof of PSL Units 1 and 2 Training Center. The loss of 17 least terns occurred because of the failure of a protective netting system covering the stormwater system. The USFWS was notified of the incident under the requirements of the Migratory Bird Treaty Act (MBTA). The stormwater system has since been modified to prevent such incidents. (Foster and Wheeler 2001)

Little Blue Heron

The little blue heron is a medium-sized heron, with purplish to maroon-brown head and neck, a small white patch on throat and upper neck, and slate-blue body. Its bill is black towards the tip. During the breeding season, exposed areas on the head appear dark gray to cobalt blue. Legs are grayish to green, becoming black in breeding season. The little blue heron feeds in shallow freshwater, brackish, and saltwater habitats. Largest nesting colonies occur in coastal areas, but the little blue heron prefers foraging in freshwater lakes, marshes, swamps, and streams. They nest in a variety of woody vegetation types, including cypress, willow, maple, black mangrove, and cabbage palm. The primary threats to the little blue heron are alteration of natural hydroperiods in wetlands used for foraging and exposure to pesticides and heavy metal contamination. (FNAI 2001)

Little blue herons have been observed on the PSL site (NRC 2003). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Reddish Egret

The reddish egret is a striking, long-legged wader with a neutral gray body and shaggy chestnut plumes on head, neck, and upper breast. In breeding season its bill is distinctly bicolored (pink or flesh-colored at base and black at end) and its legs become turquoise blue. Late in nesting season and in non-breeding adults, the pink in their bill fades becomes dusky overall. Their legs and feet turn black. The reddish egret actively pursues small fish by running erratically, flapping its wings, and generally lurching about. The reddish egret is almost exclusively coastal. They typically nest on coastal mangrove islands, or in Brazilian pepper areas near suitable foraging habitat. (FNAI 2001)

Reddish egrets are known to occur in St. Lucie County and the site does present suitable habitat, however no reddish egrets have been observed on the PSL site (FNAI 2001). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species

Roseate Spoonbill

Roseate spoonbills are known for their bright pink bodies, contrasting white necks, and flat, spoon-like bills. Immature spoonbills are whitish, acquiring the pink coloration as they mature. They primarily nest in mixed-species colonies on coastal mangrove islands or in Brazilian pepper on man-made dredge spoil islands near suitable foraging habitat. Occasionally they will nest in willow heads at freshwater sites. (FNAI 2001)

The roseate spoonbill forages in shallow water of variable salinity, including marine tidal flats and ponds, coastal marshes, mangrove-dominated inlets and pools, and freshwater sloughs and marshes. They nest locally from Tampa Bay on the Gulf coast and Brevard County on the Atlantic coast, south to northern Florida Bay, and at some interior sites. The majority of the breeding population occurs in Florida Bay. The non-breeding range extends north along both coasts and the interior of the peninsula. (FNAI 2001)

Roseate spoonbills have been observed at PSL (NRC 2003). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species

Florida Sandhill Crane

The Florida sandhill crane is a tall, long-necked, long-legged bird with a clump of feathers that droops over the rump. The adult is gray overall, with a whitish chin, cheek, and upper throat, and dull red skin on the crown and lores (lacking in immatures). The immature Florida sandhill crane has pale to tawny feathers on head and neck and a gray body with brownish-red mottling (FNAI 2001).

Florida sandhill cranes inhabit prairies, freshwater marshes, and pasture lands, avoiding forests and deep marshes, preferring transition zones and edges between these and prairies or pasture lands. They tend to frequent agricultural areas like feed lots and crop fields, and also golf courses and other open lawns, especially in winter and early spring. Their nest is a mound of herbaceous plant material in shallow water or on the ground in marshy areas. (FNAI 2001)

Florida sandhill cranes have been observed at PSL. Nesting surveys are completed prior to any ground disturbing activities. Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Southeastern American Kestrel

The southeastern American kestrel is the smallest falcon in United States. The sexes are visually distinctive, the male has blue-gray wings while the female is larger and has more uniformly rufous back and wings. Both sexes have a mustached black-and white facial pattern. Falcons in general have long, pointed wings and long tails, similar to doves. The southeastern American kestrel is found in open pine habitats, woodland edges, prairies, and pastures throughout much of Florida. Their nest sites are tall dead trees or utility poles generally with an unobstructed view of surroundings. Open patches of grass or bare ground are needed in flatwoods settings, since thick palmettos prevent detection of prey. (FNAI 2001)

Southeastern American kestrels have been observed at PSL (NRC 2003). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Tricolored Heron

The tricolored heron is a permanent resident of Florida. It is a medium-sized heron with a slender neck. Its body color appears two-toned with dark slate coloration on head, neck, and body that contrasts with white rump, belly, and undertail. A reddish-brown and white streak extends along the front of the neck. They inhabit coastal environments. During breeding season, adults have white head plumes and rufous to whitish shoulders. Most nesting colonies occur on mangrove islands or in willow thickets in fresh water, but nesting sites include other woody thickets on islands or over standing water. (FNAI 2001)

Tricolored herons have been observed at PSL (NRC 2003). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species

#### *3.7.8.2.3 Plants*

Twenty-three plant species are listed as state threatened or endangered with the possibility of occurring on or within the vicinity of the PSL site. The large flowered rosemary *(Conradina grandifloral*), nodding pinweed (*Lechea cernua*), piedmont jointgrass (*Coelorachis tuberculosa*), and many flowered pink grass (*Calopogon multiflorus),* barbed wire cactus (*acanthocereus pentagonus*), common prickly pear (Opuntia stricta), false buttonweed (*Spermacoce terminalis*), Guiana plum (*Drypetes lateriflora*), inkberry (*Scaevola plumieri*), satinleaf (*Chrysophyllum oliviforme*), and yellow butterwort (*Pinguicula lutea)* are all designated as state threatened. The celestial lily (*Nemastylis floridana*), coastal hoary-pea (*Tephrosia angustissima var. curtissii*), coastal vervain (*Glandularia maritima*), pine pinweed (*Lechea divaricate*), sand dune spurge (Chamaesyce cumulicola), scrub bluestem (*Schizachyrium niveum*), small's flax (*Linum carteri var. smallii),* terrestrial peperomia (*Peperomia humilis*), sea lavender (*Argusia gnaphalodes*), burrowing four o'clock (*Okenia hypogaea*), yellow nickerbean (*Caesalpinia major*) and blunt leaved peperomia (*Peperomia obtusifolia*) are listed as endangered.

Barbed Wire Cactus

The barbed wire cactus inhabits maritime hammocks and beaches and has historically been known to occur in St. Lucie County (Foster and Wheeler 2001). No publicly available information was found on the description and requirements of *A. Pentagonus*. While habitat is present on the PSL site according to the 2001 threatened and endangered species survey, compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Blunt Leaved Peperomia

Peperomia has round, smooth, dark green leaves and short, somewhat brittle stems, seldom growing taller than 12 inches. It is quickly growing and spreads into clumps. Its leaves are ovate, and its flowers are showy and white. (Gilman 1999)

The current range of blunt leaved peperomia is limited to the southernmost potion of the Florida peninsula and does not include St. Lucie County. No blunt leaved peperomia have been observed on site. The continued operation of PSL will not affect blunt leaved peperomia populations.

Burrowing Four O'Clock

The burrowing four o'clock is an annual with deep taproots and stems that spread out over the soil surface. It is often found with sand covering the plant in a thick coat. In Florida, burrowing four o'clock is found in only a few locations along the southeast coast, but is also found on the Mexican Gulf coast. The plant is restricted to the ocean side of coastal dunes, often being the closest plant to the water's edge. (USFWS 1999) The burrowing four o'clock was once documented on the PSL site; however, during the most recent threatened and endangered species survey, beach erosion had eliminated the habitat for this species. (Foster and Wheeler 2001)

Celestial Lily

The celestial lily is a perennial herb from a bulb with a single, tall, slender stem. Its basal leaves are grass like and can grow longer than two feet. Its flowers are more than 1.5 inches across, with six dark blue spreading petals and sepals. Its flowers open around 4 pm and close by dusk.

The celestial lily inhabits wet flatwoods (often in cabbage palm flatwoods variant), prairies, marshes, cabbage palm hammocks edges. Once widespread in eastern Florida, this species now occurs in about 15 managed areas, where it may be locally abundant if its habitat is frequently burned. (FNAI 2001)

Currently, the celestial lily's range does not include St. Lucie County, but does include surrounding counties. No occurrences of celestial lily have been documented on the PSL site (Foster and Wheeler 2001). The continued operation of PSL will not affect this species.

Common Prickly Pear

Also known as the erect prickly pear and the shell mound prickly pear, the common prickly pear is a cactus that grows on shell mounds, coastal hammocks, and dunes. It inhabits the southeast and coastal states of Florida including St. Lucie County. It prefers sandy, well-drained soil. A long-lived plant, the shell mound prickly pear's first flowers appear when the plant is three years old. (FNPS 2012)

It is identified by flat green segments that are not the leaves but the stems, which can measure up to 12 inches. It also has eyes that contain 0-11 spikes. The eyes of a cactus are called areola; areolas are the structures that spikes grow out of and the spikes are actually modified leaves. The areolas can grow roots when separated from their mother plant, which remain viable for months after detachment. (FNPS 2012)

The bright yellow flowers bloom from February to July and are insect pollinated. Although it is native to the state of Florida, it is invasive in other parts of the world, particularly in Australia.

The Argentine cactus moth, once used as a biological control, is invasive in the United States, and threatens the common prickly pear. (FNPS 2012)

Habitat for the common prickly pear has been documented on the PSL site (Foster and Wheeler 2001). While habitat is present, this species itself has not been documented on the PSL site and compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Coastal Hoary-Pea

The coastal hoary pea is a perennial herb with straggling or arching stems. Its leaves are compound with 11–17 opposite leaflets. Its flowers are tiny, between 0.25–0.4 inches long, white to dark pink, typically pea shaped with a large erect banner petal, with a hairless style (visible with magnification). The coastal hoary pea inhabits scrub and sandy areas. There are few populations of protected coastal hoary pea. (FNAI 2001)

Currently, the coastal hoary pea's range does not include St. Lucie County. No occurrences of coastal hoary pea have been documented on the PSL site (Foster and Wheeler 2001). The continued operation of PSL will not affect this species.

Coastal Vervain

Also known as beach verbena, coastal mock vervain is a short-lived perennial wildflower endemic primarily to Florida's east coast. It blooms year-round, although the most prolific flowering occurs in spring and summer. Coastal mock vervain has a deep pink to lavender flower which is five-lobed and born in flat-topped terminal clusters. Its leaves are dark green, glossy, and ovate to rhombic with deeply toothed or lobed margins that are oppositely arranged. The stems have tiny hairs and are angled and generally prostrate. They will drop roots as they spread. Seeds are born in an inconspicuous nutlet. Coastal vervain inhabits dry, well-drained calcareous, loamy, clay or sandy soils. (FWF 2021)

Coastal vervain has been found on site was found on site in a 1978 survey but was not observed in the 2001 survey (Foster and Wheeler 2001). It is documented in St. Lucie County in its current range (FWF 2021). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

False Buttonweed

False buttonweed inhabits pinelands and coastal areas. It is endemic to Florida including St. Lucie County. It is distinguished by its longer corolla tube and inflorescence usually restricted to the terminal node. (Atlas of Florida Plants 2021)

False buttonweed has not been observed on site, however, habitat does exist within PSL (Foster and Wheeler 2001). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Guiana Plum

Guiana plum is a shrub that can grow up to 10 meters tall. It is dioecious so there are distinct male and female reproductive organs. Its leaves are leathery, lanceolate to ovate, are abruptly pointed, and have entire margins (Coile and Garland 2003). Its current range does not include St. Lucie County and it has not been documented on the PSL site (Foster and Wheeler 2001).

Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species

Inkberry

Inkberry is a perennial herb or shrub that can grow up to 1.5 meters tall. Its leaves are alternate and glossy with a winged stalk. It has got white or pinkish flowers with black berries. It inhabits beaches and coastal strand habitats, including those in St. Lucie County. (Coile and Garland 2003)

The inkberry has been documented on the PSL site (Foster and Wheeler 2001). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Large-Flowered Rosemary

A member of the mint family, large-flowered rosemary is a perennial evergreen shrub endemic to Florida. It can grow up to 3 feet in height and has grayish bark along the woody portions of the stems. It has needle like leaves that, similar to its mint family members, is aromatic. Upper parts of the leaves are dark green, shiny, and marked with small black dots. The lower leaf surfaces may appear white or gray in color due to a dense growth of fine hairs along the stem and leaves. (SMS 2011)

Large-flowered rosemary generally inhabits coastal back dunes, coastal scrub, maritime hammock, sand pine scrub, and sandhill areas from Volusia through Broward counties. It flowers from March to June and has white to pale lavender-pink flowers that have a band of purple dots on the white throat (SMS 2011).

The large-flowered rosemary has been documented within the transmission line ROW on site (Foster and Wheeler 2001). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Many-Flowered Grass-Pink

The many-flowered grass pink is an herb species with 1–2 basal, grass-like leaves 4 inches long and less than 0.2 inch wide. Its flower stalk leafless, to 16 inches tall, with up to 15 dark pink flowers crowded at the top, most open at the same time. Its petals are spreading, widest above the middle, with a narrow base. It inhabits dry to moist flatwoods with longleaf pine, wiregrass, saw palmetto. (FNAI 2019)

The many-flowered grass pink is located throughout most of Florida including St. Lucie County. While habitat has been previously documented on the PSL site, there have been no records of many flowered grass pink occurring on site (Foster and Wheeler 2001). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Nodding Pinweed

The nodding pinweed prefers habitat in the scrub and scrubby flatwoods communities. The nodding pinweed prefers fire and soil disturbance. It is endemic to Florida and can only been found throughout the south and central counties. The nodding pinweed has been and is currently under a great threat due to its rapidly declining habitat caused by agricultural, residential, and commercial development. (USFWS 1999)

No nodding pinweed occurrences have been observed on site. The 2001 survey determined that habitat for the nodding pinweed is not present (Foster and Wheeler 2001). The continued operation of PSL will not affect the nodding pinweed.

Piedmont Jointgrass

Piedmont jointgrass is an uncommon species, endemic to the southeastern United States. It grows in moist to wet areas such as bogs and pine woods, especially flatwoods and savannahs. It is locally abundant with 35 occurrences in 9 counties within Florida, with habitat still available. It is threatened by logging and plantation establishment practices. (Allen 2021)

No Piedmont jointgrass occurrences have been observed on the PSL site. The 2001 survey determined that habitat for Piedmont jointgrass is not present (Foster and Wheeler 2001). The continued operation of PSL will not affect Piedmont jointgrass.

Pine Pinweed

The pine pinweed is a perennial herb with slender, erect flowering stems rising from a dense mat of spreading, older stems. Its leaves are less than 0.4 inches long, alternate, narrowly oval with pointed tips, disappearing by flowering time. Its flowers in tight clusters at ends of short branches, with three tiny purple or green petals, dropping quickly after opening, and five sepals, outer sepals shorter than inner. Fruit a tiny, hard capsule, longer than the sepals, does not split into segments when mature. Entire plant covered with spreading, gray hairs. (FNAI 2001)

The pine pinweed's range does not currently include St. Lucie County. It does, however, include several surrounding counties (FNAI 2001). There have been no documented occurrences of pine pinweed at PSL. The continues operation of PSL will not affect pine pinweed populations.

Sand-dune Spurge

Not much has been detailed about the habits and biological tendencies of sand dune spurge. No sand-dune spurge occurrences have been observed on the PSL site. The 2001 survey determined that habitat for the sand dune surge is not present (Foster and Wheeler 2001). The continued operation of PSL will not affect the sand dune spurge.

Satinleaf

The satinleaf is a medium-sized tree noted for its unusually beautiful foliage. The evergreen, 4-inch leaves are a glossy, dark green above and a glowing, bright copper color beneath, providing a beautiful, two-toned effect when breezes cause the leaves to flutter. Leaves in some respects resemble those of the brown-back southern magnolias. The trunks are rather showy because they are covered with thin, light reddish-brown, scaly bark. (Gilman et al. 1993)

The satinleaf is found on hammocks, thickets, and pinelands. Habitat was determined to be present during the 2001 threatened and endangered species survey. Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Scrub Bluestem

The scrub bluestem is a small, tufted grass with leaves approximately 2.5-4 inches long. It is hairless except for a few hairs at base, very narrow, flat, held horizontal to the stem. The flowering stalk is erect and loosely branched at the top with only one inflorescence at the tip of each branch. It inhabits white sand patches in rosemary scrub and can also inhabit sand pine scrub and oak scrub. (FNAI 2001)

The scrub bluestem is reported in nine counties, of which St. Lucie is one. No scrub bluestem occurrences have been documented on the PSL site; however, habitat is present in sand pine scrub (FNAI 2021). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Sea Lavender

Sea lavender is a native plant found naturally along the Atlantic coast of central and south Florida. The area includes Brevard County to Miami-Dade, Monroe, and Collier counties and into the Florida Keys. Sea lavender is on Florida's endangered species list due to development of the coastal areas for houses, businesses, and recreation. It is an evergreen, mounding-to-sprawling shrub that can grow to be 10 feet tall, although it typically grows shorter. It sometimes forms colonies more than 20 feet wide. Plants are usually as broad, or broader, than they are tall. The lower branches may form adventitious roots when covered by sand. They trap sand and stabilize dunes, thereby facilitating the establishment of other plants. The sprawling habit of some older plants often exposes lower branches and soil within the mound. (Brown et al. 2018)

New stems are covered with soft, light gray hairs. Its lower stems are thicker, woody, and brown or blackish in color. Trunks may grow as thick as 8 inches. Leaves are alternate and densely arranged in tufts at the ends of stems. Leaf blades are simple, entire, thick, and stalkless. (Brown et al. 2018)

The sea lavender inhabits beach dunes, coastal strand, and coastal rock barren habitats. Habitat is present for the sea lavender on the PSL site (Foster and Wheeler 2001). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Small's Flax

The small's flax is an annual herb that is between 4 to 24 inches tall with smooth, narrowly wing-angled stems. Its leaves are between 0.4 to 1.2 inches long, very narrow, alternate, often with a pair of small red glands at the base. The upper leaves are toothed. Its flowers have five yellow-orange petals and five gland-toothed sepals. Small's flax inhabits pine rock lands. It is endemic to southern peninsular Florida. (FNAI 2000)

No occurrences of small's flax have been documented on the PSL site. In addition, its current range does not include St. Lucie County and no habitat is present on site. The continued operation of PSL will not affect this species.

Terrestrial Peperomia

Terrestrial peperomia is a perennial herb between 4 and 10 inches tall, erect, sometimes forming dense colonies on the ground or rarely on tree trunks and branches. Its stems are hairy, sometimes branched, with clear sap. The leaves are between 0.5 to 2.5 inches long, usually wider above the middle, tip pointed or blunt, base wedge-shaped, with 3 veins branching from the base, hairy, succulent, opposite or whorled. Terrestrial peperomia inhabits shell mounds and limestone outcrops in mesic hammocks, coastal berms, cypress swamps. Rarely on tree trunks, branches, or rotting logs. (FNAI 2001)

Terrestrial peperomia is documented in St. Lucie County; however, there have been no documented occurrences at PSL (Foster and Wheeler 2001). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species

Yellow Butterwort

Yellow butterwort is a terrestrial herb with yellowish-green leaves that curl upward at the tips. It inhabits sandy-peaty soils, pine flatwoods, seepage bogs, ditches, and roadsides. Its current range does not include St. Lucie County, but does include all three surrounding counties. (Coile and Garland 2003)

Habitat is present on the PSL site; however, no yellow butterwort have been documented at PSL (Foster and Wheeler 2001). Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species

Yellow Nickerbean

The yellow nickerbean is a vine that can grow up to 5 meters long and is covered in prickles. It has 3-5 pinnately compound leaves with 4-7 pairs of leaflets. Its stipules are inconspicuous to absent and its flowers have orange-yellow petals. The yellow nickerbean inhabits coastal sands and hammocks (Coile and Garland 2003). The current range does not include St. Lucie County, although suitable habitat is documented on the PSL site. No yellow nickerbean have been noted as occurring at PSL (Foster and Wheeler 2001).

Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species

#### 3.7.8.3 Species Protected Under the Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) was enacted on October 21, 1972. All marine mammals are protected under the MMPA. The MMPA prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the United States.

Species of marine mammals that may inhabit waterbodies near PSL as either residents or migrants include west Indian manatee, harbor seal, bottlenose dolphins, North Atlantic right whale, humpback whale, finback whale, sperm whale, and sei whale. (NMFS 2009b)

#### 3.7.8.4 Species Protected Under the Bald and Golden Eagle Protection Act

Bald eagles are protected under the Bald and Golden Eagle Protection Act (BGEPA). The BGEPA was originally enacted in 1940 (16 U.S.C. 668-668c) and it prohibits anyone without a permit issued by the Secretary of the Interior from "taking" bald eagles, including their parts, nests, eggs, or feathers. The BGEPA provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle… [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The BGEPA defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." (USFWS 2021b)

"Disturb" means: "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle; 2) a decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior; or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." In addition to immediate impacts, this definition also covers impacts resulting from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death, or nest abandonment (USFWS 2021b).

While no documented bald eagles nests have occurred on the PSL site, bald eagles have nested in the region and suitable nesting habitat is present within a 6-mile radius of PSL. Future bald eagle nests located on the PSL site would be subject to all protections under the BGEPA.

#### 3.7.8.5 Species Protected Under the Migratory Bird Treaty Act

In addition to species protected under federal and state endangered species acts, there are numerous bird species protected under the MBTA that may visit PSL. The MBTA makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter or offer for sale, or purchase or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to federal regulations. (USFWS 2020a)

The USFWS's IPaC tool identified 43 migratory birds within St. Lucie County (USFWS 2020b). Several migratory birds that are species of concern have the potential to use the PSL site. Birds of conservation concern in particular conservation regions, specifically, the peninsular Florida conservation region, in the continental United States that may occur in St. Lucie County include the following species: American kestrel (*Falco sparverius*), black-whiskered vireo (*Vireo altiloquus*), clapper rail (*Rallus crepitans*), common ground-dove (*Columbina passerina exigua*), dunlin (*Calidris alpina arcticola*), least tern (*Sterna antillarum*), ruddy turnstone (*Arenaria interpres morinella*), short-tailed hawk (*Buteo brachyurus*), and yellow warbler (*Dendroica petechia gundlachi*). (USFWS 2020a)

The following species are considered birds of conservation concern throughout their range in the continental United States and Alaska that may occur in St. Lucie County: American oystercatcher (*Haematopus palliates*), Bachman's sparrow (*Aimophila aestivalis*), black skimmer (*Rynchops niger*), king rail (*Rallus elegans*), lesser yellowlegs (*Tringa flavipes*), limpkin (*Aramus guarauna*), magnificent frigatebird (*Fregata magnificens*), prairie warbler (*Dendroica discolor*), prothonotary warbler (*Protonotaria citrea*), red-headed woodpecker (*Melanerpes erythrocephalus*), reddish egret (*Egretta rufescens*), seaside sparrow (*Ammodramus maritimus*), semipalmated sandpiper (*Calidris pusilla*), short-billed dowitcher (*Limnodromus griseus*), swallow-tailed kite (*Elanoides forficatus*), whimbrel (*Numenius phaeopus*), willet (*Tringa semipalmata*), Wilson's plover (*Charadrius wilsonia*). (USFWS 2020a)

The following are species that are not necessarily birds of conservation concern, but warrant attention because of the BGEPA or are susceptible to offshore development or activities that may occur in St. Lucie County: bald eagle (*Haliaeetus leucocephalus*), black scoter (*Melanitta nigra*), black-legged kittiwake (*Rissa tridactyla*), Bonaparte's gull (*Chroicocephalus Philadelphia*), brown pelican (*Pelecanus occidentalis*), common loon (*gavia immer*), common tern (*Sterna hirundo*), Cory's shearwater (*Calonectris diomedea*), double-crested cormorant (*Phalacrocorax auratus*), great black-backed gull (*Larus marinus*), great shearwater (*Puffnus gravis*), herring gull (*Larus argentatus*), northern gannet (*Morus bassanus*), parasitic jaeger (*Stercorarius parasiticus*), razorbill (*Alca torda*), red-breasted merganser (*Mergus serrator*), ring-billed gull (*Larus delawarensis*), royal tern (*Thalasseus maximus*), and the surf scoter (*Melanitta perspicillata*). (USFWS 2020a)

Currently, FPL maintains a migratory bird special purpose utility permit which involves the tracking and uploading of data for handling of any injured or deceased bird found within the PSL site. Injured birds are transported to rehab facilities when feasible. A yearly report is submitted to USFWS to maintain compliance with federal regulations.

#### 3.7.8.6 Essential Fish Habitat

A review of the NOAA nationwide essential fish habitat (EFH) was conducted to determine the location of EFH within 6 miles of PSL. NOAA only provides EFH for federally managed fish and invertebrates. Twenty-two species with EFH were located within the 6-mile radius (Table 3.7-6; Figure 3.7-4). (NOAA 2018)

In addition, the NOAA Office of Sustainable Fisheries manages highly migratory species (HMS). HMS are those species who travel long distances, often across international boundaries. These pelagic species live in the water of the open ocean, although they may spend part of their life cycle in nearshore waters. Highly migratory species managed by NOAA include tunas, some sharks, swordfish, billfish, and other highly sought-after fish such as Pacific mahi mahi. Domestically, HMS are managed through the Magnuson-Stevens Act. Internationally, HMS are managed through the International Commission for the Conservation of Atlantic Tunas. EFH has been designated and described for over 40 Atlantic HMS. Of these designated species, 16 are denoted as occurring within a 6-mile radius of PSL (NOAA 2018) (Table 3.7-7).

**Table 3.7-1 Phytoplankton and Zooplankton Taxa Near the PSL Site[(a)] (Sheet 1 of 2)**

| Phytoplankton (Scientific Name) | Zooplankton (Scientific Name) |
|---|---|
| ***Indian River Lagoon*** | |
| *Bacillaria paxillifera* | *Acartia tonsa* |
| *Campylosira cymbelliformis* | *Balanus eburneus* |
| *Cerataulinapelagica* | *Corycaeus soo.* |
| *Cerataulina pelagica* | *Cyclaspsis spp.* |
| *Chaetoceros simplex* | *Dendraster excentricus* |
| *Coscinodiscus spp.* | *Euterpina acutifrons* |
| *Dactyliosolen fragilissimus* | *Labidocera spp.* |
| *Nitzschia closterium* | *Metis holothuriae* |
| *Paralia sulcata* | *Mnemiopsis leidyi* |
| *Prorocentrum micans* | *Mnemiopsis mccradyi* |
| *Protoperidinium pellucidium* | *Oithona nana* |
| *Rhizosolenia setigera* | *Paracalamis spp* |
| *Skeletonema costatum* | *Rhithropanopeus harrisii* |
| *Skeletonema menzellii* | *Scottolana canadensis* |
| *Thalassionema nitzschioides* | *Temora spp.* |
| *Thalassiosira chain* | *Tortanus setacaudatus* |
| *Trigonium spp.* | *Undinula spp.* |
| ***Atlantic Ocean*** | |
| *Actinoptychus senarius* | *Acartia bemudensis* |
| *Asterionella glacialis* | *Acartia spinata* |
| *Bacillaria paxillifer* | *Calanopia americana* |
| *Bacteriastrum delicatulum* | *Candacia curta* |
| *Bellerochea horologicalis* | *Centropages furcatus* |
| *Biddulphia alternans* | *Centropages violaceus* |
| *Biddulphia tuomeyi* | *Copilia mirabilis* |
| *C. lorenxianu* | *Euaugaptilus hecticus* |
| *Cemtium lunula* | *Eucalanus attenatus* |
| *Cerataulina pelagica* | *Eucalanus monachus* |
| *Ceratium carrieme* | *Eucalanux mucronatus* |

**Table 3.7-1 Phytoplankton and Zooplankton Taxa Near the PSL Site[(a)] (Sheet 2 of 2)**

| Phytoplankton (Scientific Name) | Zooplankton (Scientific Name) |
|---|---|
| *Ceratium extensum* | *Euchaeta marina* |
| *Ceratium hircus* | *Euterpina acutifrons* |
| *Chaetoceros affinis* | *Farranula rostrata* |
| *Chaetoceros coarctatus* | *Haloptilus longicornis* |
| *Chaetoceros decipiens* | *Heterorhabdus spinifrons* |
| *Nitxschia longissima* | *Labidocera acutifrons* |
| *Nitzschia pungens var. atlanticum* | *Lucicutia flavicornis* |
| *Odontella chinensis* | *Luhbockia squillimana* |
| *Palmeriarza hardmanianus* | *Oithona plumifera* |
| *Paralia sulcata* | *Oithoxa setigera* |
| *Plagiogramrna vanheurckii* | *Oncaea mediterranea* |
| *Pyrocystis fusiformis* | *Paracalanus aculeatus* |
| *Pymcystis noctiluca* | *Pleuromamma gracilis* |
| *Rhabdonama adriaticum* | *Pseudodiaptomus coronatus* |
| *Rhixosolenia styliformis* | *Sagitta inflata* |
| *Rhizosolenia alata* | *Temora stylifera* |
| *Skeletonema costatum* | *Temora turbinata* |
| *Thalassionema nitzschioides* | *Undinula vulgaris* |

(FPL 1973; Badylak and Philips 2004; Ralston et al. 2007; Tester and Steidinger 1979; Walker et al. 1979)

a. List is compiled of common species reported and is not meant to be all encompassing.

**Table 3.7-2 Common Marine and Brackish Species in the Vicinity of PSL (Sheet 1 of 2)**

| Common Name | Scientific Name |
|---|---|
| ***Fish*** | |
| Atlantic sharpnose shark | *Phizoprionodon terraenovae* |
| Atlantic spadefish | *Chaetodipterus faber* |
| Atlantic stingray | *Dasyatis sabina* |
| Atlantic thread herring | *Opisthonema oglinum* |
| Bay anchovy | *Anchoa mitchilli* |
| Black drum | *Pogonias cromis* |
| Bluegill | *Lepomis macrochirus* |
| Bonnethead | *Sphyrna tiburo* |
| Brook silverside | *Labidesthes sicculus* |
| Common snook | *Centropomus undecimalis* |
| Cuban anchovy | *Anchoa cubana* |
| Dusky anchovy | *Anchoa lyolepis* |
| Eastern mosquito fish | *Gambusia holbrooki* |
| Eucinostomus | *Eucinostomus spp.* |
| Hardhead catfish | *Ariopsis felis* |
| Irish Pompano | *Diapterus auratus* |
| Ladyfish | *Elops saurus* |
| Lookdown | *Selene vomer* |
| Longnose anchovy | *Anchoa nasuta* |
| Menhadens | *Brevoortia spp.* |
| Menidia silversides | *Menidia spp.* |
| Nurse shark | *Ginghlymostoma cirratum* |
| Pigfish | *Orthopristis chrysoptera* |
| Pinfish | *Lagodon rhomboides* |
| Scaled sardine | *Harengula jaguana* |
| Sea bream | *Archosargus rhomboidalis* |
| Sheepshad | *Archosargus probatocephalus* |
| Silver Jenny | *Eucinostomus gula* |
| Striped mullet | *Mugil cephalus* |
| Sunfishes | *Lepomis spp.* |
| Tidewater mojarra | *Eucinostomus harengulus* |
| White mullet | *Mugil curema* |
| Yellowfin mojarra | *Gerres cinereus* |

**Table 3.7-2 Common Marine and Brackish Species in the Vicinity of PSL (Sheet 2 of 2)**

| Common Name | Scientific Name |
|---|---|
| ***Marine Mammals*** | |
| Bottlenose dolphin | *Tursiops truncatus* |
| Common dolphin | *Delphinus delphis* |
| Finback whale | *Balaenoptera physalus* |
| Humpback whale | *Megaptera novaeangliae* |
| North Atlantic right whale | *Eubalaena glacialis* |
| Sei whale | *Balaenoptera borealis* |
| Sperm whale | *Physeter macrocephalus* |
| West Indian manatee | *Trichechus manatus latirostris* |
| ***Marine Reptiles*** | |
| Green sea turtle | *Chelonia mydas* |
| Kemp's ridley sea turtle | *Lepidochelys kempii* |
| Leatherback sea turtle | *Dermochelys coriacea* |
| Loggerhead sea turtle | *Caretta caretta* |
| Hawksbill sea turtle | *Eretmochelys imbricata* |
| ***Shellfish*** | |
| Angelwing clam | *Cyrtopleura costata* |
| Atlantic mud crab | *Panopeus herbstii* |
| Atlantic papermussel | *Amygdalum papyrium* |
| Blue crab | *Callinectes sapidus* |
| Brown shrimp | *Penaeus aztecus* |
| Dwarf surf clam | *Mulinia lateralis* |
| Hard-shell clam | *Venus mercenaria* |
| Horseshoe crab | *Limulus polyphemus* |
| Lesser blue crab | *Callinectes similis* |
| Mottled shore crab | *Pachygrapsus transversus* |
| Ornate blue crab | *Callinectes ornatus* |
| Oyster | *Ostrea virginica* |
| Pink shrimp | *Penaeus duorarum* |
| Spiny lobster | *Panulirus argus* |
| White shrimp | *Penaeus setiferus* |

(FPL 1973; iNaturalist 2021)

**Table 3.7-3 Terrestrial Species Likely to be Observed in St. Lucie County (Sheet 1 of 4)**

| Common Name | Scientific Name |
|---|---|
| ***Amphibians*** | |
| American bullfrog | *Lithobates catesbeianus* |
| Cane toad | *Rhinella marina* |
| Eastern narrow-mouthed toad | *Gastrophryne carolinensis* |
| Eastern newt | *Notophthalmus viridescens* |
| Eastern spadefoot | *Scaphiopus holbrookii* |
| Gopher frog | *Lithobates capito* |
| Greater siren | *Siren lacertina* |
| Green frog | *Rana clamitans* |
| Greenhouse frog | *Eleutherodactylus planirostris* |
| Little grass frog | *Pseudacris ocularis* |
| Oak toad | *Anaxyrus quercicus* |
| Pig frog | *Rana grylio* |
| Southern chorus frog | *Pseudacris nigrita* |
| Southern cricket frog | *Acris gryllus* |
| Southern dwarf siren | *Pseudobranchus axanthus* |
| Southern leopard frog | *Lithobates sphenocephalus* |
| Southern toad | *Anaxyrus terrestris* |
| Two-toes amphiuma | *Amphiuma means* |
| ***Birds*** | |
| American coot | *Fulica americana* |
| American kestrel | *Falco sparverius* |
| Black vulture | *Coragyps atratus* |
| Blue jay | *Cyanocitta cristata* |
| Brown headed cowbird | *Molothrus ater* |
| Brown pelican | *Pelecanus occidentalis* |
| Cardinal | *Cardinalis cardinalis* |
| Catbird | *Dumetella carolinensis* |
| Cattle egret | *Bubulcus ibis* |
| Cedar waxwing | *Bombycilla cedrorum* |
| Common grackle | *Quiscalus quiscula* |
| Common loon | *Gavia immer* |
| Common tern | *Sterna hirundo* |
| Eastern meadowlark | *Sturnella magna* |
| Eastern phoebe | *Sayornis phoebe* |
| European starling | *Sturnus vulgaris* |

**Table 3.7-3 Terrestrial Species Likely to be Observed in St. Lucie County (Sheet 2 of 4)**

| Common Name | Scientific Name |
|---|---|
| Great blue heron | *Ardea herodias* |
| Great egret | *Ardea alba* |
| Green heron | *Butorides virescens* |
| Great horned owl | *Bubo virginianus* |
| Horned grebe | *Podiceps auritus* |
| Killdeer | *Charadrius vociferus* |
| Laughing gull | *Leucophaeus atricilla* |
| Little blue heron | *Egretta caerulea* |
| Loggerhead shrike | *Lanius ludovicianus* |
| Mottled duck | *Anas fulvigula* |
| Northern cardinal | *Cardinalis cardinalis* |
| Northern harrier | *Circus cyaneus* |
| Osprey | *Pandion haliaetus* |
| Palm warbler | *Setophaga palmarum* |
| Red-winged blackbird | *Agelaius phoeniceus* |
| Robin | *Turdus migratorius* |
| Royal tern | *Thalasseus maximus* |
| Sandhill crane | *Grus canadensis* |
| Snowy egret | *Egretta thula* |
| Spotted sandpiper | *Ambystoma maculatum* |
| Tree swallow | *Tachycineta bicolor* |
| Turkey vulture | *Cathartes aura* |
| Warbler | *Dendroica spp.* |
| White ibis | *Eudocimus albus* |
| White pelican | *Pelecanus erythrorhynchos* |
| Yellow-bellied sap sucker | *Sphyrapicus varius* |
| ***Invertebrates*** | |
| Atlantic ghost crab | *Ocypode quadrata* |
| Big headed ants | *Pheidole megacephala* |
| Blue land crab | *Cardisoma guanhumi* |
| Common buckeye | *Junonia coenia* |
| Eastern lubber grasshopper | *Romalea guttata* |
| Little blue dragonlet | *Erythrodiplax minuscula* |
| Monarch | *Danaus plexippus* |
| Ox beetle | *Strategus aloeus* |

**Table 3.7-3 Terrestrial Species Likely to be Observed in St. Lucie County (Sheet 3 of 4)**

| Common Name | Scientific Name |
|---|---|
| Polyphemus moth | *Antheraea polyphemus* |
| Southern emerald | *Synchlora frondaria* |
| Western honeybee | *Apis mellifera* |
| ***Mammals*** | |
| Beach mouse | *Peromyscus polionotus* |
| Black rat | *Rattus rattus* |
| Bobcat | *Lynx rufus* |
| Eastern cottontail | *Sylvilagus flordanus* |
| Eastern grey squirrel | *Sciurus carolinensis* |
| Eastern mole | *Scalopus aquaticus* |
| Feral hog | *Sus scrofa* |
| Fox squirrel | *Sciurus niger* |
| Marsh rabbit | *Sylvilagus palustris* |
| Nine-banded armadillo | *Dasypus novemcinctus* |
| Opossum | *Didelphis virginiana* |
| Red fox | *Vulpes vulpes* |
| Raccoon | *Procyon lotor* |
| White tailed deer | *Odocoileus virgininanus* |
| ***Reptiles*** | |
| American alligator | *Alligator mississippiensis* |
| Banded watersnake | *Nerodia fasciata* |
| Brahminy blindsnake | *Indotyphlops braminus* |
| Brown anole | *Anolis sagrei* |
| Brown basilisk | *Basiliscus vittatus* |
| Brown watersnake | *Nerodia taxispilota* |
| Chicken turtle | *Deirochelys reticularia* |
| Coachwhip | *Masticophis flagellum* |
| Common garter snake | *Thamnophis sirtalis* |
| Common slider | *Trachemys scripta* |
| Corn snake | *Pantherophis guttatus* |
| Crested anole | *Anolis cristatellus* |
| Eastern coral snake | *Micrurus fulvius* |
| Eastern diamondback | *Crotalus adamanteus* |
| Eastern glass lizard | *Ophisaurus ventralis* |
| Eastern ratsnake | *Pantherophis alleghaniensis* |
| Eastern ribbon snake | *Thamnophis sauritus* |

**Table 3.7-3 Terrestrial Species Likely to be Observed in St. Lucie County (Sheet 4 of 4)**

| Common Name | Scientific Name |
|---|---|
| Florida green watersnake | *Nerodia cyclopion* |
| Florida red-bellied cooter | *Pseudemys nelsoni* |
| Florida softshell turtle | *Apalone ferox* |
| Green anole | *Anolis carolinensis* |
| Green iguana | *Iguana iguana* |
| Island glass lizard | *Ophisaurus compressus* |
| North American racer | *Coluber constrictor* |
| Northern curly tailed lizard | *Leiocephalus carinatus* |
| Peninsular cooter | *Pseudemys peninsularis* |
| Peter's rock agama | *Agama picticauda* |
| Pine snake | *Pituophis melanoleucus* |
| Pine woods littersnake | *Rhadinaea flavilata* |
| Ring-necked snake | *Diadophis punctatus* |
| Rough greensnake | *Opheodrys aestivus* |
| Scarletsnake | *Cemophora coccinea* |
| Sixed lined race runner | *Aspidoscelis sexlineata* |
| Southeastern five lined skink | *Plestiodon inexpectatus* |
| Striped mud turtle | *Kinosternon baurii* |
| Striped swampsnake | *Regina alleni* |
| Tropical house gecko | *Hemidactylus mabouia* |

(Foster and Wheeler 2001; FPL 1973; iNaturalist 2021)

**Table 3.7-4 Invasive Species Identified within a 6-Mile Radius of the PSL Site (Sheet 1 of 4)**

| Common Name | Scientific Name | Classification | Regulated |
|---|---|---|---|
| ***Terrestrial Plants*** | | | |
| Air-potato | *Dioscorea bulbifera* | Category I; Noxious | Yes |
| Arrowhead vine | *Syngonium podophyllum* | Category I | No |
| Australian pine | *Casuarina equisetifolia* | Category I; Noxious; Class I prohibited | Yes |
| Balsampear | *Momordica charantia* | Category II | No |
| Beach Naupaka | *Scaevola taccada var. sericea* | Category I; Noxious | Yes |
| Bishopwood | *Bischofia javanica* | Category I | No |
| Bottlebrush | *Melaleuca viminalis* | Category II | No |
| Bowstring hemp | *Dracaena hyacinthoides* | Category II | No |
| Brazillian peppertree | *Schinus terebinthifolius* | Category I; Noxious; Class I prohibited | Yes |
| Ceaser's weed | *Urena lobata* | Category I | No |
| Cat's claw vine | *Dolichandra unguis-cat* | Category I; Noxious | Yes |
| Carrotwood | *Cupaniopsis anacardioides* | Category I; Noxious | Yes |
| Chinaberry | *Melia azedarach* | Category II | No |
| Chinese tallowtree | *Triadica sebifera* | Category I | No |
| Chinese wisteria | *Wisteria sinensis* | Category II | No |
| Cogongrass | *Imperata cylindrica* | Category I; Noxious; Federal noxious | Yes |
| Coral ardisia | *Ardisia crenata* | Category I; Noxious | Yes |
| Day jessamine | *Cestrum diurnum* | Category II | No |
| Durban crow-foot grass | *Dactyloctenium aegyptium* | Category II | No |
| Earleaf acacia | *Acacia auriculiformis* | Category I | No |
| Gold coast jasmine | *Jasminum dichotomum* | Category I | No |
| Guava | *Psidium guajava* | Category I | No |
| Guineagrass | *Urochloa maxima* | Category II | No |
| Inchplant | *Callisia fragrans* | Category II | No |
| Java plum | *Syzygium cumini* | Category I | No |
| Lantana | *Lantana strigocamara* | Category I | No |
| Latherleaf | *Colubrina asiatica* | Category I; Noxious | Yes |
| Laurel fig | *Ficus microcarpa* | Category I | No |
| Lead tree | *Leucaena leucocephala* | Category II; Noxious | Yes |

**Table 3.7-4 Invasive Species Identified within a 6-Mile Radius of the PSL Site (Sheet 2 of 4)**

| Common Name | Scientific Name | Classification | Regulated |
|---|---|---|---|
| Melaleuca | *Melaleuca quinquenervia* | Category I; Noxious; Federal noxious; Class I prohibited | Yes |
| Natalgrass | *Melinis repens; Melinis repens* | Category I | No |
| Old world climbing fern | *Lygodium microphyllum* | Category I; Noxious | Yes |
| Peruvian primrose willow | *Ludwigia peruviana* | Category I | No |
| Puncture vine | *Tribulus cistoides* | Category II | No |
| Queen palm | *Syagrus romanzoffiana* | Category II | No |
| River sheoak | *Casuarina cunninghamiana* | Category II; Noxious | Yes |
| Rosary pea | *Abrus precatorius* | Category I; Noxious | Yes |
| Schefflera | *Schefflera actinophylla* | Category I | No |
| Sea hibiscus | *Talipariti tiliaceum* | Category II | No |
| Seaside mahoe | *Thespesia populnea* | Category I | No |
| Senegal date palm | *Phoenix reclinata* | Category II | No |
| Shoebutton ardisia | *Ardisia elliptica* | Category I; Noxious | Yes |
| Shrubby false buttonweed | *Spermacoce verticillata* | Category II | No |
| Simpleleaf Chastetree | *Vitex trifolia* | Category II | No |
| Sprengers asparagus-fern | *Asparagus aethiopicus* | Category I | No |
| Strawberry guava | *Psidium cattleianum* | Category I | No |
| Surinam cherry | *Eugenia uniflora* | Category I | No |
| Sword fern | *Nephrolepis cordifolia* | Category I | No |
| Twinleaf nightshade | *Solanum diphyllum* | Category II | No |
| Wedelia | *Sphagneticola trilobata* | Category II | No |
| Woman's toungetree | *Albizia lebbeck* | Category I | No |
| ***Terrestrial Animals*** | | | |
| Argentine black and white tegu | *Salvator merianae* | Invasive | Yes |
| Argentine boa | *Boa constrictor occidentalis* | Nonnative | No |
| Ball python | *Python regius* | Nonnative | No |
| Brown anole | *Anolis sagrei* | Nonnative | No |
| Brown basilisk | *Basiliscus vittatus* | Nonnative | No |
| Cane toad | *Rhinella marina* | Invasive | Yes |
| Common boa | *Boa constrictor* | Nonnative | No |

**Table 3.7-4 Invasive Species Identified within a 6-Mile Radius of the PSL Site (Sheet 3 of 4)**

| Common Name | Scientific Name | Classification | Regulated |
|---|---|---|---|
| Common pheasant | *Phasianus colchicus* | Nonnative | No |
| Cuban treefrog | *Osteopilus septentrionalis* | Nonnative | No |
| Egyptian goose | *Alopochen aegyptiaca* | Nonnative | No |
| Eurasian collared dove | *Streptopelia decaocto* | Nonnative | No |
| European starling | *Sturnus vulgaris* | Nonnative | No |
| Feral hog | *Sus scrofa* | Invasive | Yes |
| Green iguana | *Iguana iguana* | Invasive | Yes |
| House sparrow | *Passer domesticus* | Nonnative | No |
| Indian peafowl | *Pavo cristatus* | Nonnative | No |
| Knight anole | *Anolis equestris* | Nonnative | No |
| Muscovy duck | *Cairina moschata* | Nonnative | No |
| New guinea flatworm | *Platydemus manokwari* | Nonnative | No |
| Nile monitor | *Varanus niloticus* | Nonnative; Conditional | Yes |
| Northern curly-tailed lizard | *Leiocephalus carinatus* | Nonnative | No |
| Peters rock agama | *Agama picticauda* | Nonnative | No |
| Racer | *Coluber constrictor* | Nonnative | No |
| Red-footed tortoise | *Chelonoidis carbonarius* | Nonnative | No |
| Rock dove | *Columba livia* | Nonnative | No |
| Rose-ringed parakeet | *Psittacula krameri* | Nonnative | No |
| ***Aquatic Plants*** | | | |
| Alligatorweed | *Alternanthera philoxeroides* | Class I prohibited aquatic plant | Yes |
| Cuban bulrush | *Cyperus blepharoleptos* | None | No |
| Dotted duckweed | *Landoltia punctata* | Category II | No |
| Torpedo grass | *Panicum repens* | Category I | No |
| Water fern | *Salvinia minima* | Category I | No |
| Water hyacinth | *Eichhornia spp.* | Class I prohibited aquatic plant; Federal noxious | Yes |
| Wild taro | *Colocasia esculenta* | Category I | No |

### Table 3.7-4 Invasive Species Identified within a 6-Mile Radius of the PSL Site (Sheet 4 of 4)

| Common Name | Scientific Name | Classification | Regulated |
|---|---|---|---|
| ***Aquatic Animals*** | | | |
| Freshwater jellyfish | *Craspedacusta sowerbyi* | Invasive | No |
| Blue tilapia | *Oreochromis aureus* | Invasive; Conditional | Yes |
| Brown hoplo | *Hoplosternum littorale* | Invasive | Yes |
| Lionfish | *Pterois volitans* | Invasive | Yes |
| Mayan cichlid | *Cichlasoma urophthalma* | Nonnative | No |
| Sailfin catfish | *Pterygoplichthys multiradiatus* | Nonnative | No |
| Southern platyfish | *Xiphophorus maculatus* | Nonnative | No |
| Walking catfish | *Clarias batrachus* | Nonnative; Conditional; Prohibited | Yes |

(EDDMapS 2021; FDCAS 2019a; FDCAS 2019b; FLEPPC 2019)

**Definitions:**

**Category I** is defined by the FLEPPC as those invasive species that are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives. This definition does not rely on the economic severity or geographic range of the problem, but on the documented ecological damage caused.

**Category II** is defined by the FLEPPC as invasive exotics that have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species.

**Class I prohibited** refers to those species who under no circumstances will these species be permitted for possession, collection, transportation, cultivation, and importation except as provided in Rule 5B-64.004, F.A.C.

**Noxious** are those plants regulated by the State which may be a serious agricultural threat in Florida; have a negative impact on endangered, threatened, or commercially exploited plant species; or if the plant is a naturalized plant that disrupts naturally occurring native plant communities.

**Federal Noxious** are those plants designated on the Federal Noxious Weed List. They require permits for the importation of interstate movement.

**Nonnative** are those species who are not natural to Florida but are not necessarily regulated nor causing significant impacts to the surrounding ecosystems.

**Invasive** are those species who are regulated by FWC and have in some way negatively impacted native fish and wildlife, cause damage that is costly to repair, or pose a threat to human health and safety.

**Conditional** species (formerly referred to as restricted species) may be imported and possessed by permitted entities for research, commercial import/export business, or public educational exhibition. They may not be acquired or kept as personal pets, with the exception of red-eared sliders.

**Prohibited** species may be imported and possessed for research, following approval of the research plan that must include detailed security measures to prevent escape, and for public educational exhibition by applicants that meet strict biosecurity measures. They may not be acquired or kept as pets or for commercial sale.

**Table 3.7-5 Florida's Threatened and Endangered Species with the Potential to Occur within a 6-Mile Radius of PSL (Sheet 1 of 4)**

| Common Name | Scientific Name | Federal Status | State Status |
|---|---|---|---|
| ***Fish*** | | | |
| Atlantic sturgeon | *Acipenser oxyrinchus oxyrinchus* | E | FE |
| Giant manta ray | *Manta birostris* | T | -- |
| Nassau grouper | *Epinephelus striatus* | T | T |
| Oceanic whitetip shark | *Carcharhinus longimanus* | T | -- |
| Scalloped hammerhead shark | *Sphyrna lewini* | T | -- |
| Smalltooth sawfish | *Pristis pectinata* | E | E |
| ***Reptiles*** | | | |
| American alligator | *Alligator mississippiensis* | T (S/A) | -- |
| American crocodile | *Crocodylus acutus* | T | FT |
| Atlantic salt marsh snake | *Nerodia clarkii taeniata* | T | FT |
| Eastern indigo snake | *Drymarchon corais couperi* | T | FT |
| Florida pine snake | *Pituophis melanoleucus mugitus* | -- | T |
| Gopher tortoise | *Gopherus polyphemus* | C | T |
| Green sea turtle | *Chelonia mydas* | E | FE |
| Hawksbill sea turtle | *Eretmochelys imbricata* | E | FE |
| Kemp's ridley sea turtle | *Lepidochelys kempii* | E | FE |
| Leatherback sea turtle | *Dermochelys coriacea* | E | FE |
| Loggerhead sea turtle | *Caretta caretta* | T | FT |
| Olive ridley sea turtle | *Lepidochelys olivacea* | T | -- |
| Short-tailed snake | *Lampropeltis extenuate* | -- | T |
| ***Birds*** | | | |
| American oystercatcher | *Haematopus palliates* | -- | T |
| Audubon's crested caracara | *Caracara cheriway* | T | FT |
| Black skimmer | *Rynchops niger* | -- | T |
| Burrowing owl | *Athene cunicularia* | -- | T |
| Everglade snail kite | *Rostrhamus sociabilis plumbeus* | E | FE |
| Florida grasshopper sparrow | *Ammodramus savannarum floridanus* | E | E |
| Florida scrub-jay | *Aphelocoma coerulescens* | T | FT |
| Ivory-billed woodpecker | *Campephilus principalis* | E | FE |
| Kirtland's wood warbler | *Dendroica kirtlandii* | E | FE |
| Least tern | *Sternula antillarum* | -- | T |
| Little blue heron | *Egretta caerulea* | -- | T |

**Table 3.7-5 Florida's Threatened and Endangered Species with the Potential to Occur within a 6-Mile Radius of PSL (Sheet 2 of 4)**

| Common Name | Scientific Name | Federal Status | State Status |
|---|---|---|---|
| Piping plover | *Charadrius melodus* | T | FT |
| Red-cockaded woodpecker | *Picoides borealis* | E | FE |
| Reddish egret | *Egretta rufescens* | -- | T |
| Roseate spoonbill | *Platalea ajaja* | -- | T |
| Roseate tern | *Sterna dougallii dougallii* | T | FT |
| Rufa red knot | *Calidris canutus rufa* | T | FT |
| Sandhill crane | *Grus canagensis* | -- | T |
| Southeastern American kestrel | *Falco sparverius paulus* | -- | T |
| Tricolored heron | *Egretta tricolor* | -- | T |
| Whooping crane | *Grus americana* | XN | E |
| Wood stork | *Mycteria americana* | T | FT |
| ***Mammals*** | | | |
| Anastasia Island beach mouse | *Peromyscus polionotus phasma* | E | FE |
| Blue whale | *Balaenoptera musculus* | E | -- |
| Finback whale | *Balaenoptera physalus* | E | -- |
| Florida panther | *Puma (=Felis) concolor coryi* | E | FE |
| Florida salt marsh vole | *Microtus pennsylvanicus dukecampbelli* | E | FE |
| Gray bat | *Myotis grisescens* | E | FE |
| Humpback whale | *Megaptera novaeangliae* | E | -- |
| North Atlantic right whale | *Eubalaena glacialis* | E | -- |
| Puma | *Puma concolor spp* | T (S/A) | -- |
| Sei whale | *Balaenoptera borealis* | E | -- |
| Southeastern beach mouse | *Peromyscus polionotus niveiventris* | T | FT |
| Sperm whale | *Physeter macrocephalus* | E | -- |
| West Indian manatee (Florida manatee) | *Trichechus manatus (Trichechus manatus latirostris)* | T | FT |
| ***Insects*** | | | |
| Cassius blue butterfly | *Leptotes cassius theonus* | T (S/A) | -- |
| Ceraunus blue butterfly | *Hemiargus ceraunus antibubastus* | T (S/A) | -- |
| Florida leafwing | *Anaea troglodyte floridalis* | E | FE |
| Miami blue butterfly | *Cyclargus thomasi bethunebakeri* | E | FE |

**Table 3.7-5 Florida's Threatened and Endangered Species with the Potential to Occur within a 6-Mile Radius of PSL (Sheet 3 of 4)**

| Common Name | Scientific Name | Federal Status | State Status |
|---|---|---|---|
| ***Plants*** | | | |
| Barbed wire cactus | *Acanthocereus pentagonus* | -- | T |
| Blunt leaved peperomia | *Peperomia obtusifolia* | -- | E |
| Burrowing four-o'clock | *Okenia hypogaea* | -- | E |
| Celestial lily | *Nemastylis floridana* | -- | E |
| Common prickly pear | *Optunia stricta* | -- | T |
| Coastal hoary-pea | *Tephrosia angustissima var. curtissii* | -- | E |
| Coastal vervain | *Glandularia maritima* | -- | E |
| False buttonweed | *Spermacocoe terminalis* | -- | T |
| Florida bully | *Sideroxylon reclinatum subsp. austrofloridense* | T | FT |
| Four-petal pawpaw | *Asimina tetramera* | E | FE |
| Fragrant prickly-apple | *Cereus eriophorus var. fragrans* | E | FE |
| Guiana plum | *Drypetes lateriflora* | -- | T |
| Inkberry | *Scaevola plumieri* | -- | T |
| Johnson's seagrass | *Halophila johnsonii* | T | -- |
| Lakela's mint | *Dicerandra immaculata* | E | FE |
| Large-flowered rosemary | *Conradina grandiflora* | -- | T |
| Many-flowered grass-pink | *Calopogon multiflorus* | -- | T |
| Nodding pinweed | *Lechea cernua* | -- | T |
| Piedmont jointgrass | *Coelorachis tuberculosa* | -- | T |
| Pine pinweed | *Lechea divaricata* | -- | E |
| Sand-dune spurge | *Chamaesyce cumulicola* | -- | E |
| Satinleaf | *Chrysophyllum oliviforme* | -- | T |
| Scrub bluestem | *Schizachyrium niveum* | -- | E |
| Sea lavender | *Argusia gnaphalodes* | -- | E |
| Small's flax | *Linum carteri var. smallii* | -- | E |
| Terrestrial peperomia | *Peperomia humilis* | -- | E |
| Tiny polygala | *Polygala smallii* | E | FE |
| Yellow butterwort | *Pinguicula lutea* | -- | T |
| Yellow nickerbean | *Caesalpinia major* | -- | E |

**Table 3.7-5 Florida's Threatened and Endangered Species with the Potential to Occur within a 6-Mile Radius of PSL (Sheet 4 of 4)**

| Common Name | Scientific Name | Federal Status | State Status |
|---|---|---|---|
| ***Corals*** | | | |
| Boulder star coral | *Orbicella franksi* | T | -- |
| Lobed star coral | *Orbicella annularis* | T | -- |
| Mountainous star coral | *Orbicella faveolata* | T | -- |
| Pillar coral | *Dendrogyra cylindricus* | T | -- |
| Rough cactus coral | *Mycetophyllia ferox* | T | -- |
| Staghorn coral | *Acropora cervicornis* | T | -- |
| ***Fungi*** | | | |
| Florida perforate cladonia | *Cladonia perforata* | E | -- |

(FAC 2020; Foster and Wheeler 2001; FFWCC 2018; NOAA 2021b)

T = Threatened; E = Endangered; FT = Listed as threatened under the ESA and acknowledged by the state; FE = Listed as endangered under the ESA and acknowledged by the state; C = Candidate; T(S/A) = Threatened based off of similarity of appearance; SSC = Species of conservation concern; XN = Experimental population

**Table 3.7-6 Species with Designated Essential Fish Habitat within 6 Miles of the PSL Site**

| Common Name | Scientific Name |
|---|---|
| Atlantic sharpnose shark (Atlantic stock) | *Rhizoprionodon terraenovae* |
| Bigeye thresher shark | *Alopias superciliosus* |
| Blacknose shark (Atlantic stock) | *Carcharhinus acronotus* |
| Blacktip shark (Atlantic stock) | *Carcharhinus limbatus* |
| Bluefish | *Pomatomus saltatrix* |
| Bonnethead shark (Atlantic stock) | *Sphyrna tiburo* |
| Bull shark | *Carcharhinus leucas* |
| Caribbean reef shark | *Carcharhinus perezii* |
| Coastal migratory pelagics | Multiple species: *Rachycentron canadum; Scomberomorus maculatus; Scomberomorus cavalla* |
| Corals | Multiple spp. |
| Great hammerhead shark | *Sphyrna mokarran* |
| Lemon shark | *Negaprion brevirostris* |
| Nurse shark | *Ginglymostoma cirratum* |
| Sailfish | *Istiophorus spp.* |
| Sandbar shark | *Carcharhinus plumbeus* |
| Scalloped hammerhead shark | *Sphyrna lewini* |
| Skipjack tuna | *Katsuwonus pelamis* |
| Snapper grouper | Multiple spp. |
| Spinner shark | *Carcharhinus brevipinna* |
| Spiny lobster | *Palinuridae spp.* |
| Summer flounder | *Paralichthys dentatus* |
| Tiger shark | *Galeocerdo cuvier* |

(NOAA 2018)

**Table 3.7-7 Highly Migratory Essential Fish Species within 6 Miles of the PSL Site**

| Common Name | Scientific Name |
|---|---|
| Atlantic sharpnose shark (Atlantic stock) | *Rhizoprionodon terraenovae* |
| Bigeye thresher shark | *Alopias superciliosus* |
| Blacknose shark (Atlantic stock) | *Carcharhinus acronotus* |
| Blacktip shark (Atlantic stock) | *Carcharhinus limbatus* |
| Bonnethead shark (Atlantic stock) | *Sphyrna tiburo* |
| Bull shark | *Carcharhinus leucas* |
| Caribbean reef shark | *Carcharhinus perezii* |
| Great hammerhead shark | *Sphyrna mokarran* |
| Lemon shark | *Negaprion brevirostris* |
| Nurse shark | *Ginglymostoma cirratum* |
| Sailfish | *Istiophorus spp.* |
| Sandbar shark | *Carcharhinus plumbeus* |
| Scalloped hammerhead shark | *Sphyrna lewini* |
| Skipjack tuna | *Katsuwonus pelamis* |
| Spinner shark | *Carcharhinus brevipinna* |
| Tiger shark | *Galeocerdo cuvier* |

(NOAA 2021b)

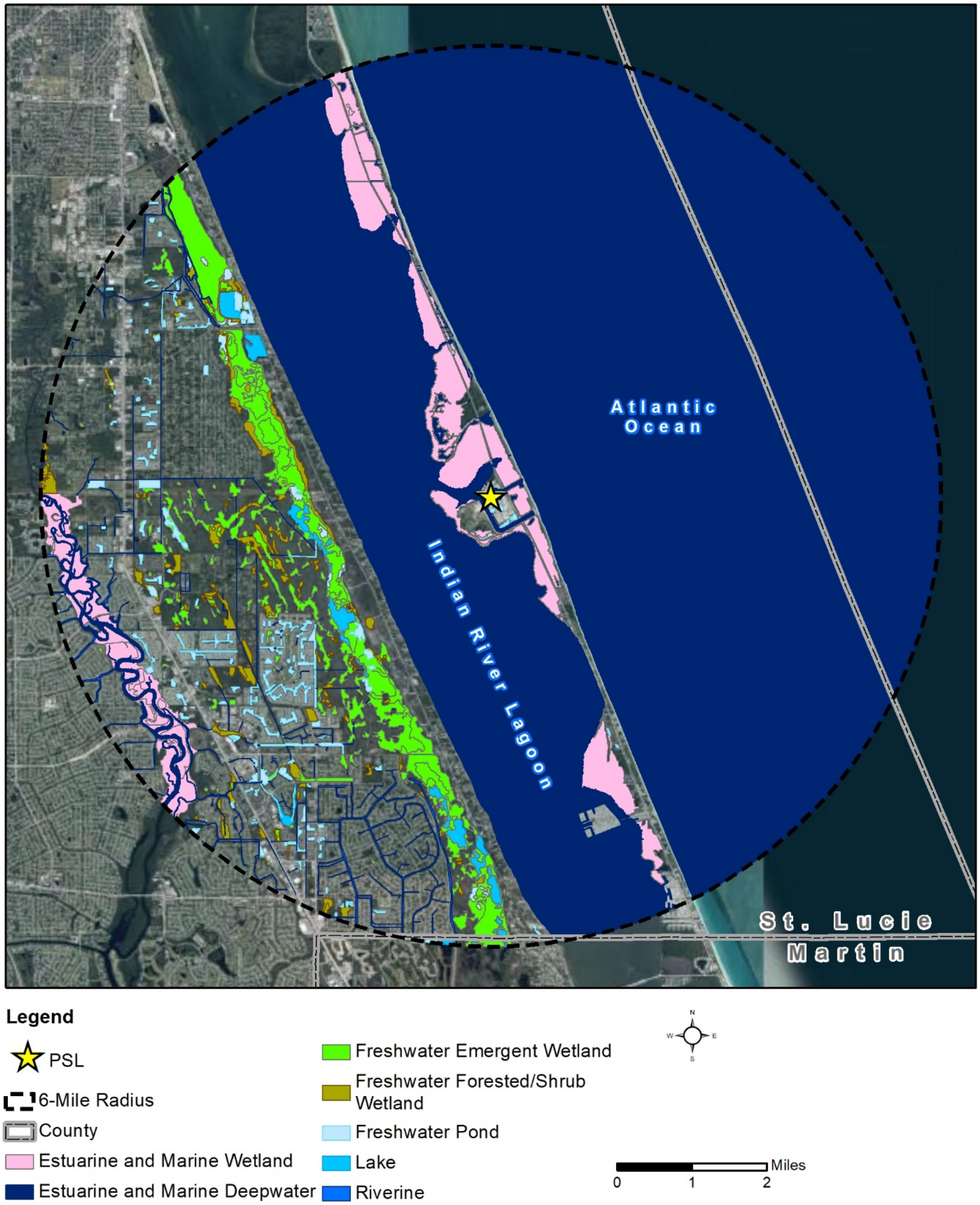



**Figure 3.7-1 NWI Wetlands, 6-Mile Radius**


**Figure 3.7-2 NWI Wetlands, Site**

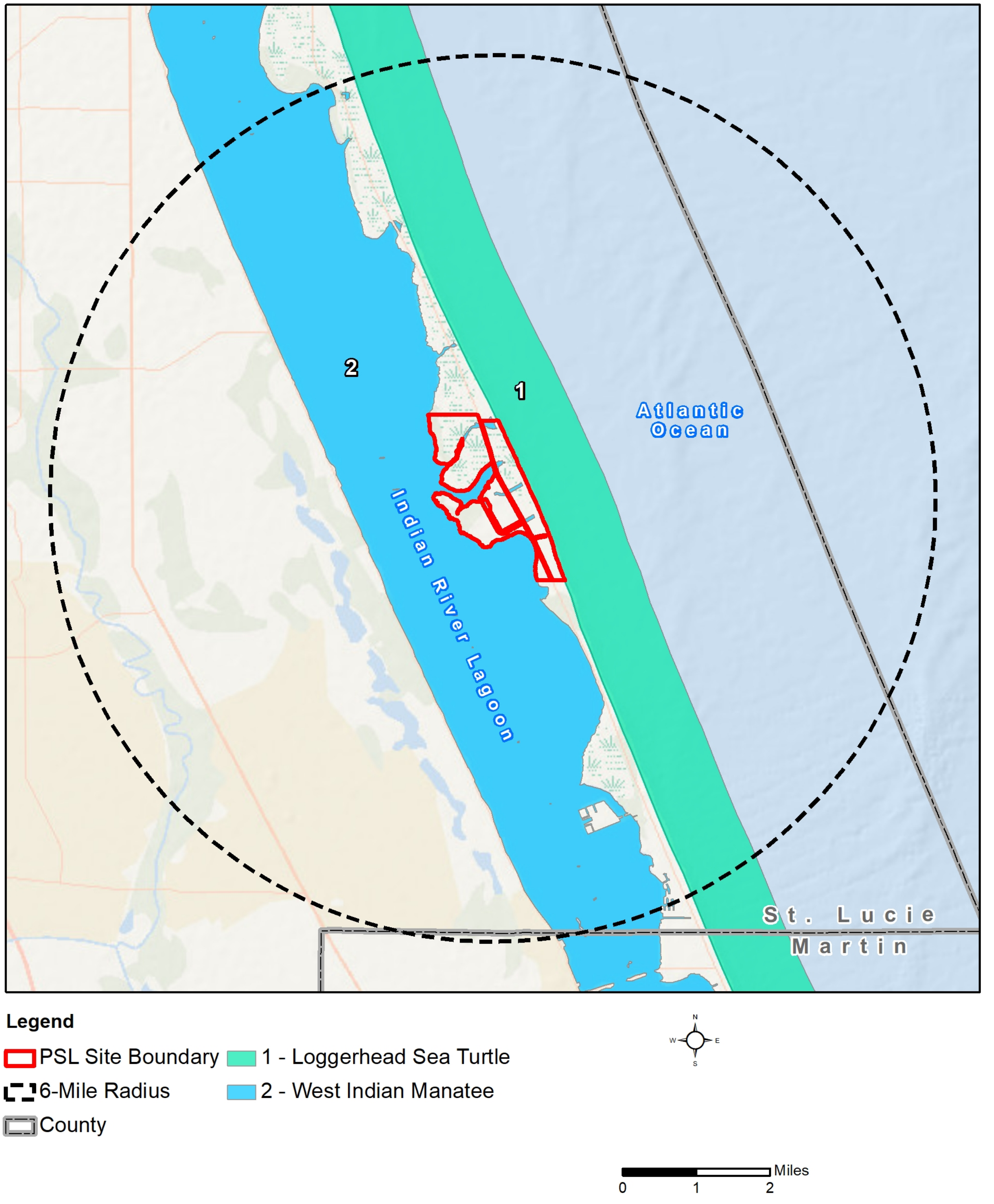



**Figure 3.7-3 Critical Habitat**

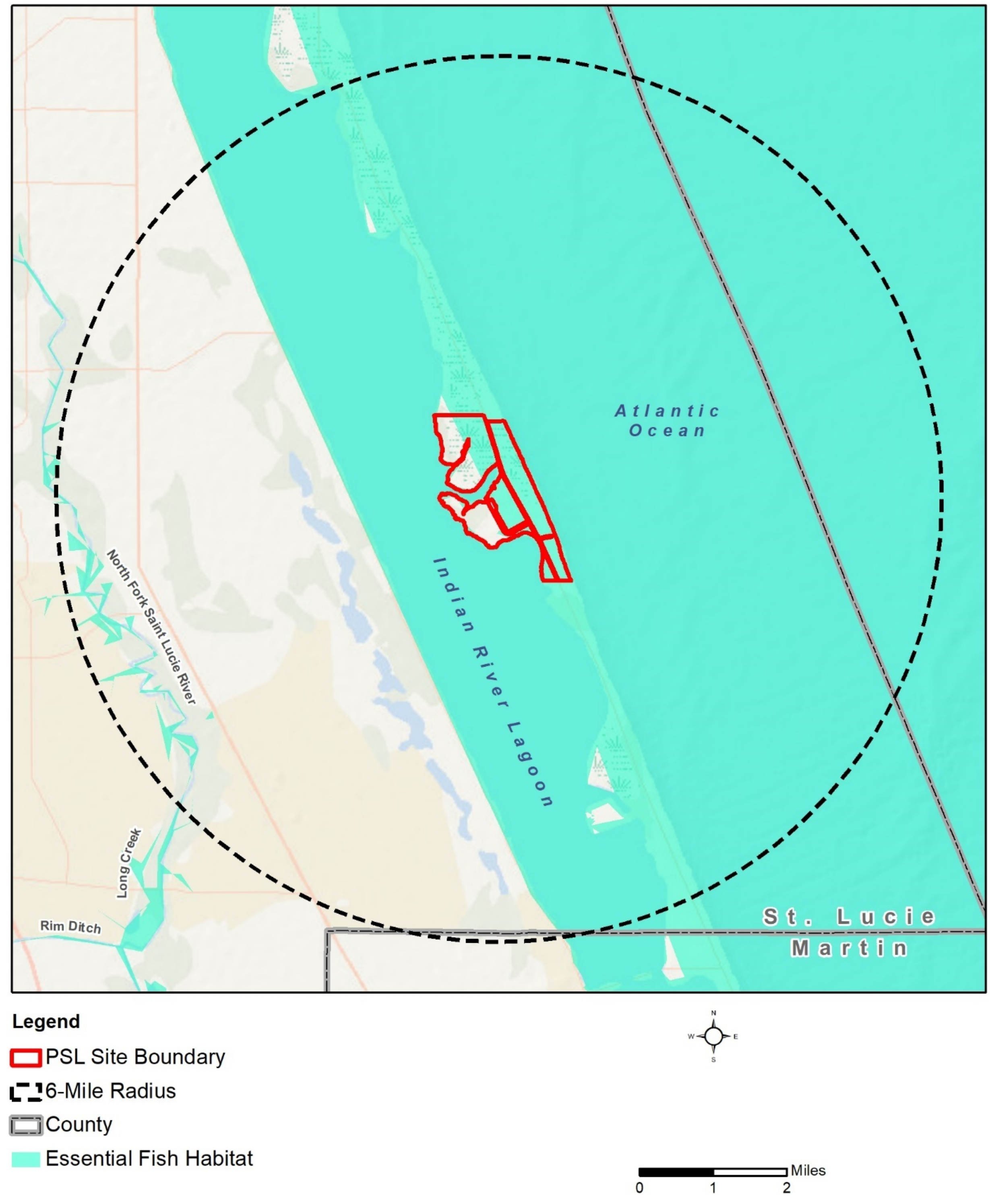



**Figure 3.7-4 Essential Fish Habitat**

## 3.8 Historic and Cultural Resources

Cultural resources include prehistoric era and historic era archaeological sites and objects, architectural properties and districts, and traditional cultural properties, which are defined as significant objects or places important to Native American tribes for maintaining their culture (USDOI 1998). Of particular concern are those cultural resources that may be considered eligible for listing on the National Register of Historic Places (NRHP). Any cultural resources listed on or eligible for the NRHP are considered historic properties under the National Historic Preservation Act of 1966 (NHPA) [Public Law 89-665; 54 USC 300101 et seq.].

Prior to taking any action to implement an undertaking, Section 106 of the NHPA requires the NRC as a federal agency to do the following:

- Take into account the effects of an undertaking (including issuance of a license) on historic properties, including any district, site, building, structure, or object included in or eligible for inclusion in the NRHP.
- Afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertaking.

To provide early coordination for the Section 106 process, FPL contacted the Florida Division of Historical Resources (FDHR) concerning the PSL SLR and potential effects on cultural resources within the approximately 1,132-acre site and on historic properties within a 6-mile radius of PSL (Attachment D). Native American groups recognized as potential stakeholders were also consulted by FPL with the opportunity for comment (Attachment D).

This ER identifies all known cultural resources within a 6-mile radius of PSL, as well as properties listed on the NRHP within that same radius. The site consists of approximately 1,132 acres and is bordered by the Atlantic Ocean to the east and the Indian River tidal lagoon to the west. Of the 1,132 acres, about 300 acres, or approximately 27 percent, are pre-empted by the plant for purposes of plant operation. Undeveloped areas of the site are occupied by dense vegetation characteristic of Florida coastal mangrove swamps. The site is also traversed by SR A1A in a north-south direction east of the plant area. For the purpose of SLR, the aboveground area of potential effects (APE) is defined as the entire PSL property and everything within a 6-mile radius of PSL. The aboveground APE considers the potential proximity effects to historical properties in relation to continued PSL operation. The archaeological APE is considered bounded by the approximately 1,132 acres, where ground disturbance, though unanticipated during the license renewal period of extended operation, might compromise the physical integrity of archaeological data.

There are no refurbishment activities or other construction activities currently planned to support SLR operations, and therefore no identified ground disturbance associated with SLR.

The literature review for the SLR of previously recorded archaeological sites included the area within a six-mile radius of PSL. A record review was conducted at the FDHR. The Florida

Master Site File (FMSF) was reviewed for the 6-mile APE. The purpose of the literature review was to help develop an understanding of the local context by conducting an inventory of all previously and newly recorded archaeological sites on the 1,132-acre PSL property and within a 6-mile radius of PSL, regardless of NRHP status.

The results of the literature review showed that there are 48 archaeological resources, 24 architectural resources, and two cemeteries recorded within 6 miles of PSL. There is one resource listed on the NRHP, 15 architectural resources determined eligible, 11 archaeological resources determined ineligible, and 11 archaeological resources listed as potential eligible. There are seven archaeological resources for which there was insufficient information to make a determination of eligibility. There are an additional 29 resources within the 6-mile APE which have not been evaluated by the State Historic Preservation Officer (SHPO) for NRHP eligibility (Tables 3.8-1 and 3.8-2).

### 3.8.1 Land Use History

The land use history for PSL and the surrounding region was developed as part of a Phase 2A literature review and archaeological sensitivity assessment of the PSL property and is summarized here. Section 3.8.2 provides a more detailed discussion of historical land use as part of the cultural history. Early maps provide information on how the area was used in the past. The 1845 General Land Office map depicts Hutchinson Island as an undeveloped barrier island with the limited areas shown to the southwest of the APE depicted as backwater, or open savanna devoid of roads, settlements, or other development (Figure 3.8-1). The USGS 1950 Eden and Ankona maps depict the PSL property as undeveloped with only a jeep trail running along the beach, while the remaining portion of the site is covered in open dunes or mangrove (Figure 3.8-2). The 1971 edition of the 1948 USGS Eden and Ankona maps depict SR A1A and the initial construction of the PSL property on the west side of SR A1A, the remaining portions of the PSL property are still depicted as dunes or mangrove backwater and a jeep trail is still depicted along the beach (Figure 3.8-3).

Photographs taken prior to, during, and after the construction of the PSL facility are useful in showing the environmental context during that time period. At the time of construction, the PSL facility consisted of a primarily undeveloped mangrove barrier island crossed by a segment of SR A1A (Figure 3.8-5). The trees and brush were removed, and the area was mechanically leveled (Figure 3.8-6). Construction included excavation for the PSL facility components (Figure 3.8-7). Final construction of the PSL facility included multiple buildings, facilities, structures, and parking lots surrounded by forest, the Indian River, and the Atlantic (Figure 3.8-8).

The PSL property and the surrounding region hold evidence of both prehistoric and historic occupation by Native Americans and Euro-Americans. Archaeological records suggest that the PSL property and the surrounding area were potentially occupied by Native American populations during the Archaic Period (ca.8000 BC to 3000 BC), the Malabar I (ca. 750 B.C. to A.D. 1000), the Malabar II (A.D. 1000 to A.D. 1750), and the Historic Period (ca. A.D. 1565 to present).

### 3.8.2 Cultural History

#### 3.8.2.1 Paleoindian Period (Prior to 6500 BC)

The Paleoindian period is the earliest substantiated cultural adaptation in Florida. (AHCI 2008) Due to lower global temperatures, more water was trapped in glaciers, resulting in a larger area of the continental shelf being exposed. Although the climate was warmer than the previous Ice Age, due to the volume of water held in the remaining ice sheets, the Florida peninsula was up to three times wider than present. Additionally, the water table was much lower than today, the region was more arid, and Lake Okeechobee was not present. Paleoindian peoples tended to live in small bands which traveled seasonally within set territories for food sources that included hunting megafauna, including extinct forms of bison, horse, camel, and mammoth. (AHCI 2008) The "Oasis Model" predicts that many of these bands likely followed herds from one water hole to another as the megafauna exploited the water and vegetation resources of the underground cenotes. Due to a lower water table, these same water resource areas commonly have exposed limestone and lithic resources suitable for tool manufacture. (AHCI 2008) The material culture is characterized by large, fluted points such as the Clovis, Simpson, and Suwanee and lithic knives, scrapers, in addition to bone pins. Paleoindian components are not common in east central Florida although a Simpson point has been reported by an avocational archaeologist in western St. Lucie County. (AHCI 2008) Overall, the scarcity of material culture from this period is likely the result of two factors. The fact that Central Florida was arid at that time may have resulted in limited Paleo activity in the region; and the inundation of not only miles of coastline, but also many areas of the interior due to a rising water table and the development of peat bogs, which may be obscuring much of the Paleoindian record in the region. (AHCI 2008)

#### 3.8.2.2 Archaic (6500 BC to 750 BC)

The Archaic Period is marked by changes in subsistence and settlement patterns likely associated with a warming climate and rising sea levels related to glacial melt which dramatically reduced the Florida peninsula. Previous researchers have speculated that the rise in sea level correlates to an average of 8.3 centimeters per 100 years for the period between 6000 to 3000 B.P. (AHCI 2008) This period is divided into the Early, Middle, and Late Archaic and is characterized by the exploitation of a larger variety of plant and animal resources with an overall greater diversity in material culture. There is an increased reliance on shellfish and the marine resources of the coast, as well as the overall expansion of the utilization of the hunting and gathering of the regions changing floral and faunal resources as the cypress swamps, and hardwood forests which appeared as early as 5000 B.P. presented a different resource base from that which was present in the early Holocene (AHCI 2008).

The Early Archaic Period (6500 to 5000 BC) is inferred to include a similar mobile lifeway as postulated for the Paleoindian period with a more localized strategy of exploiting seasonally available resources. (AHCI 2008) Projectile points no longer exemplified the intricate work characteristic of Paleoindian tools. Early Archaic tools such as spear points, knives, drills, scrapers, and gravers were still used, but varied in size and shape. The Early Archaic components of Florida generally include distinctive point types, such as Bolen, Kirk, Santa Fe and Tallahassee. (AHCI 2008) Archaic tools appear to have a long use life, and an apparent specific function, indicated by tool types that show use wear indicative of curation and reuse, such as repeated re-sharpening until the tool was broken, lost, or worn out. (AHCI 2008) As the region was still relatively arid, with a lower water table and sea levels, many Early Archaic sites in Florida have likely been inundated today, both offshore and inland. There are a few notable sites, such as the Windover mortuary pond site and the Cutler Fossil site in Brevard and Dade counties. However, the Early Archaic Period is not well documented in the region. (AHCI 2008)

By the Middle Archaic (5000 to 3000 B.C), the "tool kit" is inferred to have expanded to include Atlatls for hunting with notched and stemmed points including Alachua, Hillsborough, Marion, Newman, and Putnam types as well as mortars and pestles for food processing. The period is typified by sites of intense resource exploitation such as coastal shell middens. During this period, the first inland shell middens were constructed, indicating large semi-permanent base camps, from which the population could disperse to special-use extraction locations to exploit more seasonal resources. (AHCI 2008) In addition to the shell middens and mortuary pond sites, small camp sites are also prevalent and represented as lithic scatters across the landscape. Sea level rise and the subsequent rising water table inland have resulted in the inundation of many Middle Archaic sites. (AHCI 2008)

The Late Archaic (3000 to 500 B.C.) had important innovations such as tribal societies and clay pottery vessels, which are indicative of both a more sedentary settlement and regionalization of the population. (AHCI 2008) The climate, water table and coastline during this time was similar to that of the modern era. Ceramics with semi-fiber and fiber temper began appearing in Florida around 2000 B.C. and several barrier islands sites in Martin, Dade, and Broward counties have produced sherds of fiber and semi-fiber tempered wares including Orange Plain and semi-tempered plain. (AHCI 2008)

### 3.8.2.3 Malabar Period (500 B.C. to 1565)

The Malabar Period arose from local Late Archaic populations and existed until the arrival of the Spanish in 1565. The Malabar period is subdivided into Malabar I and Malabar II based of ceramic style and subsistence practice. Following the previous period there is an increase in population and number of settlements. The regional diversity that marked this period has been primarily attributed to local adaptations to varied ecological conditions within the state. Traditionally this diversity has been described archaeologically in terms of cultural periods based on variations in ceramic types. (AHCI 2008)

Malabar I (750 B.C. to A.D. 1000). The Indian River and inland components of the Malabar I populations in the region have differing ceramic types which many researchers consider as a marker of separate cultural origins for the populations of these two regions. At inland sites sand tempered wares predominate, while along the coast and to the north St. Johns Plainwares are almost exclusive of other types. As a result, many researchers of the Indian River district postulate a Glades origin for Malabar I, populations in St. Lucie, Martin, Indian River, and Palm Beach counties, while to the north and inland the sites producing St. John Plain wares are thought to originate from the previous Orange Culture. (AHCI 2008)

Malabar II (A.D.1000 to A.D. 1750). Concise dating of the Malabar I to Malabar II boundary is not available. There is however agreement that the defining characteristic of Malabar II is the appearance of St. John Check-Stamped ceramic wares. Additionally, there is an increase in the utilization of burial mounds, both large and small, as well as the numbers of village sites, which is inferred to indicate increasing cultural complexity. (AHCI 2008)

#### 3.8.2.4 Historic Period (A.D. 1565 to Present)

The Historic Period begins with the arrival of Europeans. At the time of Spanish contact, Florida was the home of numerous Native American groups. In St. Lucie County, the Spanish first encountered the Ais, a chiefdom of towns with individual leaders under a paramount chief known as "Ais." (AHCI 2008) The Spanish also called the main town Ais, which was located just north of the Old St. Lucie inlet. After a 1695 visit from Englishman John Dickinson, the population of the Ais is noted to have declined over several decades. The population decrease was due not only to European disease, but also to intertribal warfare and slave raids, which played a major role in the demise of the Ais. Those who survived integrated into the Seminoles, who were descendants of the Creek Indians who moved to Florida in the early 18th century to escape the political pressure as well as the population pressure of the ever-expanding American colonies to the north. (AHCI 2008)

By the end of the 18th century the Seminole occupied the area of St. Lucie County. Two forts were established in the region during the second Seminole War, Fort Van Swearingen about 1837 and Fort Pierce in 1838. Later in 1849 Fort Capron was established and utilized in the third Seminole War. (AHCI 2008) Between the latter two Seminole Wars, a colony of settlers was established in the region from St. Lucie Sound to the Sebastian River. Known as the Indian River Colony, these homesteaders established trading posts and Dr. Weeden occupied the structures which remained at the deactivated Fort Pierce to attract other potential settlers to the area. (SLHS 2021) Later, pineapple plantations developed into a viable industry in the county and continued to contribute to the local economy into the 20th century. (AHCI 2008) Most of the settlement in the region was along the Indian River estuary, as it was the main mode of transportation via steam river boats or coastal schooners in the mid to late 19th century. As the population increased communities in St. Lucie County were established, often in the vicinity of the home of the earliest settlers. These communities often bear the names of the early settlers, such as Ankona named for Dr. John Fletcher Ankeny, Edgartown named for Edgar Bowman, Eldred, named for Lucius Eldrid. Other communities bear names bestowed upon them in honor of non-Floridians such as Quay. Eden Plantation was named after the Garden of Eden by founder Captain Thomas E. Richards due to the beauty of the region. (SLHS 2021)

The pineapple plantations began seriously in the 1880s at Captain Richards' Eden Plantation. His success inspired others to adapt varieties suited to the area and by 1890 it was estimated that two million pineapple plants were growing in the region and by 1895 the Jensen Beach area was referred to as the "Pineapple Capital of the World." Unfavorable cold seasons, lack of fertilizer and outbreaks of pests such as spider mites and nematodes brought an end to the great pineapple plantation era along the Indian River by World War I. Many growers turned to citrus farming afterwards. (SLHS 2021) Pineapple, citrus, and other agricultural activities such as cattle ranching were not the only source of the regional economy and trade. The natural resources of the region were also exploited commercially. The fisheries, oyster beds, and green turtles of the region were a large part of the regional trade. Many landowners created their own oyster beds near their river docks, and the fisheries spawned other local industry, such as the fish canning operations at Can Town. (SLHS 2021)

Perhaps the most important economic development in the region was Henry Flagler's railroad along the eastern coast of Florida from Jacksonville in 1894. The railroad brought transportation options for the produce and bountiful seafood production of the region. Of more economic importance was the designation of Fort Pierce as a division point on the Florida East Coast Railway in 1911. The population of the town was 800 in 1905 and had increased to 3,500 by 1915. The economy of the county has been dominated by the transportation opportunities of the railroad and the local port which contributed to military training efforts in World War II. (SLHS 2021)

### 3.8.3 Onsite Cultural Resources

Onsite cultural resources are those located within the 1,132-acre PSL property. That property includes the entirety of the archaeological APE, which is also the onsite portion of the aboveground APE.

The FMSF lists five cultural resources within the PSL 1,132-acre property: sites SL00011, SL00013, SL00033, SL00044, and SL00055. There was insufficient information to determine NRHP eligibility for sites SL00011 and SL00013. Site SL00044 has been determined potentially eligible for the NRHP. Sites SL00033 and SL00055 are shipwrecks, which have not been evaluated by the SHPO. No historic structures within the PSL property have been recorded on the FMSF, nor have any been documented through the Historic American Buildings Survey or Historic American Engineering Record programs.

### 3.8.4 Offsite Cultural Resources

Offsite cultural resources are those outside the 1,132-acre PSL property boundary. There are 69 offsite resources within 6 miles of the PSL. Lists of known archaeological sites and historic properties within a 6-mile radius of PSL are presented in Tables 3.8-1 and 3.8-2. There are 43 archaeological resources and 24 architectural resources, and two cemeteries. Of these 69 cultural resources, one is listed on the NRHP, 15 resources have been determined eligible, 10 resources are listed as potential eligible, 11 are listed as ineligible. There were five resources for which there was insufficient information for the SHPO to make a determination of eligibility. There are an additional 27 resources, including six shipwrecks, within the 6-mile APE which have not been evaluated for NRHP eligibility by the SHPO (Tables 3.8-1 and 3.8-2).

The Captain Hamond House (SL00077) is the only cultural resource which has been listed on the NRHP (Table 3.8-1, Figure 3.8-4). It is a frame vernacular house constructed in 1901 located approximately 6 miles from the PSL property. Visibility is limited by the curvature of the earth and is approximately 3 miles from standing height. As such, it is unlikely that PSL is visible from the Captain Hammond House. Additionally, as no refurbishment activities are part of the SLR, there is no potential for the undertaking to adversely affect the viewshed of this NRHP listed resource.

Based on a desktop evaluation, the Fairmont Manor (SL00077), Gustave Ringdahl House (SL00132), Nels C. Jorgenson House (SL00134), Covenant Tabernacle Church (SL00155), White City Mercantile Building (SL00155), and the Christensen House (SL00188) are all properties which are inland and over 5.25 miles from PSL which have been determined eligible for the NRHP. The six properties are very unlikely to be within the viewshed of PSL. Additionally, as no refurbishment activities are part of the SLR, there is no potential for the undertaking to adversely affect the viewshed of this NRHP listed resource.

Based on a desktop evaluation, the Captain John Miller House (SL 00211), R.V. Ankeny House (SL00223), Russell House (SL00224), 7901 South Indian River Drive (SL00227), 5703 South Indian River Drive (SL00231), William Robinson House (SL00235), Riverhill (SL00236), Britt House (SL00237), and N.E. Card House (SL00238) are all properties which have been determined eligible for the NRHP which are located less than 5 miles from PSL and are potentially within, or in, the viewshed of PSL. As no refurbishment activities are part of the SLR, there is no potential for the undertaking to adversely affect the viewshed of these eight NRHP eligible resources beyond the current viewshed impact.

There are 10 cultural resources listed as potentially eligible for the NRHP within the 6-mile APE of PSL. As no refurbishment activities are part of the SLR, there is no potential for the undertaking to adversely affect the viewshed of these eight potentially eligible resources beyond the current viewshed impact.

### 3.8.5 Cultural Resource Surveys

There have been 14 cultural resources surveys documented within the 6-mile radius of the 1,132-acre PSL property. An archaeological resources survey was conducted in 1969 by the Board of Archives and History on a portion of the PSL property (FMSF Survey 600). During this survey one prehistoric archaeological site was recorded and one prehistoric site was described but was not recorded.

A full cultural resources survey was conducted in the vicinity of the PSL property in 1996 (FMSF Survey 4558). No cultural resources were identified during the survey. An archeological survey was conducted in the vicinity of the PSL property in 1998 (FMSF Survey 5238). The survey did not record any new cultural resources but was an assessment of two prehistoric sites. An archeological survey was conducted in 2000 for St. Lucie County by FDHR (FMSF Survey 6105). The survey resulted in the recording of two prehistoric mound sites, a prehistoric habitation site, and one shipwreck within the 6-mile radius of the PSL property. A survey of historic resources was conducted for St. Lucie County in 2003 (FMSF Survey 9684). The historic resources survey resulted in recording and evaluation of 17 structures and two cemeteries within the 6-mile radius of the PSL property.

A cultural resources survey was conducted in the vicinity of the PSL property in 2007 (FMSF Survey 14038). The survey resulted in the recording/evaluation of four prehistoric sites. Another cultural resources survey and construction monitoring activities was conducted in 2007 in the vicinity of the PSL property (FMSF Survey 15623). The survey resulted in the recording of six new prehistoric resources.

A marine survey was conducted 2003 in the vicinity of the PSL property (FMSF Survey 15701). No archeological sites were recorded within the 6-mile radius of the PSL property. A full cultural survey (FMSF Survey 17392) was conducted in the vicinity of the PSL property in 2008. The survey resulted in the recording of three prehistoric camp sites. Another full cultural survey (FMSF 17559) was conducted in the vicinity of the PSL property in 2008. The survey did not result in the recording of any cultural resources within the six-mile radius of the PSL property.

A cultural resources survey (FMSF Survey 20868) was conducted in the vicinity of PSL in 2014. The cultural resources survey resulted in the recording of one prehistoric camp site. A marine survey was completed in the vicinity of the PSL property in 2007 (FMSF Survey 21358). The survey did not result in the recording of any new cultural resources. A cultural resources survey was conducted for a cell tower on the PSL property in 2014 (FMSF Survey 22921). The survey did not result in the recording of any cultural resources. A cultural resources survey was conducted by AHCI in 2008 for FPL which has not been turned into FDHR, and as a result there is not FMSF Survey number for the study (AHCI 2008). The survey resulted in the recording of one prehistoric site, which is not listed on the FMSF.

### 3.8.6 Procedures and Integrated Cultural Resources Management Plan

There is currently no cultural resources management plan or unanticipated discoveries plan in place at the PSL facility. The inadvertent discovery of human remains is handled via 872.05 Florida Statutes (Offences Concerning Dead Bodies and Graves; Unmarked Human Burials).

**Table 3.8-1 Architecture and History Inventory Entries within a 6-Mile Radius of PSL (Sheet 1 of 2)**

| Site ID# | Site Name | Quadrangle | Style | NRHP Status/SHPO Evaluation |
|---|---|---|---|---|
| SL00077 | Captain Hammond House | Ankona | Frame Vernacular ca. 1901 | Listed on NRHP 1990 |
| SL00078 | Fairmont Manor | Ankona | Greek Revival ca. 1825-1860; year built 1896 | Eligible for NRHP |
| SL00124 | Nels Hanson House | Ankona | Frame Vernacular; year built 1914 | Not evaluated by SHPO |
| SL00126 | 905 W Second Street | Ankona | Georgian Revival ca. 1880-present; year built 1927 | Not evaluated by SHPO |
| SL00132 | Gustave Ringdahl House | Ankona | Frame Vernacular; year built 1898 | Eligible for NRHP |
| SL00134 | Nels C. Jorgenson House | Ankona | Craftsman; year built 1925 | Eligible for NRHP |
| SL00138 | Mary Kerr House | Ankona | Masonry Vernacular; year built 1920 | Not evaluated by SHPO |
| SL00139 | Ray Kerr House | Ankona | Frame Vernacular; year built 1929 | Not evaluated by SHPO |
| SL00151 | Covenant Tabernacle Church | Ankona | Frame Vernacular; year built 1914 | Eligible for NRHP |
| SL00155 | White City Mercantile Building | Ankona | Frame Vernacular; year built 1900 | Eligible for NRHP |
| SL00179 | 4111 Oleander Avenue | Ankona | Frame Vernacular; year built 1915 | Not evaluated by SHPO |
| SL00188 | Christensen House | Ankona | Frame Vernacular; year built 1895 | Eligible for NRHP |
| SL00193 | Pete Robinson House | Ankona | Frame Vernacular; year built1905 | Not evaluated by SHPO |
| SL00211 | Captain John Miller House | Eden | Frame Vernacular; year built 1895 | Eligible for NRHP |
| SL00223 | R. V. Ankeny House | Ankona | Neo-Classical Revival ca. 1880-1940; year built 1904 | Eligible for NRHP |
| SL00224 | Russell House | Ankona | Frame Vernacular; year built 1900 | Eligible for NRHP |
| SL00227 | 7901 South Indian River Drive | Ankona | Craftsman; year built 1910 | Eligible for NRHP |
| SL00231 | 5703 S Indian River Drive | Ankona | Prairie ca. 1900-1920; year built 1915 | Eligible for NRHP |

**Table 3.8-1 Architecture and History Inventory Entries within a 6-Mile Radius of PSL (Sheet 2 of 2)**

| Site ID# | Site Name | Quadrangle | Style | NRHP Status/SHPO Evaluation |
|---|---|---|---|---|
| SL00235 | William Robinson House | Ankona | Frame Vernacular; year built 1901 | Eligible for NRHP |
| SL00236 | Riverhill | Ankona | Frame Vernacular; year built 1903 | Eligible for NRHP |
| SL00237 | Britt House | Ankona | Frame Vernacular; year built 1908 | Eligible for NRHP |
| SL00238 | N. E. Card House | Ankona | Masonry Vernacular; year built 1914 | Eligible for NRHP |
| SL01745 | Eden Grove | Ankona | Style not specified; year built 1883 | Not evaluated by SHPO |
| SL03035 | William H. Tancre Pineapple Plantation | Ankona | Other; year built 1885 | Not evaluated by SHPO |

**Table 3.8-2 Archaeological Sites within a 6-mile Radius of PSL (Sheet 1 of 3)**

| Site ID# | Quadrangle | Type | NRHP Status/SHPO Evaluation |
|---|---|---|---|
| SL00004 | Fort Pierce | Prehistoric camp site and 19th century farm | Potentially eligible for NRHP |
| SL00008 | Eden | Prehistoric midden with pottery | Not evaluated by SHPO |
| SL00009 | Eden | Prehistoric midden with burials and 19th century scatter | Not evaluated by SHPO |
| SL00011 | Eden | Prehistoric burial mound(s) | Not evaluated by SHPO |
| SL00013 | Eden | Prehistoric midden mound with burials | Insufficient information |
| SL00015 | Fort Pierce | Shell midden with no artifacts observed | Ineligible for NRHP |
| SL00017 | Fort Pierce | Multicomponent prehistoric site and $16^{th}$-$18^{th}$ century shipwreck | Not evaluated by SHPO |
| SL00022 | Eden | Historic shipwreck | Not evaluated by SHPO |
| SL00026 | Eden | Historic shipwreck | Not evaluated by SHPO |
| SL00028 | Eden | 18th century shipwreck | Not evaluated by SHPO |
| SL00033 | Eden | 19th to 20th century shipwreck | Not evaluated by SHPO |
| SL00037 | Eden | Prehistoric midden | Not evaluated by SHPO |
| SL00043 | Fort Pierce | Prehistoric midden | Not evaluated by SHPO |
| SL00044 | Eden | Prehistoric midden with burials | Potentially eligible for NRHP |
| SL00055 | Eden | Prehistoric campsite and historic shipwreck | Not evaluated by SHPO |
| SL00074 | Ankona | Prehistoric midden(s) | Not evaluated by SHPO |
| SL00075 | Ankona | Prehistoric camp site and 19th Century scatter | Not evaluated by SHPO |
| SL00291 | Ankona | Prehistoric habitation and 19th to 20th century scatter | Not evaluated by SHPO |
| SL00292 | Ankona | Prehistoric habitation and 19th to 20th century scatter | Not evaluated by SHPO |
| SL01121 | Ankona | Prehistoric burial mound(s) | Not evaluated by SHPO |
| SL01136 | Ankona | Prehistoric campsite and late 19th to 20 century homestead | Ineligible for the NRHP |

**Table 3.8-2 Archaeological Sites within a 6-mile Radius of PSL (Sheet 2 of 3)**

| Site ID# | Quadrangle | Type | NRHP Status/SHPO Evaluation |
|---|---|---|---|
| SL01146 | Eden | Prehistoric midden | Ineligible for the NRHP |
| SL01173 | Eden | Prehistoric midden and homestead (unidentified timeframe) | Ineligible for the NRHP |
| SL01174 | Ankona | 20th century homestead | Ineligible for the NRHP |
| SL01175 | Ankona | 20th century trash dump and scatter | Ineligible for the NRHP |
| SL01176 | Eden | Prehistoric campsite | Ineligible for the NRHP |
| SL01177 | Eden | Prehistoric campsite | Ineligible for the NRHP |
| SL01178 | Eden | Prehistoric midden(s) | Ineligible for the NRHP |
| SL01184 | Eden | An isolated Archaic artifact | Ineligible for the NRHP |
| SL01269 | Palms Cemetery | Ankona | Protected by state burial laws, not evaluated by SHPO |
| SL01634 | Eden Cemetery | Eden | Protected by state burial laws, not evaluated by SHPO |
| SL01640 | Eden | Late 19th century homestead | Ineligible for the NRHP |
| SL01720 | Fort Pierce | Prehistoric campsite | Potentially eligible for the NRHP |
| SL01721 | Fort Pierce | Prehistoric midden(s) | Potentially eligible for the NRHP |
| Site ID# | Quadrangle | Type | NRHP status/SHPO evaluation |
| SL01722 | Ankona | Prehistoric midden(s) | Insufficient information |
| SL01723 | Ankona | Prehistoric midden(s) and 20th century refuse/dump | Potentially eligible for the NRHP |
| SL01724 | Ankona | Prehistoric midden(s) and 19th to 20th century homestead and refuse/dump | Potentially eligible for the NRHP |
| SL01725 | Ankona | Prehistoric midden(s) and 20th century refuse/dump | Potentially eligible for the NRHP |
| SL01726 | Ankona | 19th to 20th century homestead and refuse/dump | Not evaluated by SHPO |
| SL01810 | Ankona | Prehistoric burials | Potentially eligible for NRHP |
| SL01811 | Ankona | Prehistoric midden(s) | Potentially eligible for NRHP |

**Table 3.8-2 Archaeological Sites within a 6-mile Radius of PSL (Sheet 3 of 3)**

| Site ID# | Quadrangle | Type | NRHP Status/SHPO Evaluation |
|---|---|---|---|
| SL01812 | Ankona | Prehistoric habitation with midden(s) and 20th century refuse/dump | Potentially eligible for NRHP |
| SL01813 | Ankona | Prehistoric habitation with midden(s) and 20th century refuse/dump | Potentially eligible for NRHP |
| SL03016 | Eden | 19th to 20th century homestead refuse/dump | Not evaluated by SHPO |
| SL03017 | Ankona | Prehistoric burial mound(s) | Insufficient information |
| SL03018 | Ankona | Prehistoric habitation with midden(s) | Insufficient information |
| SL03019 | Ankona | Prehistoric habitation with midden(s) | Insufficient information |
| SL03020 | Ankona | Prehistoric habitation with midden(s) | Insufficient information |
| SL03021 | Ankona | Prehistoric habitation with midden(s) | Insufficient information |
| SL03258 | Ankona | 20th century refuse/dump | Not evaluated by SHPO |


**Figure 3.8-1 Government Land Office 1845 Hutchinson Island Map**


**Figure 3.8-2 Florida Power & Light Property, 1950**


**Figure 3.8-3 Florida Power & Light Property, 1971**

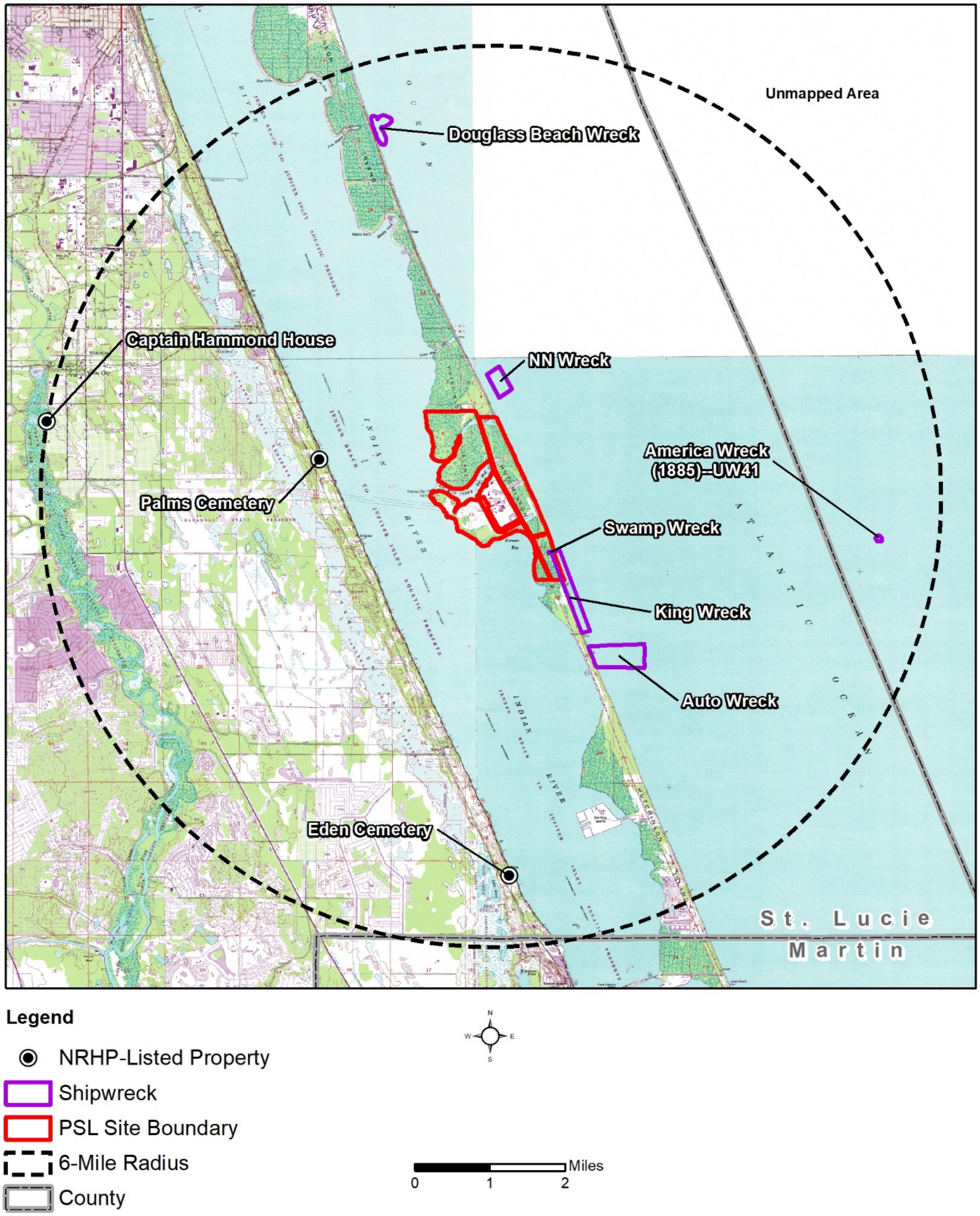



**Figure 3.8-4 NRHP-Listed Resources within 6 Miles of PSL**

**Figure 3.8-5 Pre-Construction Aerial Photograph of the PSL Region Showing Primarily Undeveloped Barrier Island with the PSL Site Depicted in the Upper Right Quadrant of the Aerial**

**Figure 3.8-6 Construction Photograph of the PSL Site Showing Tree Removal, Excavation, and Mechanical Leveling**

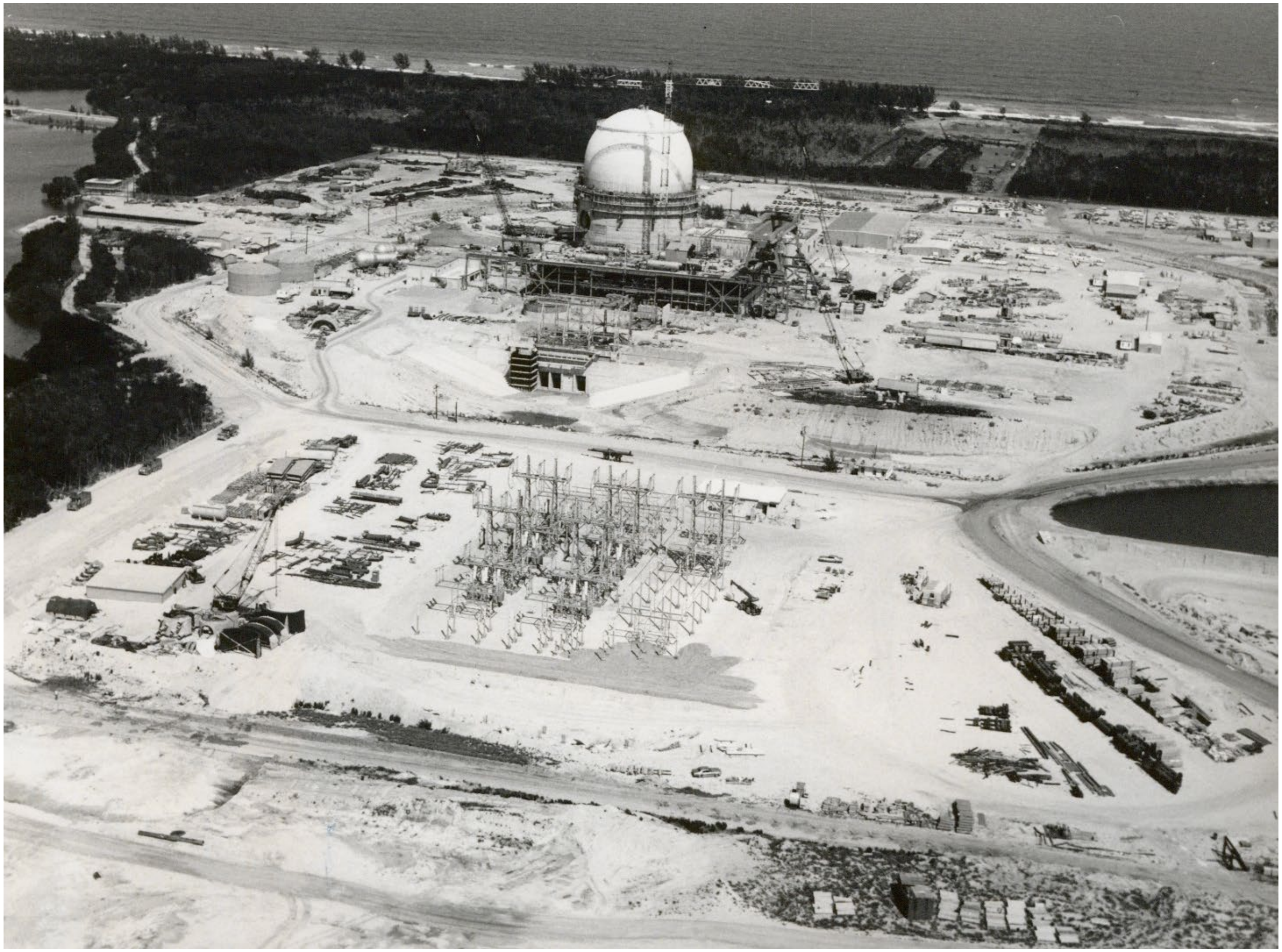


**Figure 3.8-7 Construction Photograph of PSL, Showing Areas Excavated for Structures**

**Figure 3.8-8 A Late-State Construction Photograph of PSL Showing Structures, Facilities, Buildings, and the Site Surrounded by Mangroves, the Indian River, and the Atlantic Ocean**

## 3.9 Socioeconomics

Socioeconomic descriptions are focused on Martin and St. Lucie counties because approximately 78 percent of the PSL workforce reside in the two counties, while remaining workforce are dispersed throughout the region (see Table 2.5-1).

As described in Section 2.5, refueling outages are scheduled once every 18 months per unit, with outages lasting approximately 32 days for each refueling cycle. Approximately 1,500 contract employees provide support during an outage. As seen in Figure 3.1-4, within the 50-mile radius of PSL there are several nearby Florida communities, including Fort Pierce, Port St. Lucie, and Stuart. In the region there are numerous motels, campgrounds, and food service conveniences available for contract workers who provide temporary services during site outages. Transportation corridors such as I-95, US 1, and local roads provide commuter access to SR A1A and PSL.

### 3.9.1 Employment and Income

The two geographic areas most economically influenced by PSL operations are Martin and St. Lucie counties, and because of population size and interaction of urban areas, both counties are included in the Port St. Lucie MSA and the Miami-Port St. Lucie-Fort Lauderdale CSA (see Section 3.1). Additionally, PSL is one of FPL's assets on which property taxes are paid to St. Lucie County. As presented in Section 3.11, the population of these counties are expected to increase during the proposed SLR operating term. Low-income populations and poverty thresholds for the counties are described in Section 3.11.2.

The estimated employed population in Martin County in 2019 was 104,594 persons. The leading reported occupational sector was health care and social assistance, with approximately 15 percent, or 16,054 persons employed. This was followed by retail trade with approximately 11 percent, or 11,402 persons employed; and accommodation and food services with approximately 9 percent, or 8,978 persons employed. The annual personal income in Martin County was approximately $14 billion in 2019, and the average wage per job was $45,617. In 2019, per capita personal income was $85,394. (BEA 2020) The annual average unemployment rate in Martin County has dropped steadily over the years from a reported recent high in 2009 (11.0 percent) to 3.1 percent in 2019 (BLS 2020). Martin County's largest employer is Cleveland Clinic, formerly known as Martin Memorial Health System (MC 2021c).

The estimated employed population in St. Lucie County in 2019 was 128,631. The leading reported occupational sector was health care and social assistance, with approximately 13 percent, or 16,619 persons employed. This was followed by government and government enterprises with 11 percent, or 14,479 persons employed; and retail trade with 11 percent, or 14,351 persons employed. The annual personal income in St. Lucie County was approximately $14 billion in 2019, and the average wage per job was $44,013. In 2019, per capita personal income was $41,125. (BEA 2020) The annual average unemployment rate in St. Lucie County has dropped steadily over the years from a reported recent high in 2010 (13.8 percent) to 3.9

percent in 2019 (BLS 2020). St. Lucie County's largest employer is the St. Lucie County School Board (SLC 2020d).

### 3.9.2 Housing

Between 2010 and 2019, the population in Martin County is estimated to have increased by approximately 10 percent (see Table 3.11-2). As seen in Table 3.9-1, total available housing within Martin County grew by 19.3 percent between 2000 and 2010; and increased by 3.4 percent between 2010 and 2019. In 2010, overall vacancy was 23.1 percent of total housing units, and in 2019 dropped by 3.6 percent to 19.5 percent of total housing units. With the vacancy rate showing only minimal decline in housing availability over the years, this would indicate that adequate housing was available to keep up with the Martin County population increase. The median home values in Martin County increased by 23.6 percent between 2000 and 2010, and 63.4 percent between 2010 and 2019. The median monthly rent for the county increased by 40.1 percent between 2000 and 2010, and by 35.6 percent between 2010 and 2019. (USCB 2020d)

As seen in Table 3.11-2, the population in St. Lucie County has also increased between 2010 and 2019 (approximately 18 percent). From 2000 to 2010, the total available housing grew by 50.2 percent, but slowed down between 2010 and 2019, and total available housing increased by only 6.6 percent. In 2010, overall vacant housing was 23.4 percent of total housing units, and 20.0 percent of total housing units in 2019, a drop of 3.4 percent. The reported total percentage of housing vacancy would indicate enough housing availability for the increasing county population. St. Lucie County saw large increases in housing values between 2000 and 2010 (46.3 percent), and again between 2010 and 2019 (79.4 percent). Median monthly rents also saw an increase, from 48.5 percent between 2000 and 2010, and 29.7 percent between 2010 and 2020. (USCB 2020d)

### 3.9.3 Water Supply and Wastewater

The South Florida Water Management District (SFWMD) is one of five Florida water management districts, managing water resources in a 16-county region that stretches from Orlando to the Florida Keys. Within the SFWMD, Martin and St. Lucie counties, as well as the northeastern portion of Okeechobee County, are included in the upper East Coast (UEC) water supply planning area. The SFWMD has developed the 2016 UEC water supply plan update to assess projected water demands and potential sources of water for the period from 2013 to 2040. The plan is intended for use by local governments, water users, and utilities to update and modify local comprehensive plans, facility work plans, and ordinances. (SFWMD 2021)

Total water demand in the UEC is projected to increase by 38 percent, from 257.5 MGD in 2013 to 354.7 MGD by 2040. Agriculture is projected to use 52.6 percent of the planning area's total water demand with public water systems (PWS) using 20.6 percent in 2040. The remaining four categories: domestic (residential) self-supply, recreation, and landscaping, industrial, and power generation, will account for the remaining 26.8 percent. Typically, the UEC receives abundant fresh water seasonally, with volumes exceeding human and natural system needs during wet periods. Water availability varies annually and includes periodic drought years. The UEC relies on groundwater from the surficial aquifer system and Floridian aquifer system for urban areas. In 2013, the surficial aquifer system accounted for approximately 40 percent of PWS use, and the Floridian aquifer system accounted for the remaining 60 percent. (SFWMD 2021)

A growing population in the UEC will lead to an increase in the water demand for the PWS category by 2040. Overall, the population is expected to increase by 204,304 residents (47 percent) from 434,015 in 2013 to 638,319 in 2040. St. Lucie County will experience the region's greatest population increase. Seventeen PWS utilities with a capacity of more than 0.1 MGD are currently located within the UEC planning area, with seven located in Martin County and 10 located in St. Lucie County. The portion of Okeechobee County within the UEC planning area has no PWS utilities. The city of Port St. Lucie Utility Systems Department is the largest utility in the region. (SFWMD 2021)

The projected gross water demand for 2040 for the UEC is 73.2 MGD, an increase of 25.6 MGD from the 2013 demand of 47.6 MGD. The cumulative volume of water currently allocated for PWS slightly exceeds the total projected demand for 2040, and the majority of PWS water providers appear able to meet their 2040 projected demand without additional permit allocation or infrastructure. Two utilities likely face a potential future deficit on an average daily or peak demand basis. To meet these projected needs, one utility has proposed projects that will supply the deficit, and the other utility is in the process of modifying their water use permit to meet projected demands. While only one utility will need to complete projects to meet 2040 projected demands, five utilities have proposed 10 new potable water supply projects, totaling 23.6 MGD. Projects include increased storage via proposed reservoirs, aquifer storage and recovery, and other traditional and alternative water supply projects. In addition to the potable water supply projects, the UEC identified seven non-potable water projects proposed by utilities. Four of these are reclaimed water projects. (SFWMD 2021)

Domestic self-supply includes potable water from a private domestic well serving a private residence and utilities that produces less than 0.1 MGD on an annual basis. Domestic self-supply average net (finished) demands in the UEC are projected to decrease from 3.83 MGD in 2013 to 0.74 MGD in 2040. This decrease is expected to occur because utilities are expanding their distribution lines and encouraging homeowners to connect. Domestic self-supply needs are currently met with fresh groundwater utilizing the surficial aquifer system. All future needs in this use category are expected to be met using fresh groundwater supplies. As such, no water supply development projects are proposed for this use class. (SFWMD 2021)

In 2013, 21 wastewater treatment facilities in the UEC had a capacity of 0.1 MGD or greater, 20 of these reused at least part of their wastewater. Although the regional capacity of wastewater treatment facilities in the UEC area totals 48.2 MGD, an average of only 22.4 MGD of wastewater was treated in 2013. Regionally, 7.9 MGD (35 percent) of the treated wastewater in 2013 was reused, primarily for public access irrigation, such as irrigation of golf courses, parks, schools, and residences. Public access irrigation accounted for 6.7 MGD of the 7.9 MGD, 0.6

was reused for groundwater recharge through percolation ponds, and 0.6 MGD was reused for other uses such as agriculture and industrial. Effluent not reused was disposed of through deep well injection (13.9 MGD). Currently, there are no reclaimed water producers in the portion of northeastern Okeechobee County located in the UEC. As of 2013, 27 percent of the wastewater generated in St. Lucie County and 52 percent of the wastewater generated in Martin County is being reused. Utilities are projecting wastewater flows will increase from 22.4 MGD in 2013 to approximately 37.8 MGD by 2040. Utilities currently distributing reclaimed water intend to continue and expand their reuse systems as additional reclaimed water and users become available. In many cases, future reuse will occur in new residential developments. (SFWMD 2021)

At PSL, water used for Units 1 and 2 reactors and most other plant systems is piped in from the Ft. Pierce municipal water supply. A separate supply of water that cools the turbine steam supply for re-use comes from, and is returned to, the Atlantic Ocean through pipes located offshore. (FPL 2020c) Sanitary wastewater from PSL is released to St. Lucie County's South Hutchinson Island water reclamation facility. Reclaimed water from the facility is sometimes used for irrigation on Hutchinson Island. When the reclaimed water supply exceeds the demand, the excess is pumped by agreement to a point beyond the point of discharge in the PSL discharge canal. (FDEP 2020a)

### 3.9.4 Community Services and Education

As of the 2019-2020 school year, Martin County had one public school district with a reported 18,624 total students and 34 schools (grades pre-kindergarten to 12). The public school district student/teacher ratio was 16.85. Martin County also reported eight private schools with a total of 1,414 students (2017-2018 school year). (NCES 2021)

There is one public school district in St. Lucie County. For the 2019-2020 school year, St. Lucie County had 41,409 total students with 50 schools for the education of grades pre-kindergarten through 12. The public school district student/teacher ratio was 17.66. St. Lucie County also had 24 private schools with a reported enrollment of 5,108 students. (NCES 2021)

Within approximately 50 miles of PSL there are 24 two-year and four-year higher educational institutions (both public and private), with 10 schools offering bachelor and advanced degrees. Within St. Lucie County (where PSL is located), the cities of Port Saint Lucie and Fort Pierce are home to five of these educational facilities. (NCES 2021).

For Martin County emergency services, primary law enforcement is provided through the county sheriff's office, and the town of Sewall's Point and city of Stuart police departments (USACOPS 2021). According to National Fire Department Registry reporting (2021), residents are served by 353 career firefighters based out of 18 stations scattered throughout Martin County (USFA 2021). A wide range of medical facilities and treatment centers are available in Martin County. There are two full-service hospitals located in the city of Stuart: the Cleveland Clinic Martin North Hospital (244 beds), and Cleveland Clinic Martin South Hospital (100 beds). (FHA 2021)

For St. Lucie County emergency services, law enforcement is provided through the county sheriff's office, and city of Fort Pierce and city of Port St. Lucie police departments (USACOPS 2021). The St. Lucie County Fire District has 410 active career firefighters located at 19 fire stations in the county (USFA 2021). St. Lucie County has three full-service acute care hospitals in the city of Port St. Lucie: the Cleveland Clinic Tradition Hospital (177 beds), Lawnwood Regional Medical Center and Heart Institute (392 beds), and St. Lucie Medical Center (229 beds). (FHA 2021)

### 3.9.5 Local Government Revenues

In Florida, property taxes are levied on both real and personal property. Each year the county property appraiser determines property value and exemptions to calculate taxable value. The county commissioners and other taxing districts set millage rates. After property tax payments are received, funds are distributed to government agencies and taxing authorities. For the fiscal year (FY) ending September 30, 2019, the combined total operating millage rate of 7.8704 mills was established to support the St. Lucie County operating budget and dependent districts. (SLC 2020a) FPL pays annual property tax payments to St. Lucie County on behalf of PSL for primary government expenses, and supports the county school and fire districts, the County Board of Commissioners, and the SFWMD. (NRC 2011)

In FY 2019, St. Lucie County's total general revenues were $347.7 million, or a 12.9 percent increase over 2018 total revenues ($307.9 million). General property tax, the largest source of revenue in the County were $175.3 million for FY 2019, or 50.4 percent of the county total primary government revenues. Along with property tax, other revenue sources for St. Lucie County include capital grants and contributions, operating grants and contributions, interest earnings, franchise and sales taxes, miscellaneous, state-shared revenues, and charges for services. (SLC 2020d)

St. Lucie County primary government expenses for FY 2019 were $342.9 million, which was a 11.2 percent increase over FY 2018 expenses ($308.3 million). St. Lucie County expenses cover a wide range of services and some of the larger government programs receiving county funding were public safety (37.1 percent), general government (16.8 percent), and transportation (10.8 percent). The approximately 35 percent of remaining program expenses includes physical environment, economic environment, human services, court related, culture and recreation, bailing and recycling, water and sewer, golf course, building code, and interest and fiscal charges. (SLC 2020d)

In St. Lucie County, from 2008 to 2014 the total assessed real property value decreased by 49 percent due to the Great Recession. As the economy has slowly recovered in recent years, real property valuations have also increased. In 2019 the real property valuations increased by 19 percent countywide, and there was an 8.1 percent increase in St. Lucie County total property tax revenues between 2018 and 2019. (SLC 2020d)

FPL is considered a principal property taxpayer in St. Lucie County, and the assessed property valuation of FPL property was approximate $3.4 billion in FY 2019. As seen in Table 3.9-2, the FPL property tax payment to St. Lucie County in FY 2019 was approximately 26 percent of the total County property tax revenue. Although FPL's property tax payments have been on the rise in recent years, total county property taxes revenues have also annually been increasing, resulting in FPL's annual payment having dropped over the years as a percentage of the total county property tax revenues. There have been no adjustments to the FPL 2015–2019 annual property tax payments after they were initially paid. At this time, FPL does not anticipate any changes to state law that would amend St. Lucie County's property valuation methodology or future assessments. (SLC 2020d)

PSL is not only located in the community it serves, but is an integral part of community happenings. FPL employees are actively involved in United Way, scout organizations, Little League Baseball, chambers of commerce and other local organizations, and are always available to speak to local community groups, including neighborhood residential associations. FPL is one of the area's largest employers, providing a solid base of support through local purchases, service contracts and tax payments. FPL also conducts a "Power to Care" week each year during which hundreds of employees volunteer at non-profit organizations across the state, including local counties. Employees are also active in the FPL annual iPledge drive, which raises millions of dollars for local non-profits. (FPL 2020c; )

### 3.9.6 Transportation

As discussed in Section 3.1, transportation in the PSL region includes an extensive road network serving both rural and urban areas, public transit bus systems, passenger rail, and airports. The primary road network in the area is shown in Figure 3.1-3 and Figure 3.1-4. Major roads and highway transportation corridors in the region include I-95, the Florida Turnpike, and US 1, with both running north and south through the state of Florida, connecting coastal cities.

PSL staff and plant visitors arrive at the plant on SR A1A, the major north-south route on Hutchison Island in St. Lucie County. SR A1A traverses FPL's property to the east of PSL Units 1 and 2. Within St. Lucie County, SR A1A is considered a secondary highway. The Florida Department of Transportation (FDOT) provides average annual daily traffic (AADT) volumes for state roads, including SR A1A. Between 2015 and 2019, the AADT count for SR A1A was reported to run as low as 3,000 vehicles (2015) and as high as 4,800 vehicles (2016). For the most recent year of reporting (2019), the AADT count for SR A1A was 4,400 vehicles. (FDOT 2021).

The US Transportation Research Board has developed a commonly used indicator called level of Service (LOS) to measure how well a highway accommodates traffic flow. LOS is a qualitative assessment of traffic flow and how much delay the average vehicle might encounter on a road. LOS categories as defined in the Highway Capacity Manual are listed in Table 3.9-3.

The St. Lucie County traffic counts and LOS report (Fall/Winter 2019/2020) has assigned a LOS classification of "C" for SR A1A during peak drive times. Utilizing 2017 FDOT AADT reporting with traffic volumes representing both lane directions and adjusted using FDOT peak seasonal factors, the county analyzed data from two count stations situated north and south of PSL along SR A1A. The count station established between Nettles Island (residential neighborhood south of PSL) and the plant has a peak hour service capacity of 920 vehicles. The AM peak hour/peak direction volume was 337 vehicles, or volume to service capacity ratio (V/C) of 0.387, and the PM peak hour/peak direction was 302 vehicles or 0.347 V/C. North of the plant, the count station established between PSL and Blue Heron Boulevard (location of residential neighborhood) has a peak hour service capacity of 700 vehicles. The AM peak hour/peak direction volume at this location was 457 vehicles or 0.692 V/C, and PM peak hour/peak direction volume was 367 vehicles or 0.556 V/C. The analysis indicates a lower vehicular road capacity at the north SR A1A count station, and a higher volume of traffic during peak times. With the current range of reported AADT counts for SR A1A remaining consistent over the years, and a LOS classification assignment of "C," there should be ample capacity to support traffic accessibility at PSL. (SLC 2021h)

According to the FDOT 2021–2025 five-year work program for statewide transportation, in St. Lucie County the SR A1A road segment associated with PSL has no current nor scheduled future road construction projects (FDOT 2021). FDOT has designated SR A1A a scenic roadway and it is identified by St. Lucie County for protection and preservation of its intrinsic (historical, archaeological, cultural, recreational, scenic, and natural) resources while minimizing any potential negative impacts on adjacent properties (SLC 2021i).

### 3.9.7 Recreational Facilities

As seen in Figure 3.1-5 and Figure 3.1-6, there are a number of public lands and recreational activities located within the region and vicinity of PSL. Table 3.1-1 identifies the various public parks, beaches, and attractions located within a 6-mile radius of PSL, and shows that the majority fall within St. Lucie County. In 2017, St. Lucie County issued the results of a county-wide visitor tracking and economic impact study. While individual attraction visitation numbers were not available, the county visitor study reported approximately 1.2 million persons visited St. Lucie County in 2017. (SLC 2020e)

As seen in Figure 3.1-1, the PSL Nuclear Training Center is outside the restricted area but within the EAB. The training center building is the location of the onsite visitor center, Energy Encounter. Along with training activities and meetings, Energy Encounter is open to the public by appointment only, used for community stakeholder meetings, and allows visitors to experience interactive exhibits on electricity, nuclear energy, and the environment. No PSL public visitation numbers are available for Energy Encounters. (FPL 2020c)

To increase awareness of sea turtle nesting, surveys have been conducted since 1971 on beaches near the plant. This is one of the longest nesting surveys in the world. PSL biologists also lead "turtle walks" to enable members of the public to observe nesting sea turtles. These walks have been held by FPL since 1989 to increase public awareness of sea turtle conservation issues. Approximately 450-500 people attend the walks each year, which includes education information on turtles and PSL's role in protecting the environment. (FPL 2020c)

**Table 3.9-1 Housing Statistics, 2000–2019**

| Name | 2000 | 2010[(a)] | 2000 to 2010 Change (%) | 2019 Estimate[(b)] | 2010 to 2019 Change (%) |
|---|---|---|---|---|---|
| **Martin County** | | | | | |
| Total Housing Units | 65,471 | 78,132 | 19.3 | 80,779 | 3.4 |
| Occupied Units | 55,288 | 60,090 | 8.7 | 65,014 | 8.2 |
| Vacancy Units | 10,183 | 18,042 | 77.2 | 15,765 | -12.6 |
| Vacancy Percent | 15.6 | 23.1 | 7.5 | 19.5 | -3.6 |
| Median House Value ($) | 152,400 | 188,400 | 23.6 | 307,800 | 63.4 |
| Median Rent ($/month) | 633 | 887 | 40.1 | 1,203 | 35.6 |
| **St. Lucie County** | | | | | |
| Total Housing Units | 91,262 | 137,038 | 50.2 | 146,060 | 6.6 |
| Occupied Units | 76,933 | 104,982 | 36.5 | 116,900 | 11.4 |
| Vacancy Units | 14,329 | 32,056 | 123.7 | 29,160 | -9.0 |
| Vacancy Percent | 15.7 | 23.4 | 7.7 | 20.0 | -3.4 |
| Median House Value ($) | 86,100 | 126,000 | 46.3 | 226,000 | 79.4 |
| Median Rent ($/month) | 621 | 922 | 48.5 | 1,196 | 29.7 |

(USCB 2020d)

a) 2010 American Community Survey one-year estimates.

b) 2019 American Community Survey one-year estimates.

**Table 3.9-2 FPL Property Tax Payments 2015–2019**

| Year | Annual Property Tax Paid by FPL[(a)] | FY Total St Lucie County Property Tax Revenues | FPL % of Total County Property Tax |
|---|---|---|---|
| 2015 | 41,794,304.64 | 125,441,070.00 | 33 |
| 2016 | 43,794,619.13 | 135,745,043.00 | 32 |
| 2017 | 41,848,947.50 | 145,340,196.00 | 29 |
| 2018 | 44,350,053.21 | 162,131,840.00 | 27 |
| 2019 | 45,762,840.37 | 175,283,557.00 | 26 |

(SLC 2020d)

a) FPL Total Property Tax Payment – Real and Tangible (Personal)

**Table 3.9-3 Level of Service Definitions**

| Level of Service | Conditions |
|---|---|
| A | Free flow of the traffic stream; users are mostly unaffected by the presence of other vehicles. |
| B | Free flow of the traffic stream, although the presence of other vehicles becomes noticeable. Drivers have slightly less freedom to maneuver. |
| C | The influence of the traffic density on operations becomes marked and queues may be expected to form. The ability to maneuver with the traffic stream is clearly affected by other vehicles. |
| D | The ability to maneuver is severely restricted due to traffic congestion. Travel speed is reduced by the increasing volume. Only minor disruptions can be absorbed without extensive queues forming and the service deteriorating. |
| E | Operations at or near capacity, an unstable level. The densities vary, depending on the free-flow speed. Vehicles are operating with the minimum spacing (or gaps) for maintaining uniform flow. Disruptions cannot be dissipated readily, often causing queues to form and service to deteriorate to LOS F. |
| F | Forced or breakdown of flow. It occurs either when vehicles arrive at a rate greater than the rate at which they are discharged or when the forecast demand exceeds the computed capacity. Queues form behind these breakdowns. Operations within queues are highly unstable, with vehicles experiencing brief periods of movement followed by stoppages. |

## 3.10 Human Health

This section describes site conditions likely to contribute to the occurrence of pathogenic thermophilic microbiological organisms; methodology and procedures designed to meet the regulatory requirements and standards for limiting potential induced current hazards arising from energized in-scope transmission lines; and a description of the plant's radiological health environment and preventative measures necessary to reduce potential exposure levels to plant workers and visitors during plant operations.

### 3.10.1 Microbiological Hazards

In the GEIS, the NRC considered health impacts from thermophilic microorganisms posed to both the public and plant workers because ideal conditions for thermophilic microorganisms can result from nuclear facility operations and discharges. Microorganisms of particular concern include several types of bacteria (*Legionella* species, *Salmonella* species, *Shigella* species, and *Pseudomonas aeruginosa*) and the free-living amoeba *Naegleria fowleri*. The public can be exposed to the thermophilic microorganisms *Salmonella*, *Shigella*, *P. aeruginosa*, and *N. fowleri* during swimming, boating, or other recreational uses of freshwater[1]. If a nuclear plant's thermal effluent enhances the growth of thermophilic microorganisms in waters open for recreational use, recreational users could experience an elevated risk of exposure when using waters near the plant's discharge. (NRC 2013a; NRC 2020a)

*Legionella* is a genus of common warm water bacteria that occurs in lakes, ponds, and other surface waters, as well as some groundwater sources and soils. *Legionella* optimally grow in stagnant surface waters with biofilms or slimes that range in temperature from 95°F to 113°F, although the bacteria can persist in waters from 68°F to 122°F. The bacteria are only pathogenic to humans when aerosolized and inhaled into the lungs. As such, human infection is often associated with complex water systems housed within buildings or structures, such as cooling towers. (NRC 2020a)

*N. fowleri* is ubiquitous in nature and thrives in water bodies at temperatures ranging from 95°F to106°F or higher and is rarely found in water cooler than 95°F. Infection rarely occurs in water temperatures of 95°F or less (NRC 2013a, Section 3.9.3). *N. fowleri* is not found in saltwater, like the ocean. Infections occur when *N. fowleri* penetrates the nasal tissue through direct contact with water in warm lakes, rivers, or hot springs and migrates to the brain tissues (CDC 2020). There have been only 38 cases of primary amebic meningoencephalitis, the infection caused by *N. fowleri*, in Florida from 1962–2020 (FDOH 2020).

The other human pathogens mentioned above have infection routes of contact with infected persons or contaminated water, food, soil, or other contaminated material. The pathogens can grow at a range of temperatures, but as human pathogens, have an optimal growth temperature

[1] Research indicates species of *Legionella, Salmonella*, and *Shigella* can survive in seawater (Gast et. al. 2011; Wait and Sobsey 2001). *Pseudomonas aeruginosa* has been detected in marine water samples (Khan et. al. 2010).

around the human body temperature. The U.S. Centers for Disease Control and Prevention reports no outbreaks or cases of waterborne *Salmonella* infection from recreational waters in the United States 2009–2018 (NRC 2020a, Section 3.11.3). There were no reported cases of infection from waterborne *Salmonella* spp. in the United States in 2019 (CDC 2019). There were no infection cases from waterborne pathogens in untreated recreational water in Florida in 2013–2014 (CDC 2014). The exposure route of concern would be contact with contaminated water containing a population of microorganisms sufficient for human infection.

PSL utilizes a once-through cooling system for both units that draws water from and discharges to the Atlantic Ocean. Biofouling of the condenser tubes and other system components is controlled through the use of plastic foam balls (Taprogge® system) and injection of sodium hypochlorite. The foam balls are injected upstream from the condenser, scrub the condenser tubes as they pass through the tubes, and are collected in ball strainers downstream from the condensers (FPL 2001, Section 3.1.3.2). The plant's IWFP No. FL0002208 specifies water treatment chemicals and biocides and their dosage rates and sets a total residual oxidant concentration at the eastern end of the discharge canal as at or below 0.10 mg/l (FDEP 2020c).

Heated water is discharged to the discharge canal located to the east and west of SR A1A. The discharge canal is posted as no trespassing/authorized personnel only. Public access to the discharge canal is further controlled by barriers. The discharge canal is fenced at the SR A1A and beach ends. Along the north and south sides of the discharge canal as it extends beachward from SR A1A is mangrove swamp. Work at and near the discharge canal by PSL-authorized personnel is governed by the plant's industrial safety program and safety handbook.

The discharge canal transports the heated cooling water to two discharge pipes at its eastern terminus. The pipes transport water beneath the beach and dune system back to the Atlantic Ocean. The discharge pipe serving PSL Unit 1 is 12 feet in diameter, extends approximately 1,500 feet offshore, and terminates in a two-port "Y" diffuser. The other pipe, for Unit 2 operation, is 16 feet in diameter, extends approximately 3,400 feet offshore, and features a multiport diffuser. This diffuser consists of fifty-eight 16-inch diameter ports located 24 feet apart on the easternmost 1,400 feet of the pipe. The discharge of heated water through the Y-port and multiport diffusers ensure distribution over a wide area and rapid and efficient mixing with ambient waters. (FPL 2001, Section 3.1.3.2). Temperature of the discharged cooling water is limited by the IWFP. These limits require that heated water from the diffusers, as measured near the exit from the discharge canal, not exceed 115°F or 30°F above ambient during normal operations; a maximum temperature of 117°F or 32°F above ambient is permitted during maintenance operations. (FDEP 2016a; FDEP 2020c) PSL's Atlantic Ocean discharge is the sole thermal discharge along PSL's approximately 2.35-mile-long oceanfront. The plant's offshore discharge is near the center of the plant's site boundary along the ocean. Therefore, PSL's thermal discharge would not overlap with other thermal discharges.

Two county parks, Walton Rocks Beach and Dog Park and Ocean Bay Riverside Park, lie within the southern PSL property boundary and are shown in Figure 3.1-5. To the north, Blind Creek public access (Riverside South and Beachside units) falls outside of the site boundary.

Beachfront fencing and the thick mangrove swamp restrict the public's approach to the discharge canal. As stated above, the submerged discharge pipes are located 1,500 feet and more offshore and the heated water rapidly mixes with the ocean waters. Navigation buoys in the Atlantic Ocean flank the discharge area. (FPL 2001, Section 2.1, Figure 2.1-3)

NRC guidance regarding microbiological hazards is that applicant's consult the state agency responsible for environmental health regarding the potential existence and concentration of the above microorganisms in the receiving waters for plant cooling water discharge (NRC 2013b). Correspondence with the Florida Department of Health (FDOH) regarding the PSL thermal discharge is included in Attachment E.

### 3.10.2 Electric Shock Hazards

The electric field created by high-voltage lines can extend from the energized conductors on the lines to other conducting objects, such as the ground, vegetation, buildings, vehicles, and persons if appropriate clearances are not maintained, posing a shock hazard for the public and workers. To minimize the shock that could be experienced by someone touching an object that is capacitively charged, the clearance between the power lines and the object must limit the induced current to a low enough electrical charge. The National Electrical Safety Code (NESC) contains the basic provisions considered necessary for the safety of workers and the public.

The in-scope transmission lines (Figure 2.2-4) are located completely within the PSL property boundary as well as being wholly located within the owner-controlled area. Thus, risk to the public is minimized due to restricted site access. Furthermore, the transmission lines span areas with additional layers of access restrictions. The in-scope transmission lines span the fenced protected area, the intake canal, and the fenced switchyard. The protected area includes control measures, such as barriers, monitoring-detection equipment, and armed security guards. The switchyard and entry relay house are surrounded by a security wall with electronic security access, monitoring, and alarm equipment. Only qualified personnel are permitted in the protected site and controlled switchyard locations. There is only a small strip of property between the switchyard and intake canal of approximately 50 feet, which is not enveloped within the two secured areas. However, the area is within the owner-controlled area and has no features for personnel to gather (i.e., benches, break areas).

The in-scope transmission lines between the switchyard up to the main and start-up transformer elevated tower connection sections are within the responsibility of the transmission system owner. The minimum clearances for these transmission lines over equipment and pedestrians are met with large margins. The lines meet the design requirements of NESC Specification D-7 based on American National Standards Institute (ANSI) C2-2007.

The in-scope transmission lines are designed to meet the clearance requirements of the NESC in effect at the time of its construction, with a minimum clearance of 15.4 feet between accessible portions of the bridge crane and to the nearest 230-kV conductor. A minimum clearance of 20 feet is maintained for conditions, which would result in the most severe degree of transmission line sag, due to factors such as heat, ampere loading and wind. In addition, there is a clearance of 20 feet between the main transformer transmission line phases (A, B & C), 16 feet 4 inches between the start-up transformer transmission line phases (A, B & C), and a 41.18-foot clearance (with sag) between the start-up transmission lines and the roadway. The main transformer transmission lines have a clearance greater than 41.18 feet from the roadway.

Work on the PSL site is governed by a comprehensive industrial safety program consisting of a safe work practices manual, a safety handbook, a fleet industrial safety procedure, and tiered PSL administrative procedures. For the PSL site, FPL uses and follows the U.S. Occupational Safety and Health Administration (OSHA) standard 29 CFR Part 1910 Subpart R, Special Industries, as it relates to electric power generation, transmission, and distribution (29 CFR 1910.269). This standard incorporates, by reference many other consensus standards. OSHA does not develop specific standards if there are other standards that are equally enforceable and of sufficient quality that can be used in conjunction with OSHA standards. For example, Appendix G of Subpart R includes references to the following consensus standards used during development of the current OSHA 1910.269 standard, established in November of 2016. The consensus standards were developed by the following:

- ANSI, which is inclusive of NESC;
- American Society of Mechanical Engineers (ASME);
- American Society of Testing and Materials (ASTM);
- National Fire Protection Association (NFPA), and others.

The PSL industrial safety program includes procedures on general electrical safety, electrical arc protection and boundary requirements, use of ladders and portable equipment, etc. Additional instructions are provided for using forklifts, platform lift trucks, rigging, cranes, and man-lifts to ensure these are placed and operated safely. Safe work approach distances are incorporated into PSL safe work practices manuals and procedures, as appropriate. PSL has a workplace hazards identification process and performs jobsite analysis of workplace hazards, focusing on mitigation activities to eliminate risk and potential for both injury and human error. PSL also has grounding and bonding procedural guidance for the in-scope transmission lines and transformers to ensure any temporary vehicles or structures parked near or adjacent to the in-scope transmission lines are properly grounded and/or bonded to PSL's established ground grid.

### 3.10.3 Radiological Hazards

As required by NRC regulations at 10 CFR 20.1101, "Radiation protection programs," FPL designed a radiation protection program to protect onsite personnel (including employees and contractor employees), visitors, and offsite members of the public from radiation and radioactive material at PSL. NRC regulations require that gaseous and liquid radioactive releases from nuclear power plants must meet radiation dose-based limits specified in 10 CFR Part 20, "Standards for Protection Against Radiation," and the ALARA criteria in 10 CFR Part 50,

Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low as is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents." Through these release limits, the NRC places regulatory limits on the radiation dose that members of the public can receive from a nuclear power plant's radioactive effluent. PSL's ODCM contains the methods and parameters for calculating offsite doses resulting from liquid and gaseous radioactive effluents. The liquid and gaseous radioactive effluents and calculated doses are reported in annual radiological effluent releases reports. Any updates to the ODCM are presented in the report and the updated ODCM is appended to the report. (FPL 2020a) The monitoring and dose calculation methods ensure that radioactive material discharges from PSL meet NRC and EPA regulatory dose standards. The NRC established the total effective dose equivalent (TEDE) to individual members of the public from the licensed operation does not exceed 0.1 roentgen equivalent man (rem) (100 millirem [mrem]; 1 millisievert [mSv]) in a year (10 CFR 20.1301(a)(1), and further established guidance on maintaining dose ALARA in 10 CFR Part 50, Appendix I. The EPA established the annual dose or dose limit to any member of the public due to operations to 25 mrem to the whole body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrem (40 CFR Part 190).

PSL's annual radioactive effluent release reports contain a detailed presentation of the radioactive liquid and gaseous effluents released from PSL and the resultant calculated doses. Calculated doses from radioactive effluents for 2019 are detailed below (FPL 2020a):

<u>Liquid Releases:</u>

| | |
|---|---|
| Total body dose | 7.72E-03 mrem (ALARA criteria 3 mrem) |
| Lung (highest organ dose) | 9.23E-03 mrem (ALARA criteria any organ 10 mrem) |

<u>Gaseous Releases, Noble Gases:</u>

| | |
|---|---|
| Gamma Air Dose | 5.75E-03 milliradiation (mrad) (ALARA criteria 10 mrad) |
| Beta Air Dose | 2.60E-03 (mrad; ALARA criteria 20 mrad) |

<u>Gaseous Releases, Radioiodines, Tritium, and Particulates:</u>

| | |
|---|---|
| Bone (highest organ dose) | 6.12E-03 mrem (ALARA criteria any organ 15 mrem) |

Using actual metrological data for calendar year 2019, FPL assessed radiation dose from radioactive effluents to members of the public due to their activities inside the PSL site boundary. The assessment assumes the member of the public to be a lifeguard at the Walton Rocks Beach recreation area. The visitor is assumed to be onsite for 6 hours per day for 312 days per year at a distance of 1 mile in the southeast sector. The assumed member of the public received exposure from each of the two reactors. The calculated doses were the following, complying with the radiological limits. (FPL 2020a)

Noble Gas:

| | |
|---|---|
| Gamma Air Dose | 1.95E-03 mrad |
| Beta Air Dose | 8.82E-04 mrad |

Gas, Particulate, Iodine, Carbon Dose:

| | |
|---|---|
| Bone | 3.08E-04 mrem |
| Liver | 1.16E-04 mrem |
| Thyroid | 1.44E-04 mrem |
| Kidney | 1.16E-04 mrem |
| Lung | 1.58E-04 mrem |
| GI-LLI | 1.17E-04 mrem |
| Total Body | 1.28E-04 mrem |

PSL also monitors radioactivity onsite and in the surrounding approximately 10-mile radius through its Radiological Environmental Monitoring Program (REMP) to identify any undue accumulation of radioactivity in any sector of the environment. The program samples direct radiation gamma exposure continuously at 27 sample locations ranging from one to 10.8 miles distance and a control location at 18.1 miles distance. The direct radiation gamma exposure sampling uses thermoluminescent dosimeters. Airborne radioiodine and particulate samplers are operated continuously at two onsite and three offsite locations. Broadleaf vegetation samples are collected monthly from three near offsite locations. Samples of surface water are collected weekly and monthly at two locations, one within one mile and a second 10+ miles distance and shoreline sediment, fish, and invertebrate samples are collected semiannually at the same two locations. (FPL 2020b)

Samples are collected by and analysis is conducted by the FDOH, Bureau of Radiation Control. Annual reports on the results are submitted to the NRC. The 2019 report concluded that the data verify that the levels of radiation and concentrations of radioactive materials in environmental samples, representing the highest potential exposure pathways to members of the public, are not increasing. Measured exposure rates are consistent with exposure rates that were observed during the preoperational surveillance program. (FPL 2020b)

Occupational exposure at nuclear power plants is monitored by the NRC. PSL's average annual individual occupational dose was well under the NRC exposure limit and the collective worker dose was also below average. The 3-year (2016 to 2018) average occupational dose per individual (TEDE) was 0.081 rem for PSL. The annual occupational TEDE limit is 5 rems [10 CFR 20.1201(a)(1)]. The NRC also trended PSL's collective dose for workers. From 2016 to

2018, the collective dose per reactor at PSL was comparable to average collective dose for pressurized water reactors. (NRC 2020b)

## 3.11 Environmental Justice

This section characterizes the population and demographic characteristics, including the identification of minority and low-income individuals, within a 50-mile radius of PSL.

### 3.11.1 Regional Population

The GEIS presents a population characterization method based on two factors: "sparseness" and "proximity" (NRC 1996b, Section C.1.4). Sparseness measures population density and city size within 20 miles of a site and categorizes the demographic information as follows.

**Demographic Categories Based on Sparseness**

| | | Category |
|---|---|---|
| **Most sparse** | 1. | Less than 40 persons per square mile and no community with 25,000 or more persons within 20 miles. |
| | 2. | 40 to 60 persons per square mile and no community with 25,000 or more persons within 20 miles. |
| | 3. | 60 to 120 persons per square mile or less than 60 persons per square mile with at least one community with 25,000 or more persons within 20 miles. |
| **Least sparse** | 4. | Greater than or equal to 120 persons per square mile within 20 miles. |

(NRC 1996b, Section C.1.4)

"Proximity" measures population density and city size within 50 miles and categorizes the demographic information as follows.

**Demographic Categories Based on Proximity**

| | | Category |
|---|---|---|
| **Not close proximity** | 1. | No city with 100,000 or more persons and less than 50 persons per square mile within 50 miles. |
| | 2. | No city with 100,000 or more persons and between 50 and 190 persons per square mile within 50 miles. |
| | 3. | One or more cities with 100,000 or more persons and less than 190 persons per square mile within 50 miles. |
| **Close proximity** | 4. | Greater than or equal to 190 persons per square mile within 50 miles. |

(NRC 1996b, Section C.1.4)

The GEIS then uses the following matrix to rank the population in the region of the plant as low, medium, or high.

**GEIS Sparseness and Proximity Matrix**

| | | Proximity | | | |
|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** |
| **Sparseness** | **1** | 1.1 | 1.2 | 1.3 | 1.4 |
| | **2** | 2.1 | 2.2 | 2.3 | 2.4 |
| | **3** | 3.1 | 3.2 | 3.3 | 3.4 |
| | **4** | 4.1 | 4.2 | 4.3 | 4.4 |

Low Population Area (1.1, 1.2, 2.1) | Medium Population Area | High Population Area (3.4, 4.3, 4.4)

(NRC 1996b, Figure C.1)

The 2010 census population and TIGER/line data from the U.S. Census Bureau (USCB) were used to determine demographic characteristics in the vicinity of the site (USCB 2021f). The data were processed at the state, county, and census block levels using ESRI ArcGIS software (USCB 2021h; USCB 2021e; USCB. 2021g). Census data include people living in group quarters such as institutionalized and non-institutionalized populations. Examples of institutional populations living in group quarters are correctional institutions (i.e., prisons, jails, and detention centers); nursing homes; mental (psychiatric) hospitals; hospitals or wards for the chronically ill; and juvenile institutions. Examples of non-institutional populations living in group quarters are group homes; college dormitories; military quarters; soup kitchens; shelters for abused women (shelters against domestic violence or family crisis centers); and shelters for children who are runaways, neglected, or without conventional housing. (USCB 2021i)

The 2010 census data indicate that approximately 426,141 people live within a 20-mile radius of the PSL site, which equates to a population density of approximately 339 persons per square mile (USCB 2021g). Based on the GEIS sparseness index, the site is classified as Category 4 with greater than or equal to 120 persons per square mile within 20 miles.

The 2010 census data indicate that approximately 1,272,305 people live within a 50-mile radius of the site, which equates to a population density of approximately 162 persons per square mile (USCB 2021g). There are three cities within a 50-mile radius that have a population greater than 100,000 residents (Table 3.11-1). Based on the GEIS proximity index, the site is classified as Category 3, one or more cities with 100,000 or more persons and less than 190 persons per square mile within 50 miles.

As illustrated in the GEIS sparseness and proximity matrix, the combination of “sparseness” Category 4 and “proximity” Category 3 results in the conclusion that PSL is located in a “high” population area.

The area within a 50-mile radius of the PSL site totally or partially includes nine counties within the state of Florida (Table 3.11-2). A portion of Hendry County, Florida, is also included in the 50-mile radius; however, this portion is water and the USCB does not record any permanent population for this area. According to the 2010 census, the permanent population (not including transient populations) of the entire nine counties was 2,845,996 (Table 3.11-2). By 2063, the end of the proposed PSL operating term for Unit 2, the permanent population (not including transient populations) of the entire nine counties is projected to be approximately 4,841,057. Based on 2010–2063 population projections, an annual growth rate of approximately 1 percent is anticipated for the permanent population in the nine counties wholly or partially within a 50-mile radius (FOEDR 2021).

As shown in Table 3.11-2, the total population (including transient populations) of the nine counties, which are totally or partially included within a 50-mile radius, is projected to be approximately 5,265,819 in 2063. The total population (including transient populations) within the 50-mile radius is projected to be 2,211,579 in 2063. (FOEDR 2021; USCB 2021g; USCB 2021h; VFL 2017; VFL 2021)

The latest permanent population projections for Florida were obtained from the Florida Office of Economic and Demographic Research (FOEDR 2021). County-level permanent population values for the counties within a 50-mile radius are shown in Table 3.11-2. Transient data for the State of Florida was obtained from Visit Florida. The average length of stay for domestic, Canadian, and overseas visitors is 4.2, 21.2, and 11 nights respectively. (VFL 2017; VFL 2021).

PSL is located in St. Lucie County. As shown in Table 3.11-2, the population of St. Lucie County, Florida, as reported in the 2010 census was 277,789. Based on Florida's population projection data, St. Lucie County's projected permanent population for 2063 is expected to be 502,822. (FOEDR 2021; USCB 2021e). Estimated projected populations and average annual growth rates for St. Lucie County are shown in Table 3.11-3.

Cities, towns, villages, and some CDPs with centers falling within a 50-mile radius of PSL are listed in Table 3.11-1. As seen in Figure 3.1-3, portions of the city of Port St. Lucie and Fort Pierce (St. Lucie County) fall within the 6-mile vicinity of PSL. Port St. Lucie's 2019 estimated population was reported at 189,396 persons; Fort Pierce's 2019 estimated population is 45,329. (USCB 2021c).

As listed in Table 3.11-1, there are three cities with populations greater than 100,000 in the region. The largest of these is Port St. Lucie, with the city center located 7 miles west-southwest. Palm Bay (52 miles north-northwest) has an estimated 2019 population of 111,997. West Palm Beach (45 mile south-southeast) has an estimated population of 109,767. A total of 10 additional communities, within a 50-mile radius, have a population greater than 25,000 as of 2019 (Table 3.11-1).

### 3.11.2 Minority and Low-Income Populations

#### 3.11.2.1 Background

The NRC performs environmental justice analyses utilizing a 50-mile radius around the plant as the environmental "impact area." LIC-203 Revision 4 (NRC 2020c) defines a geographic area for comparison as a 50-mile radius (also referred to as "the region" in this discussion) centered on the nuclear plant. An alternative approach is also addressed that uses an individual state that encompasses the 50-mile radius for comparative analysis as the "geographic area." Both approaches were used to assess the minority and low-income population criteria for PSL.

LIC-203 guidance suggests using the most recent USCB decennial census data. However, low-income data are collected separately from the decennial census and are available in 5-year averages. The 2019 low-income and minority census population data and TIGER/Line data for Florida were obtained from the USCB website and processed using ArcGIS software (USCB 2021d). Census population data were used to identify the minority and low-income populations within a 50-mile radius of PSL. Environmental justice evaluations for minority and low-income populations are based on the use of USCB block groups for minority and low-income populations.

#### 3.11.2.2 Minority Populations

NRC procedural guidance defines a "minority" population as Black or African American, American Indian or Alaska Native, Asian, Native Hawaiian/other Pacific Islander, some other race, two or more races, the aggregate of all minority races, Hispanic or Latino ethnicity, and the aggregate of all minority races and Hispanic ethnicity (NRC 2020c). The guidance indicates that a minority population is considered present if either of the following two conditions exists:

1. The minority population in the census block group exceeds 50 percent; or
2. The minority population percentage is more than 20 percentage points greater in the census block group than the minority percentage of the geographic area chosen for the comparative analysis.

To establish minimum thresholds for each minority category, the non-white minority population total for each state was divided by the total population in the state. This process was repeated with a 50-mile radius total minority population and 50-mile radius total population. As described in the second criterion, 20 percentage points were added to the minority percentage values for each geographic area. The lower of the two NRC conditions for a minority population was selected as defining a minority area (i.e., census block group minority population exceeds 50 percent, or minority population is more than 20 percentage points greater than the minority population of the geographic area). Any census block group with a percentage exceeding this value was considered a minority population. Minority percentages for Florida, the 50-mile radius, and the corresponding criteria, are shown in Table 3.11-4.

A minority category of "Aggregate of All Races" is created when the populations of all the 2019 USCB minority categories are summed. As shown in Table 3.11-4, the 2019 "Aggregate of All

Races" category, when compared to the total population, indicates 24.9 of Florida's population are minorities. The 2019 "Aggregate of All Races" category, when compared to the total population of the 50-mile radius (region), indicates 24 percent of the population in the region are minorities. These percentages do not exceed the 50 percent noted for Condition 1, defined above. As such, the criteria calculated using Condition 2, 44.9 and 44.0 percent respectively, were used for the threshold.

The "Aggregate of All Races and Hispanic" population percentages for Florida and the region are 46.1 and 41.4 percent, respectively. Using the Condition 2 approach, both criteria for the "Aggregate of All Races and Hispanic" categories, at 66.1 and 61.4 percent respectively, would exceed the 50 percent noted for Condition 1. Therefore, the lower criterion of 50 percent would be used for the threshold and any census block group with an "Aggregate and Hispanic" population exceeding 50 percent would be considered a minority population.

Because Hispanic is not considered a race by the USCB, Hispanics are already represented in the census-defined race categories. However, because Hispanics can be represented in any race category, some white Hispanics not otherwise considered minorities become classified as a minority when categorized in the "Aggregate and Hispanic" category.

The number of census block groups contributing to the minority population count were evaluated using the criteria shown in Table 3.11-4 and summarized in Table 3.11-5. The results of the evaluation are census block groups flagged as having a minority population(s). The resulting maps (Figures 3.11-1, 3.11-2, 3.11-3, 3.11-4, 3.11-5, 3.11-6, 3.11-7, 3.11-8, 3.11-9, 3.11-10, 3.11-11, and 3.11-12) depict the location of minority population census block groups flagged accordingly for each race or aggregate category. Because no block group met the criteria for the "Asian," "Native Hawaiian/Other Pacific Islander," or "Two or More" race categories, no figures illustrating those race categories were produced.

The percentage of census block groups exceeding the "Aggregate of All Races" minority population criterion was 15.2 percent when a 50-mile radius (region) was used and 14.7 percent when the state was used as the geographic area (Table 3.11-5). For the "Aggregate and Hispanic" category, 32.3 percent of the census block groups contained a minority population when the region or the state was used (Table 3.11-5). The minority population values of the block groups were significantly reduced when races were analyzed individually.

The identified minority population closest to the PSL center point is located approximately 4 miles southwest of the site: Block Group 121113818021. This census block group contained a total of 1,660 people in the following categories: 1,051 "White," 322 "Black or African American," 232 "Some Other Race," 47 "Two or More Races," 750 "Hispanic or Latino," 609 "Aggregate of All Races," and 1,109 "Aggregate and Hispanic." Using the regional criteria, the block group contains a Hispanic or Latino and an aggregate and Hispanic population. Using the state criteria, the block group contains an aggregate and Hispanic population. (USCB 2021d; USCB 2021h)

There are eight block groups within a 6-mile radius that meet the criteria for a minority population. There are 272 identified minority population block groups located in, partially within, or adjacent to cities, municipalities, or USCB-defined urban areas. This leaves two block groups that do not fall within or are not immediately adjacent to cities, municipalities, or USCB-defined urban areas. (USCB 2021d; USCB 2021f)

As presented in Section 3.1.3, the Seminole Tribe of Florida has two reservations located within the PSL 50-mile region. Nearer to PSL, the Fort Pierce Reservation is approximately 50 acres in size and located in St. Lucie County northwest of the site. (NCSL 2021; STF 2021; USCB 2021f)

### 3.11.2.3 Low-Income Populations

NRC guidance defines "low-income" using USCB statistical poverty thresholds for individuals or families (NRC 2020c). As addressed above with minority populations, two alternative geographic areas (the state of Florida and the region) were used as the geographic areas for comparison in this analysis. The guidance indicates that a low-income population is considered present if either of the two following conditions exists:

1. The low-income population in the census block group exceeds 50 percent; or
2. The percentage of households below the poverty level in a block group is significantly greater (typically at least 20 percentage points) than the low-income population percentage of the geographic area chosen for the comparative analysis (i.e., state and region's combined average).

To establish minimum thresholds for the individual low-income category, the population with an income below the poverty level for the state was divided by the total population for whom poverty status is determined in the state. To establish minimum thresholds for the family low-income category, the family population count with an income below the poverty level for the state was divided by the total family population count in the state. This process was repeated for the regional population with an income below the poverty level and regional total population for whom poverty status is determined. As described in Condition 2, above, 20 percentage points were added to the low-income values for individuals and families and each geographic area. None of the low income criteria for the geographic areas described in the first condition exceeded 50 percent.

As shown in Table 3.11-6, when the 2019 census data category "income in the past 12 months below poverty level" (individual) is compared to "total population for whom poverty status is determined," 12.5 percent of the population in the region has an individual income below poverty level. In the state of Florida, the percentages of individuals with an income below poverty level is 14.0 percent.

As shown in Table 3.11-6, Florida has an estimated 1,029,407 families living below poverty level. When the 2019 census data family category "income in the past 12 months below poverty level" is compared to "total family count," 11.7 percent of the families within the region have an income below poverty level. In the state of Florida, the percentage of the family population with an income below poverty level is 13.3 percent.

As an example, when the region is used as the geographic area, any census block group within a 50-mile radius with populations of low-income individuals equal to or greater than 32.5 percent of the total block group population would be considered a "low-income population." Using this criterion, 57 of the 817 census block groups (7 percent) were identified as low-income populations within a 50-mile radius of the PSL site, as shown in Figure 3.11-13. (USCB 2021d)

When Florida is used as the geographic area, any census block group within the region with a low-income population equal to or greater than 34 percent of the total block group, the population would be considered a "low-income population" (individual) (Table 3.11-6). These census block groups are illustrated in Figure 3.11-13. Using the appropriate criteria for the state criteria, 47 of the total 817 census block groups (5.8 percent) have low-income individual population percentages that meet or exceed the threshold criteria noted in Table 3.11-5. These census block groups are illustrated in Figure 3.11-14.

Similarly, these criteria are found using both geographies and family census counts (Table 3.11-5). Using the family state criteria, 48 census block groups were identified as having low-income families. Using the regional criteria, 56 census block groups were identified as having low-income families (Table 3.11-5). These census block groups are illustrated in Figures 3.11-15 and 3.11-16. (USCB 2021d; USCB 2021h) The closest low-income block group that meets the guidance criteria for individuals or families is located 5.8 miles northwest of the PSL center point (Block Group 121113805001). (USCB 2021d)

### 3.11.3 Subsistence Populations and Migrant Workers

#### 3.11.3.1 Subsistence Populations

Subsistence refers to the use of natural resources as food for consumption and for ceremonial and traditional cultural purposes, usually by low-income or minority populations. Specific examples of subsistence use include gathering plants for direct consumption (rather than produced for sale from farming operations), for use as medicine, or in ritual practices. Fishing or hunting activities associated with direct consumption or use in ceremonies, rather than for sport, are other examples.

Determining the presence of subsistence use can be difficult, as data at the county or block group level are aggregated and not usually structured to identify such uses on or near the site. Frequently, the best means of investigating the presence of subsistence use is through dialogue with the local population who are most likely to know of such activity. This may include county officials, community leaders, and landowners in the vicinity who would have knowledge of subsistence activity. For example, in a 2018 conversation with a regional tribal representative, there was no subsistence activity.

The area surrounding PSL is characterized by residential subdivisions and commercial areas interspersed with wetlands, managed preserves, recreational, and natural areas dedicated to various purposes. As reported in the 2003 NUREG-1437 Supplement 11, the NRC found no unusual resource dependencies or practices, such as subsistence agriculture through which the minority and low-income populations could experience disproportionately high and adverse impacts (NRC 2003). No additional subsistence studies have been conducted, but plant staff living and working in the area are not aware of any cases of subsistence activity in the vicinity of PSL.

### 3.11.3.2 Migrant Workers

Migrant labor, or migrant worker, is defined by the USDA as "a farm worker whose employment required travel that prevented the migrant worker from returning to his/her permanent place of residence the same day." In 2017, St. Lucie County reported that 134 out of 415 total farms employed farm labor. Martin County reported 201 out of 594 total farms employed farm labor. The 2017 census of agriculture reported that seven of the St. Lucie County farms employed migrant farm workers. Six farms in Martin County reported employing migrant workers. For St. Lucie County, an estimated total of 1,073 farm laborers were hired, of which 368 were estimated to work fewer than 150 days per year. For Martin County, an estimated total of 1,184 farm laborers were hired, of which 126 were estimated to work fewer than 150 days per year. (USDA 2020c)

**Table 3.11-1 Cities or Towns Located Totally or Partially within a 50-Mile Radius of PSL (Sheet 1 of 2)**

| City/Town/Village/CDP | County | 2000 Census Population[a] | 2010 Census Population[a] | 2019 Census Population[a][b] | Distance to PSL (miles)[c][d] | Direction [c][d] |
|---|---|---|---|---|---|---|
| ***Florida*** | | | | | | |
| Belle Glade | Palm Beach | 14,906 | 17,467 | 19,654 | 53 | SSW |
| Cloud Lake | Palm Beach | 167 | 135 | 222 | 47 | SSE |
| Fellsmere | Indian River | 3,813 | 5,197 | 5,625 | 36 | NW |
| Fort Pierce | Saint Lucie | 37,516 | 41,590 | 45,329 | 8 | NW |
| Glen Ridge | Palm Beach | 276 | 219 | 195 | 48 | SSE |
| Grant-Valkaria | Brevard | NA | 3,850 | 4,176 | 45 | NNW |
| Greenacres | Palm Beach | 27,569 | 37,573 | 40,529 | 50 | S |
| Haverhill | Palm Beach | 1,454 | 1,873 | 2,319 | 46 | S |
| Hobe Sound | Martin | 11,376 | 11,521 | 14,003 | 21 | SSE |
| Indian River Shores | Indian River | 3,448 | 3,901 | 4,206 | 27 | NNW |
| Indiantown | Martin | 5,588 | 6,083 | 7,053 | 27 | SSW |
| Jensen Beach | Martin | 11,100 | 11,707 | 13,479 | 7 | S |
| Juno Beach | Palm Beach | 3,262 | 3,176 | 3,586 | 34 | SSE |
| Jupiter | Palm Beach | 39,328 | 55,156 | 64,565 | 30 | SSE |
| Jupiter Inlet Colony | Palm Beach | 368 | 400 | 381 | 30 | SSE |
| Jupiter Island | Martin | 620 | 817 | 803 | 24 | SSE |
| Lake Clarke Shores | Palm Beach | 3,451 | 3,376 | 3,600 | 50 | SSE |
| Lake Park | Palm Beach | 8,721 | 8,155 | 8,508 | 39 | SSE |
| Lake Worth | Palm Beach | 35,133 | 34,910 | 38,010 | 52 | SSE |
| Loxahatchee Groves | Palm Beach | NA | 3,180 | 3,520 | 46 | S |
| Malabar | Brevard | 2,622 | 2,757 | 3,061 | 49 | NNW |
| Mangonia Park | Palm Beach | 1,283 | 1,888 | 2,333 | 42 | SSE |
| North Palm Beach | Palm Beach | 12,064 | 12,015 | 13,029 | 37 | SSE |
| Ocean Breeze | Martin | 463 | 355 | 195 | 7 | S |

**Table 3.11-1 Cities or Towns Located Totally or Partially within a 50-Mile Radius of PSL (Sheet 2 of 2)**

| City/Town/Village/CDP | County | 2000 Census Population[(a)] | 2010 Census Population[(a)] | 2019 Census Population[(a)(b)] | Distance to PSL (miles)[(c)(d)] | Direction [(c)(d)] |
|---|---|---|---|---|---|---|
| Okeechobee | Okeechobee | 5,376 | 5,621 | 5,724 | 37 | WSW |
| Orchid | Indian River | 140 | 415 | 516 | 31 | NNW |
| Pahokee | Palm Beach | 5,985 | 5,649 | 6,269 | 45 | SW |
| Palm Bay | Brevard | 79,413 | 103,190 | 111,997 | 52 | NNW |
| Palm Beach | Palm Beach | 10,468 | 8,348 | 8,723 | 46 | SSE |
| Palm Beach Gardens | Palm Beach | 35,058 | 48,452 | 56,219 | 37 | S |
| Palm Beach Shores | Palm Beach | 1,269 | 1,142 | 1,136 | 41 | SSE |
| Palm City | Martin | 20,097 | 23,120 | 24,840 | 13 | S |
| Palm Springs | Palm Beach | 11,699 | 18,928 | 24,843 | 50 | S |
| Port St. Lucie | Saint Lucie | 88,769 | 164,603 | 189,396 | 7 | WSW |
| Riviera Beach | Palm Beach | 29,884 | 32,488 | 34,702 | 41 | SSE |
| Royal Palm Beach | Palm Beach | 21,523 | 34,140 | 38,962 | 44 | S |
| Sebastian | Indian River | 16,181 | 21,929 | 25,107 | 35 | NNW |
| Sewall's Point | Martin | 1,946 | 1,996 | 2,099 | 11 | SSE |
| St. Lucie Village | Saint Lucie | 604 | 590 | 802 | 11 | NNW |
| Stuart | Martin | 14,633 | 15,593 | 16,161 | 10 | S |
| Tequesta | Palm Beach | 5,273 | 5,629 | 6,071 | 27 | SSE |
| The Acreage | Palm Beach | NA | 38,704 | 40,177 | 38 | S |
| Vero Beach | Indian River | 17,705 | 15,220 | 16,857 | 22 | NNW |
| Wellington | Palm Beach | 38,216 | 56,508 | 64,396 | 47 | S |
| West Palm Beach | Palm Beach | 82,103 | 99,919 | 109,767 | 45 | SSE |
| Westlake | Palm Beach | NA | NA | 52 | 40 | S |

a) (USCB 2021c)
b) 5-year 2015–2019 estimates.
c) (USDOT 2021b)
d) Reported distances and directions were calculated from the PSL center point to the city center.
NA=Data not available.

**Table 3.11-2 County Populations Totally or Partially Included within a 50-Mile Radius of PSL**

| State, County, and Independent City | 2000 Population[(a)] | 2010 Population[(a)] | 2019 Population Estimate[(a)] | 2063 Projected Permanent Population[(a)(b)] | 2063 Projected Total Population[(a)(b)(c)] |
|---|---|---|---|---|---|
| **Florida (9 Counties)** | **2,346,132** | **2,845,996** | **3,285,883** | **4,841,057** | **5,265,819** |
| Brevard | 476,230 | 543,376 | 601,942 | 824,608 | 896,961 |
| Glades | 10,576 | 12,884 | 13,811 | 15,083 | 16,406 |
| Highlands | 87,366 | 98,786 | 106,221 | 127,382 | 138,559 |
| Indian River | 112,947 | 138,028 | 159,923 | 236,089 | 256,804 |
| Martin | 126,731 | 146,318 | 161,000 | 218,880 | 238,085 |
| Okeechobee | 35,910 | 39,996 | 42,168 | 50,399 | 54,821 |
| Osceola | 172,493 | 268,685 | 375,751 | 844,927 | 919,062 |
| Palm Beach | 1,131,184 | 1,320,134 | 1,496,770 | 2,020,867 | 2,198,181 |
| St. Lucie | 192,695 | 277,789 | 328,297 | 502,822 | 546,940 |

a. (USCB 2021e)

b. (FOEDR 2021)

c. (VFL 2017; VFL 2021)

**Table 3.11-3 County Population Growth, 2010–2063**

| Florida | | 2010 | 2019 | 2025 | 2035 | 2045 | 2055 | 2063 |
|---|---|---|---|---|---|---|---|---|
| St. Lucie County | Population | 277,789 | 328,297 | 342,908 | 387,386 | 419,391 | 472,797 | 502,822 |
| | Average Annual Growth % | | 1.87 | 0.73 | 1.23 | 0.80 | 1.11 | 0.89 |
| Martin County | Population | 146,318 | 161,000 | 169,531 | 182,884 | 193,040 | 209,552 | 218,880 |
| | Average Annual Growth % | | 1.07 | 1.07 | 0.86 | 0.76 | 0.54 | 0.76 |

Note: Projected population values are based on the population projection growth trend for the years reported by the Florida Office of Economic and Demographic Research (FOEDR 2021 Projections; USCB 2021e).

**Table 3.11-4 Minority Populations Evaluated Against Criterion**

| Geographic Area | | Florida[a] | | 50-Mile Radius (Region)[b] | | |
|---|---|---|---|---|---|---|
| Total Population | | 20,901,636 | | 1,457,068 | | |
| **Census Categories** | **State Population by Census Category[a]** | **Percent[c]** | **Criteria** | **Regional Population by Census Category[b]** | **Percent[c]** | **Criteria** |
| Black or African American | 3,359,031 | 16.1 | 36.1 | 247,168 | 17.0 | 37.0 |
| American Indian or Alaska Native | 59,320 | 0.3 | 20.3 | 4,865 | 0.3 | 20.3 |
| Asian | 571,276 | 2.7 | 22.7 | 32,134 | 2.2 | 22.2 |
| Native Hawaiian/Other Pacific Islander | 12,653 | 0.1 | 20.1 | 756 | 0.1 | 20.1 |
| Some Other Race | 625,079 | 3.0 | 23.0 | 29,949 | 2.1 | 22.1 |
| Two or More Races | 572,021 | 2.7 | 22.7 | 34,898 | 2.4 | 22.4 |
| Aggregate of All Races | 5,199,380 | 24.9 | 44.9 | 349,770 | 24.0 | 44.0 |
| Hispanic or Latino | 5,346,684 | 25.6 | 45.6 | 299,510 | 20.6 | 40.6 |
| Aggregate and Hispanic[d] | 9,635,289 | 46.1 | 50.0 | 603,026 | 41.4 | 50.0 |

a. (USCB 2021h)

b. (USCB 2021d)

c. Percent values were calculated by dividing each census category's population by the state or region total population values.

d. Includes everyone except persons who identified themselves as "White," "Not Hispanic," or "Latino" (NRC 2020c).

**Table 3.11-5 Minority Census Block Group Counts, 50-Mile Radius of PSL**

| Total Number of Block Groups with Population within Region | State Method | 817 | 50-Mile Radius (Region) | 817 |
|---|---|---|---|---|
| **Census Categories** | **Number of Block Groups** | **Percent of Block Groups within Region** | **Number of Block Groups** | **Percent of Block Groups within Region** |
| Black or African American | 111 | 13.6 | 109 | 13.3 |
| American Indian or Alaska Native | 1 | 0.1 | 1 | 0.1 |
| Asian | 0 | 0 | 0 | 0 |
| Native Hawaiian/Other Pacific Islander | 0 | 0 | 0 | 0 |
| Some Other Race | 3 | 0.4 | 4 | 0.5 |
| Two or More Races | 0 | 0 | 0 | 0 |
| Aggregate of All Races | 120 | 14.7 | 124 | 15.2 |
| Hispanic or Latino | 92 | 11.3 | 110 | 13.5 |
| Aggregate and Hispanic | 264 | 32.3 | 264 | 32.3 |
| Low Income Individuals | 47 | 5.8 | 57 | 7 |
| Low Income Families (Households) | 48 | 5.9 | 56 | 6.9 |

(USCB 2021d; USCB 2021f)

**Table 3.11-6 Low-Income Population Criteria Using Two Geographic Areas**

| Geographic Area | | Florida[a] | | 50-Mile Radius (Region)[b] | | |
|---|---|---|---|---|---|---|
| (Income) Total Population | | 20,481,252 | | 1,436,418 | | |
| (Income) Total Families | | 7,736,311 | | 538,099 | | |
| **Census Category** | **State Population** | **Percent[c]** | **Criteria** | **Region Population** | **Percent[c]** | **Criteria** |
| Low Income – Number of Persons Below Poverty Level (Individuals) | 2,870,487 | 14.0 | 34.0 | 179,984 | 12.5 | 32.5 |
| Low Income – Number of Families Below Poverty Level (Households) | 1,029,407 | 13.3 | 33.3 | 63,101 | 11.7 | 31.7 |

a. (USCB 2021h)

b. (USCB 2021d)

c. Percent values were calculated by dividing each census category's population by the state and regional total population values.

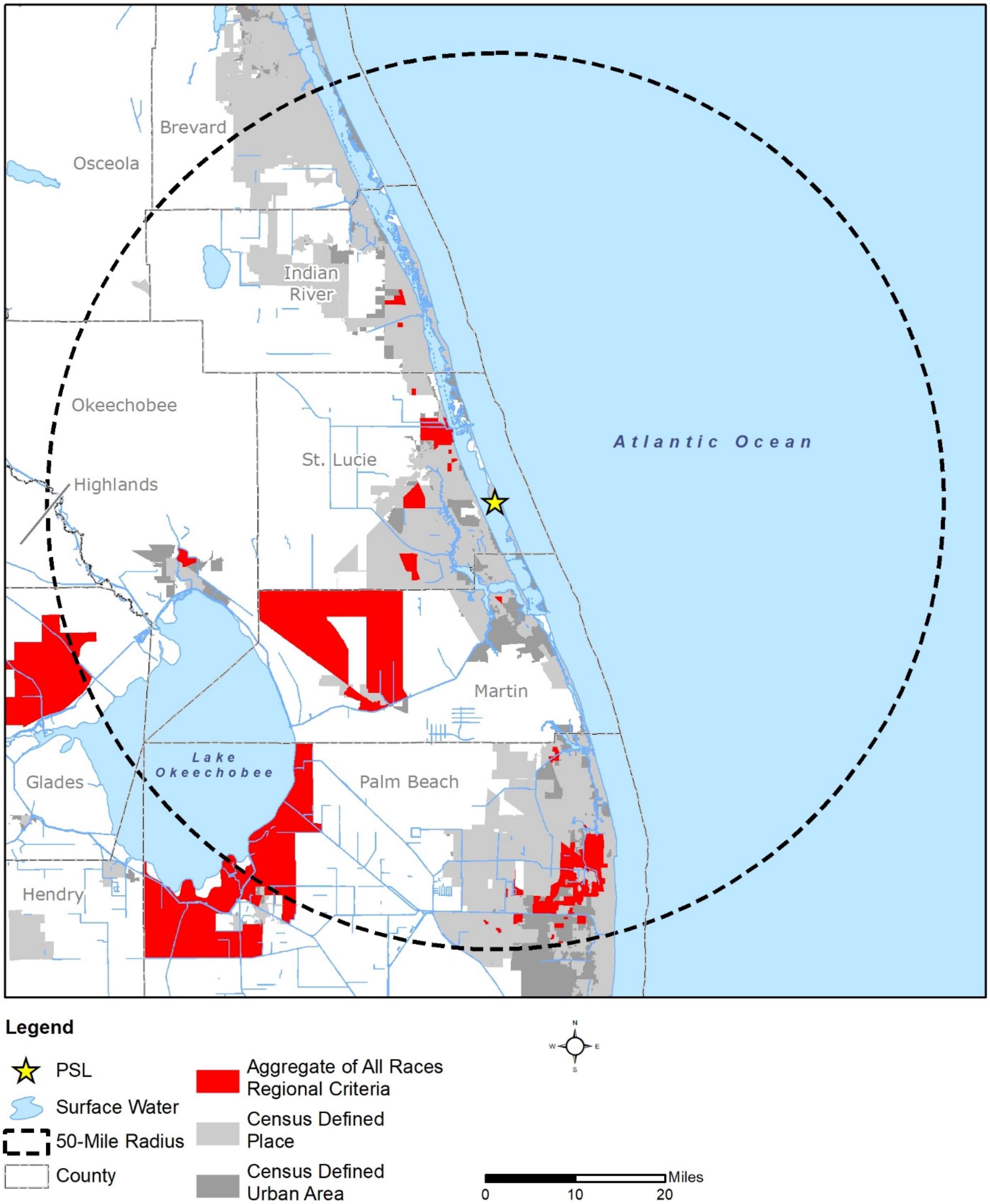



**Figure 3.11-1 Aggregate of All Races Populations (Regional)**

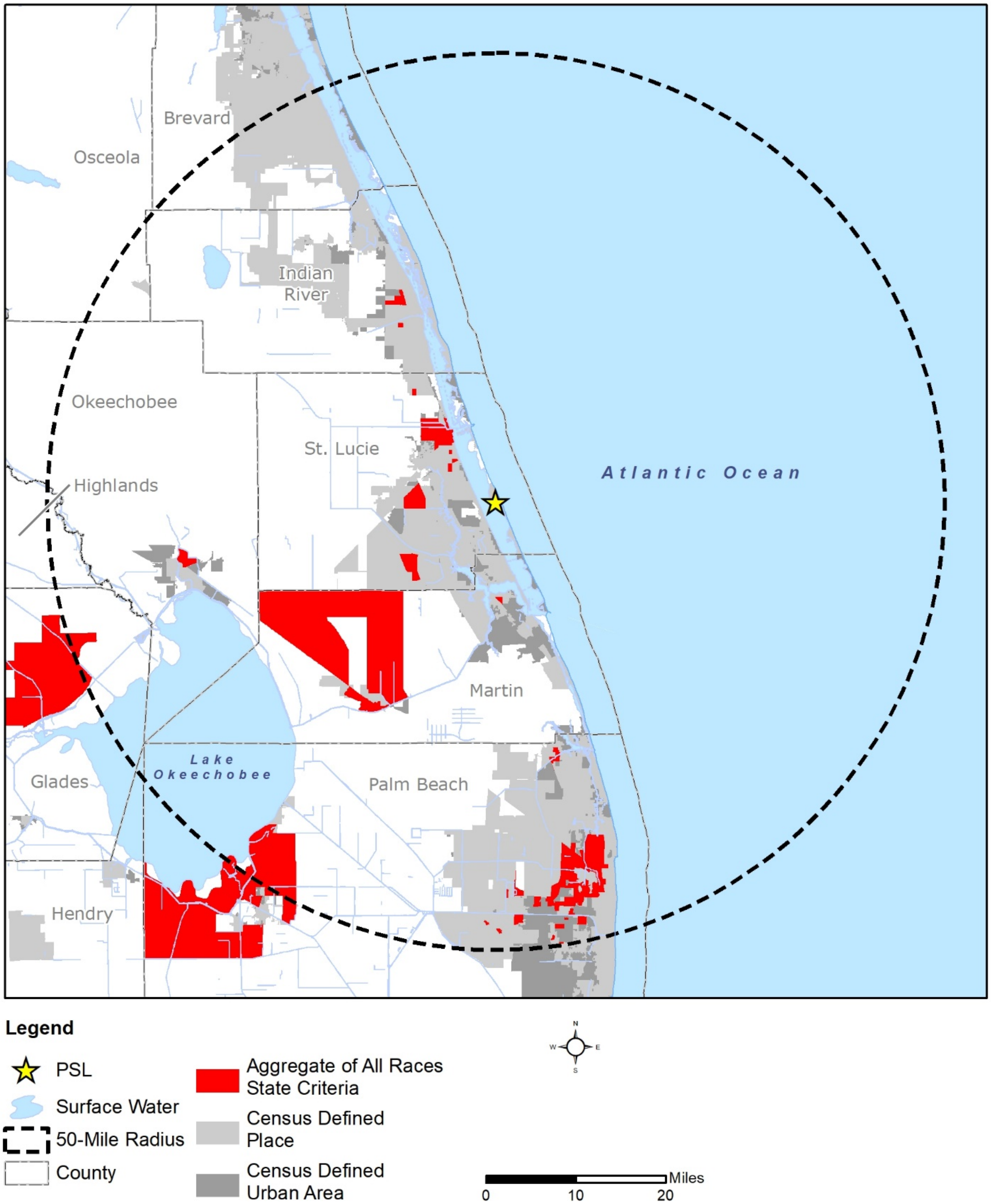



**Figure 3.11-2 Aggregate of All Races Populations (State)**

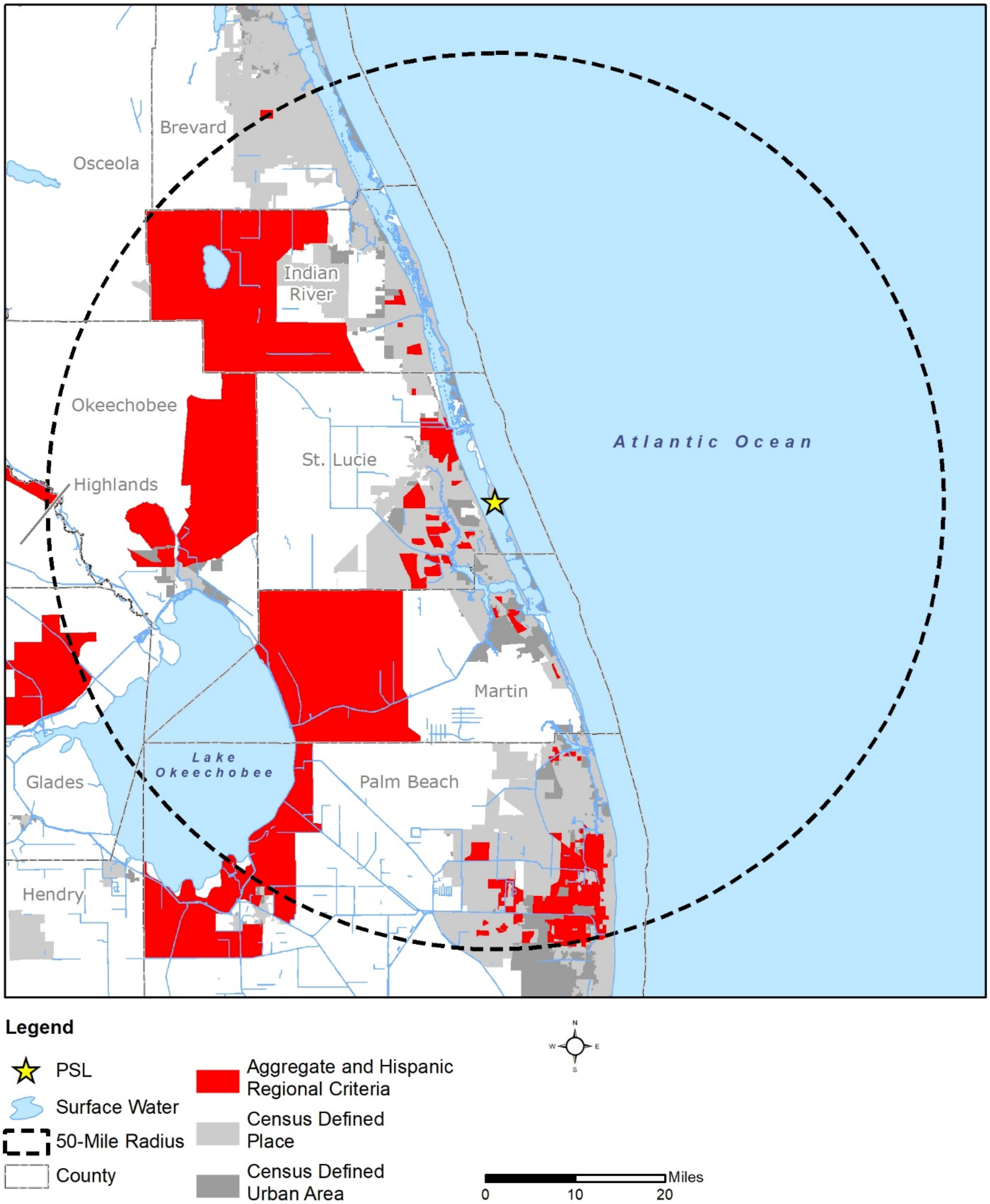



**Figure 3.11-3 Aggregate and Hispanic Populations (Regional)**

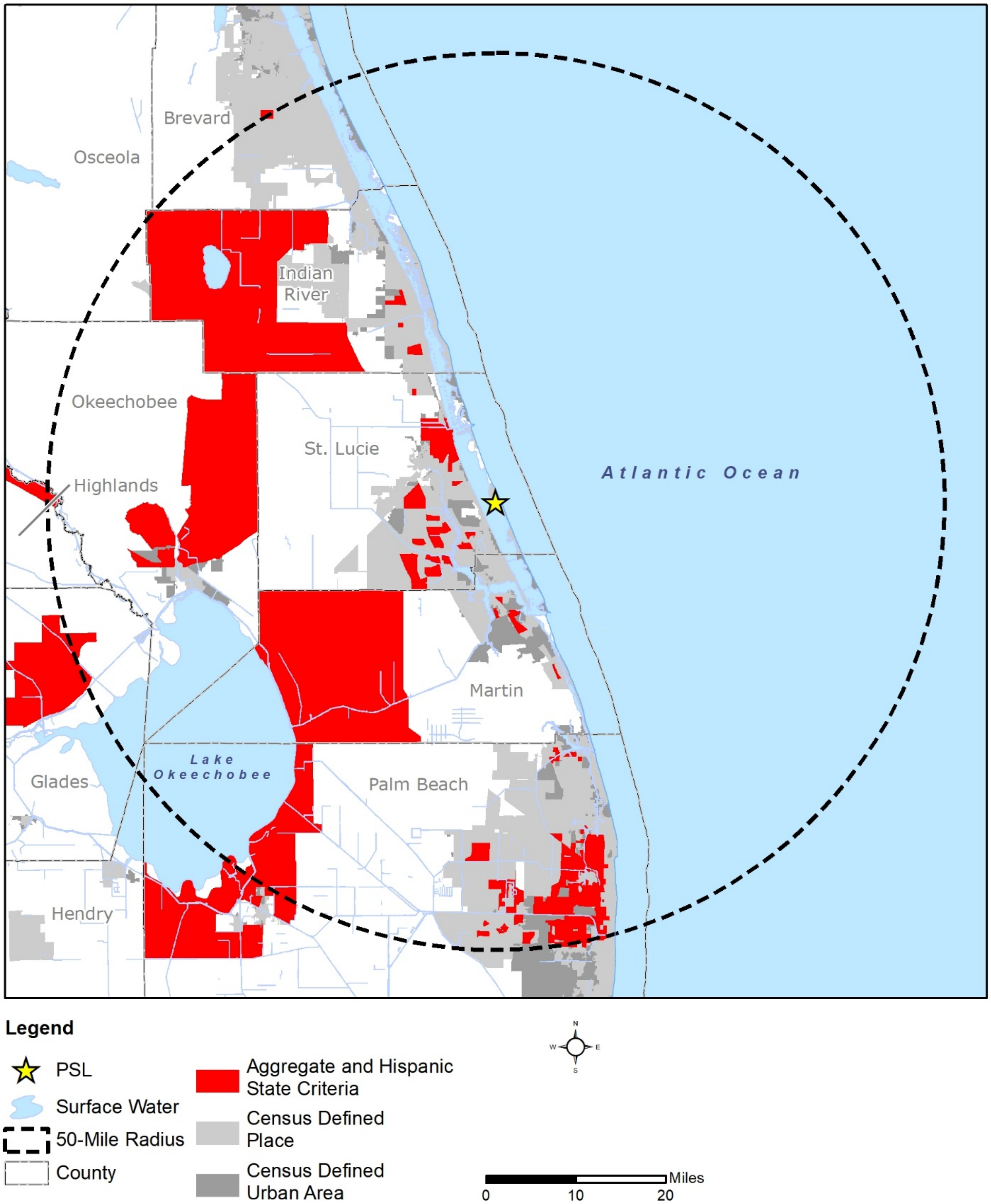



**Figure 3.11-4 Aggregate and Hispanic Populations (State)**

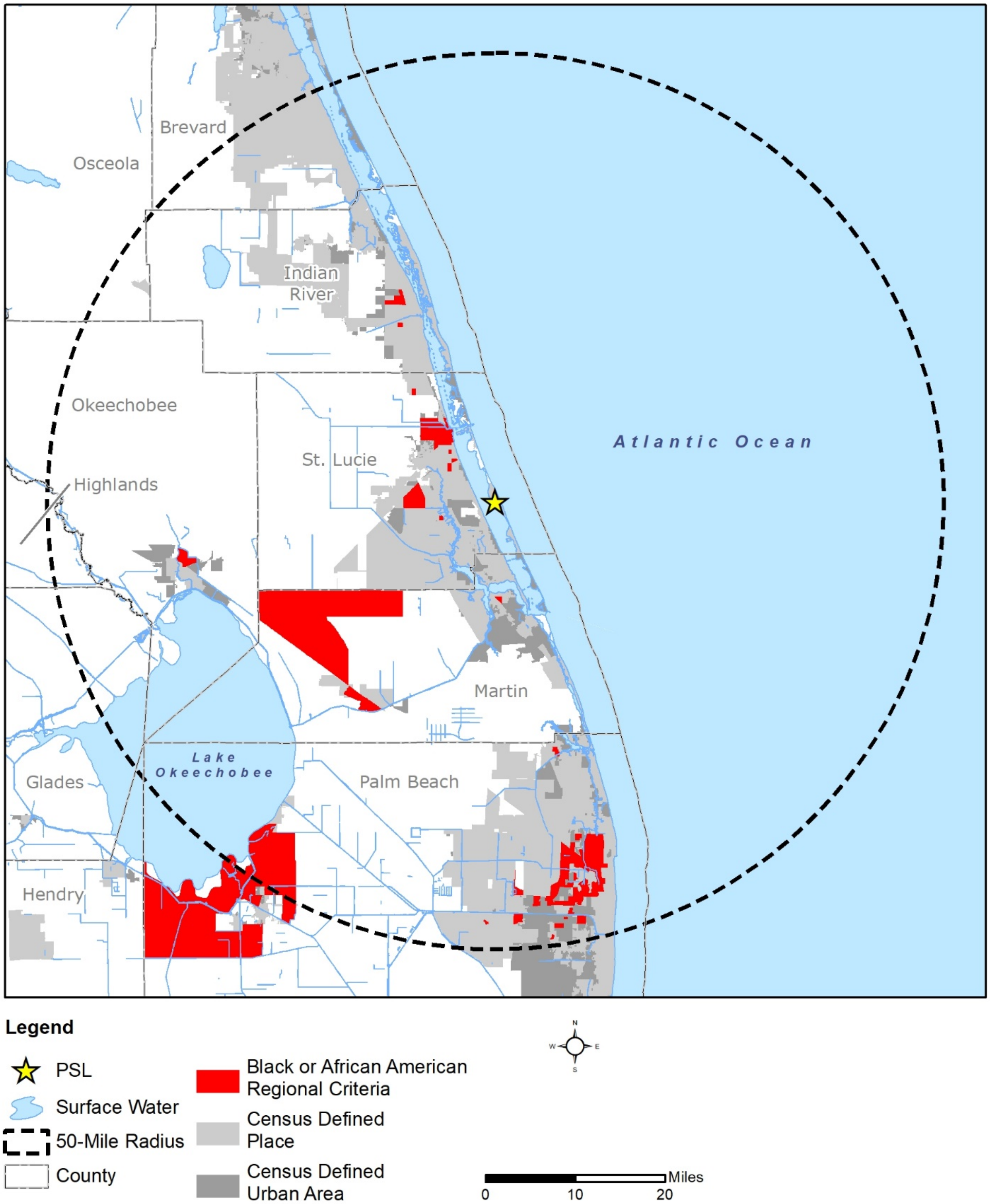



**Figure 3.11-5 Black or African American Populations (Regional)**

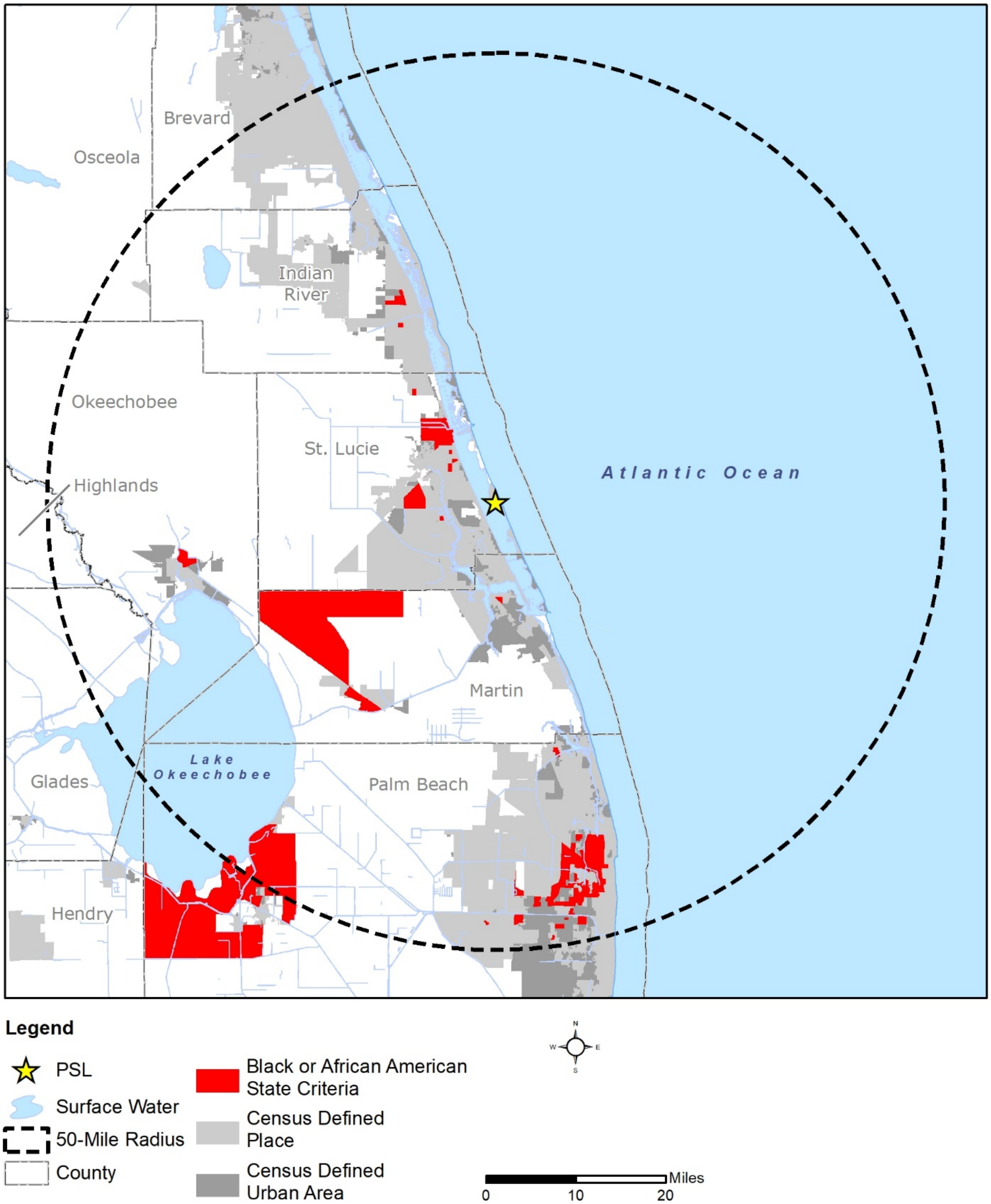



**Figure 3.11-6 Black or African American Populations (State)**

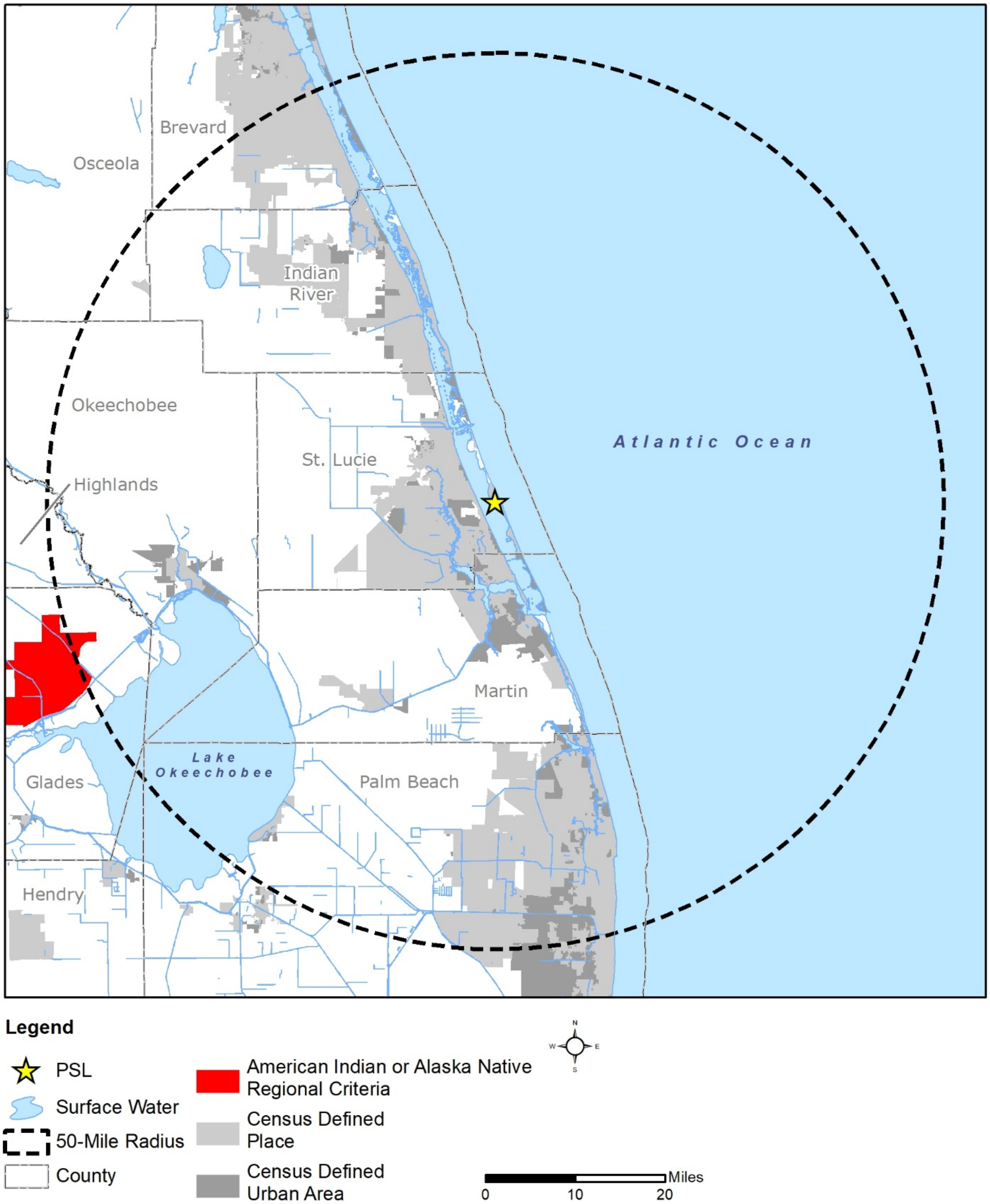



**Figure 3.11-7 American Indian or Alaska Native Populations (Regional)**

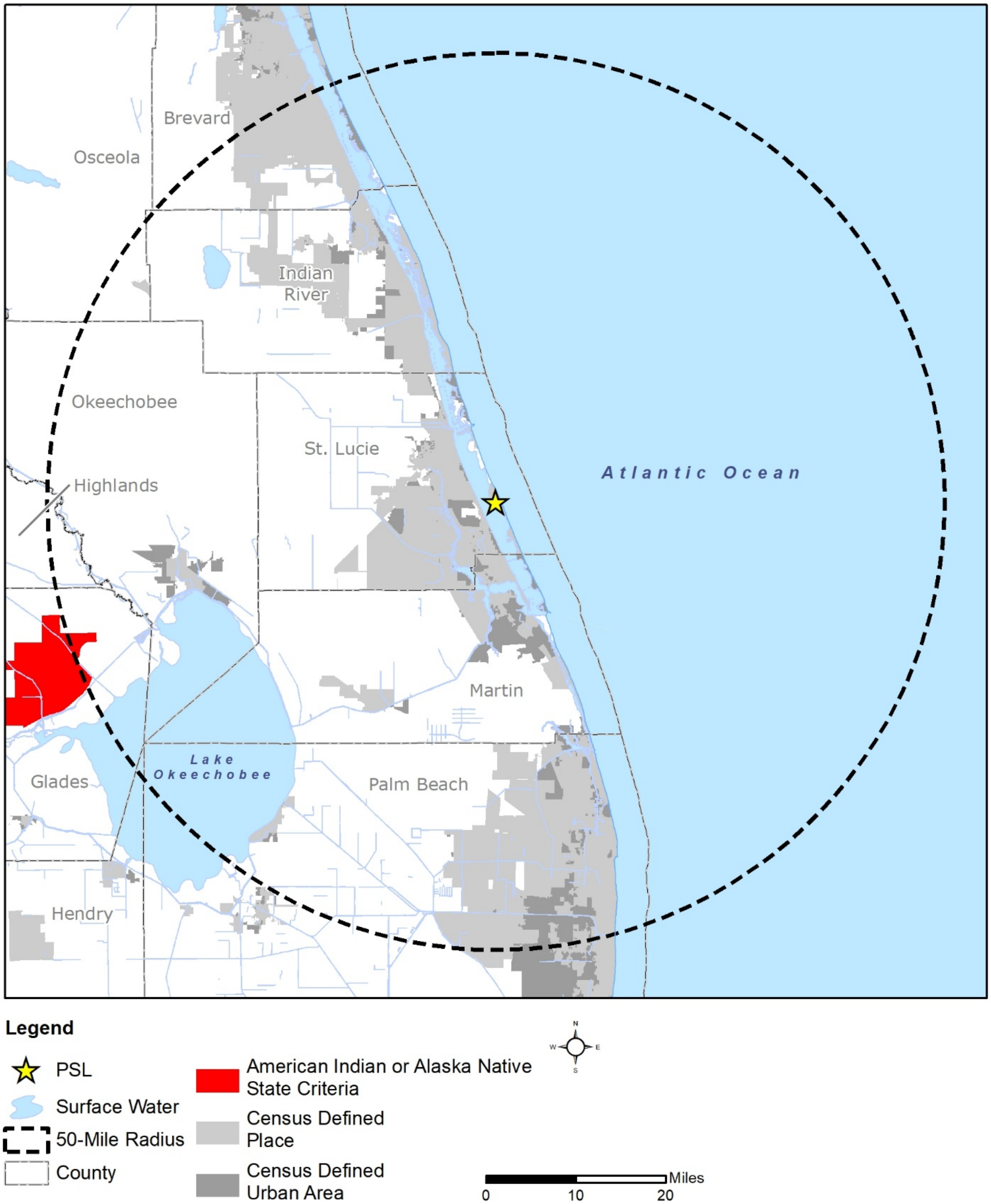



**Figure 3.11-8 American Indian or Alaska Native Populations (State)**

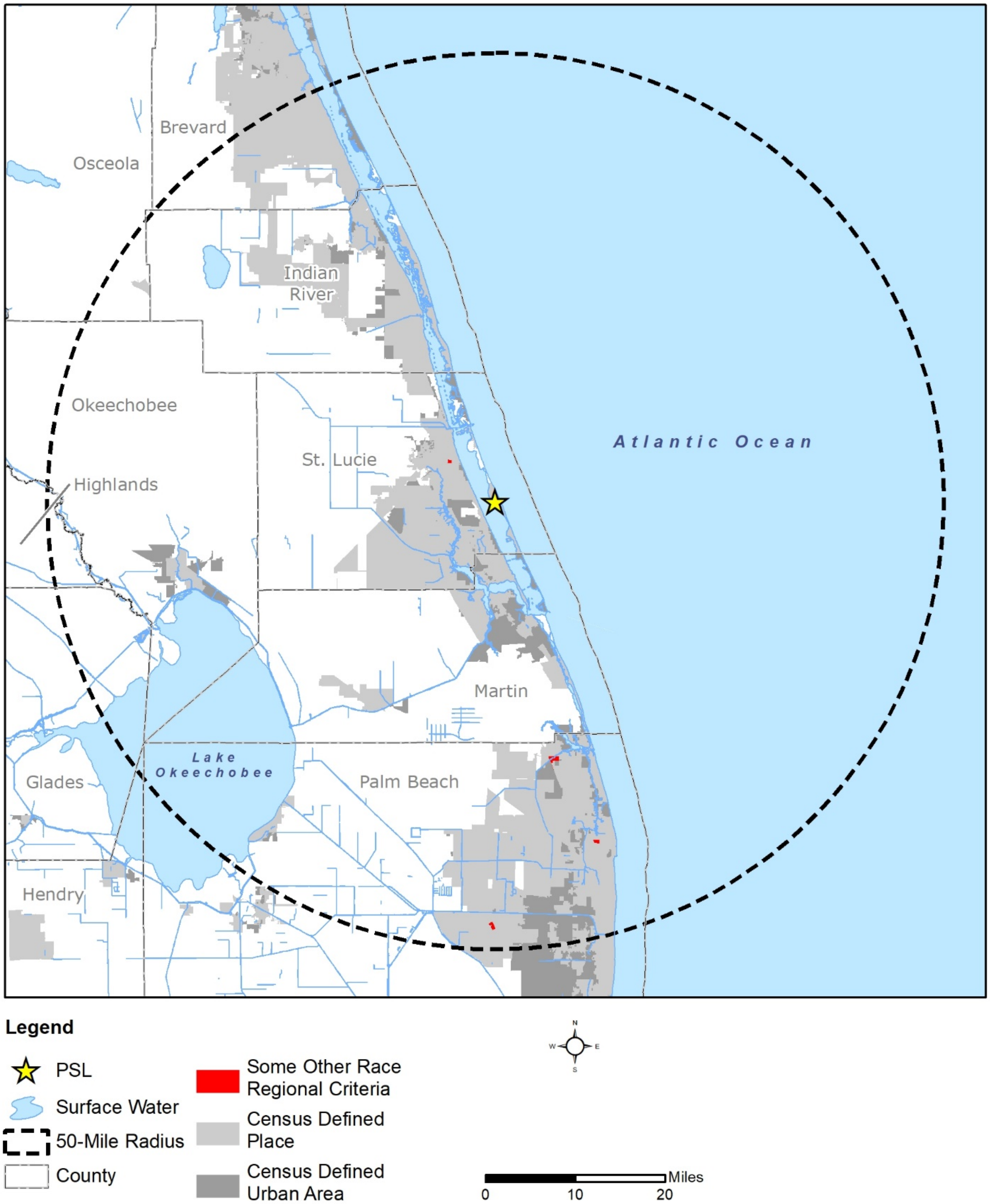



**Figure 3.11-9 Some Other Race Populations (Regional)**

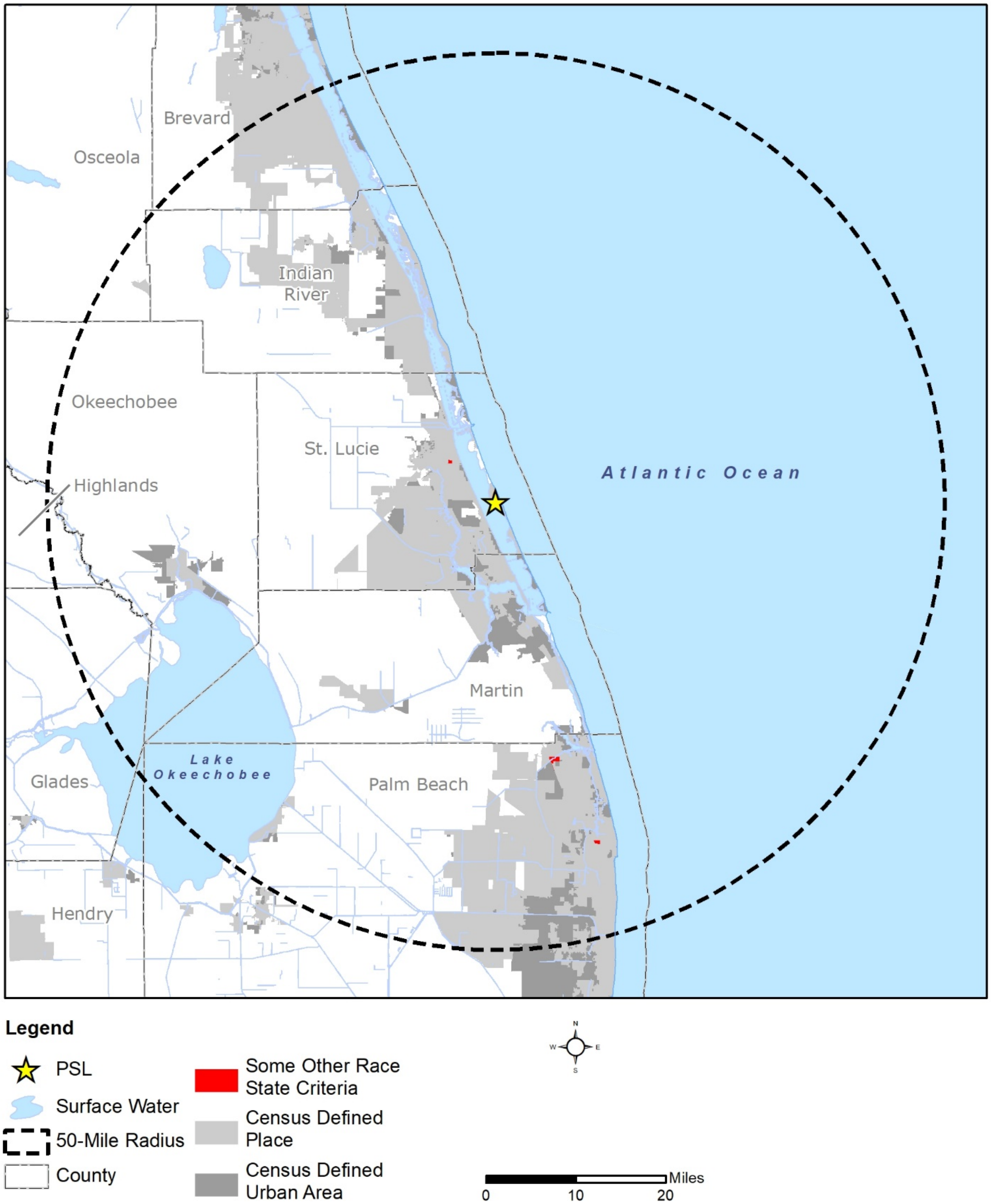



**Figure 3.11-10 Some Other Race Populations (State)**

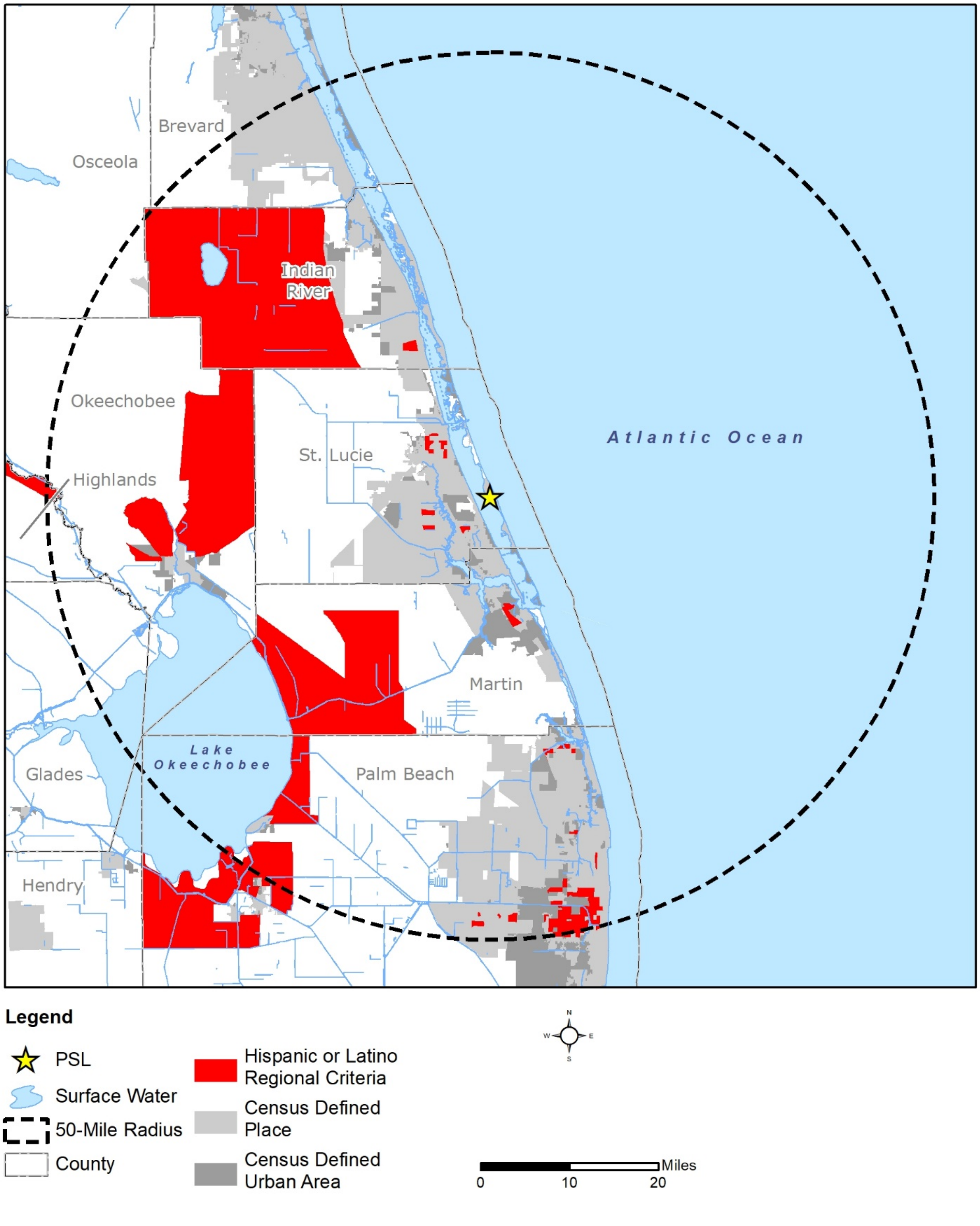



**Figure 3.11-11 Hispanic or Latino Populations (Regional)**

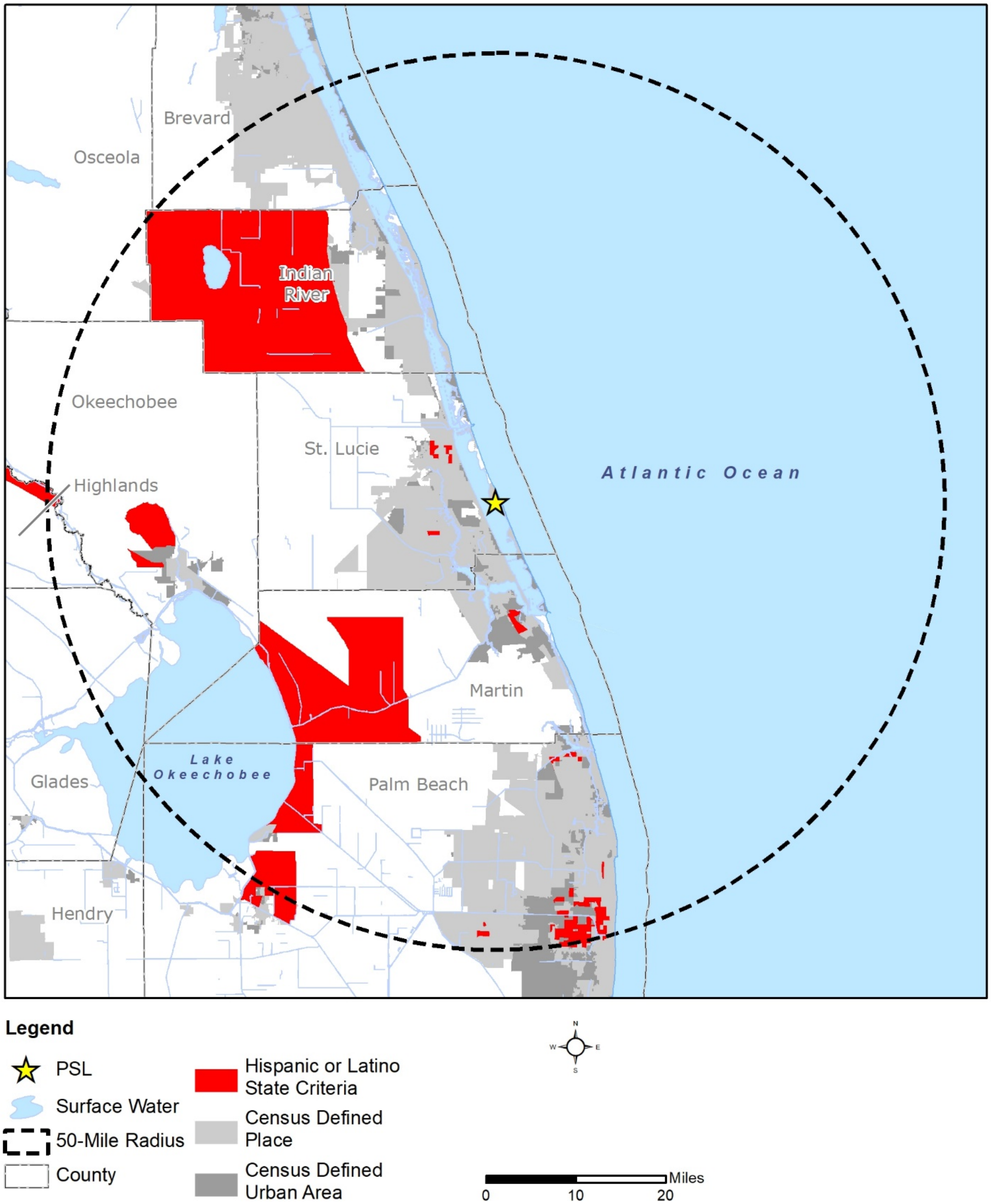



**Figure 3.11-12 Hispanic or Latino Populations (State)**

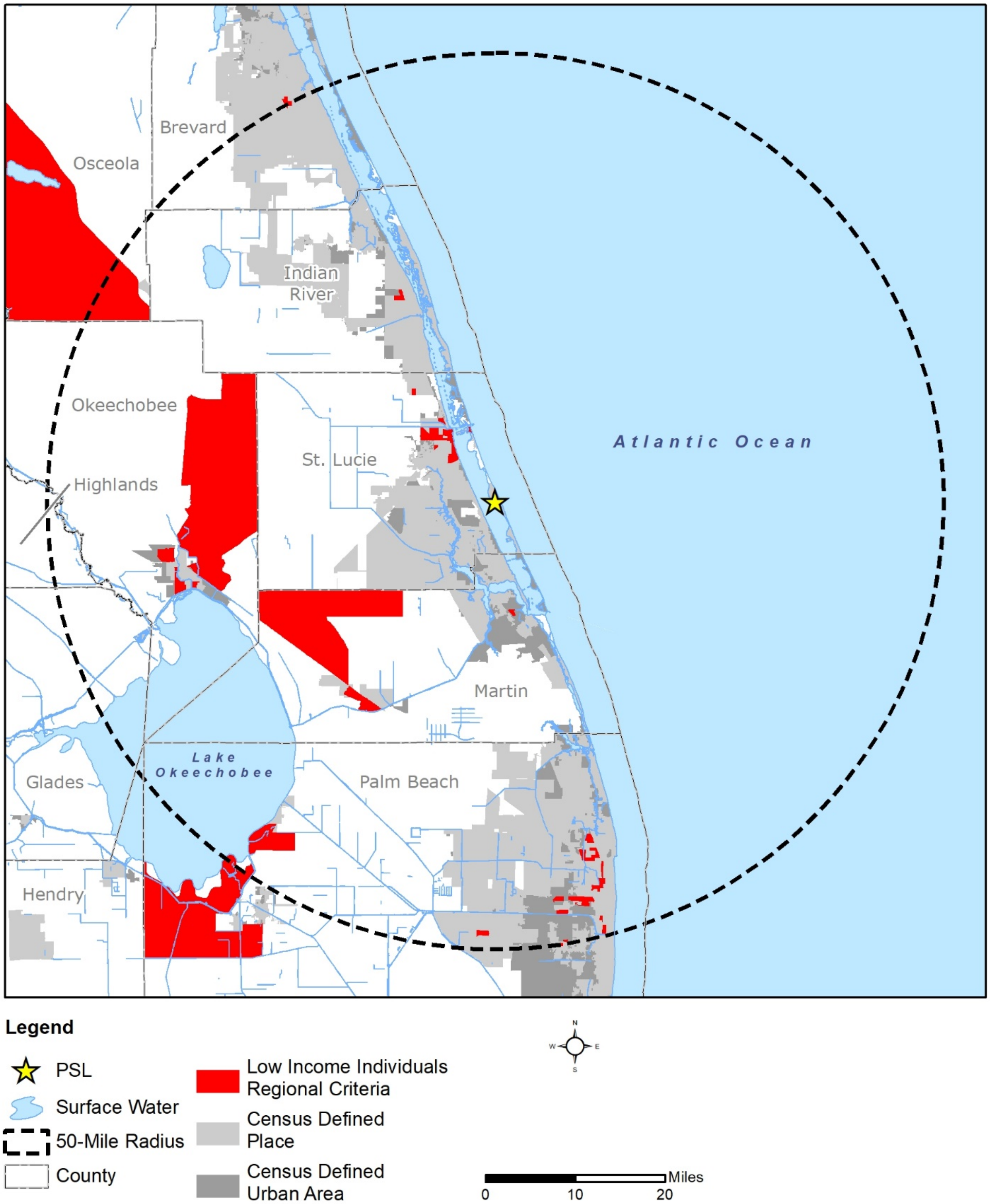



**Figure 3.11-13 Low Income Individuals (Regional)**

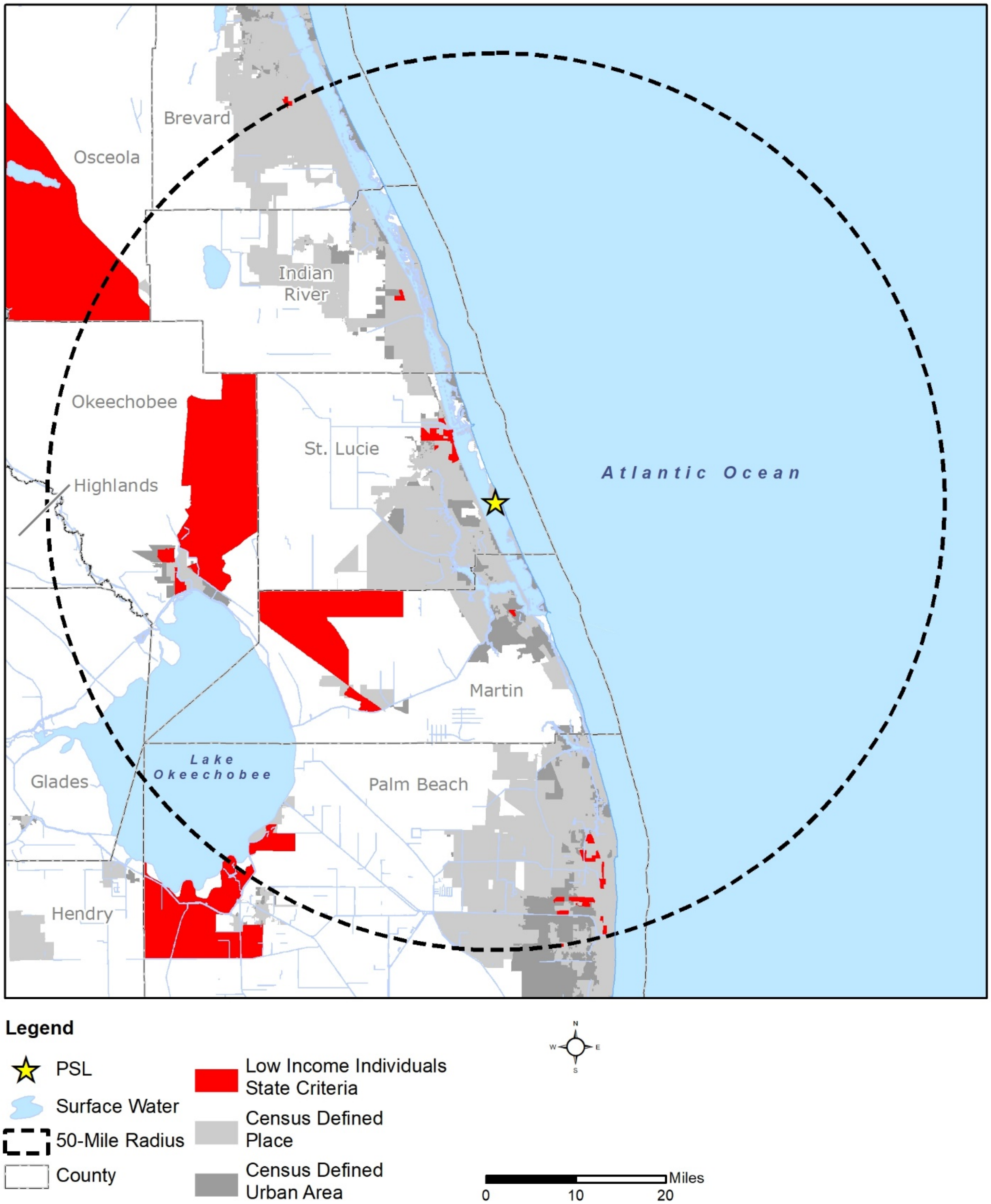



**Figure 3.11-14 Low Income Individuals (State)**

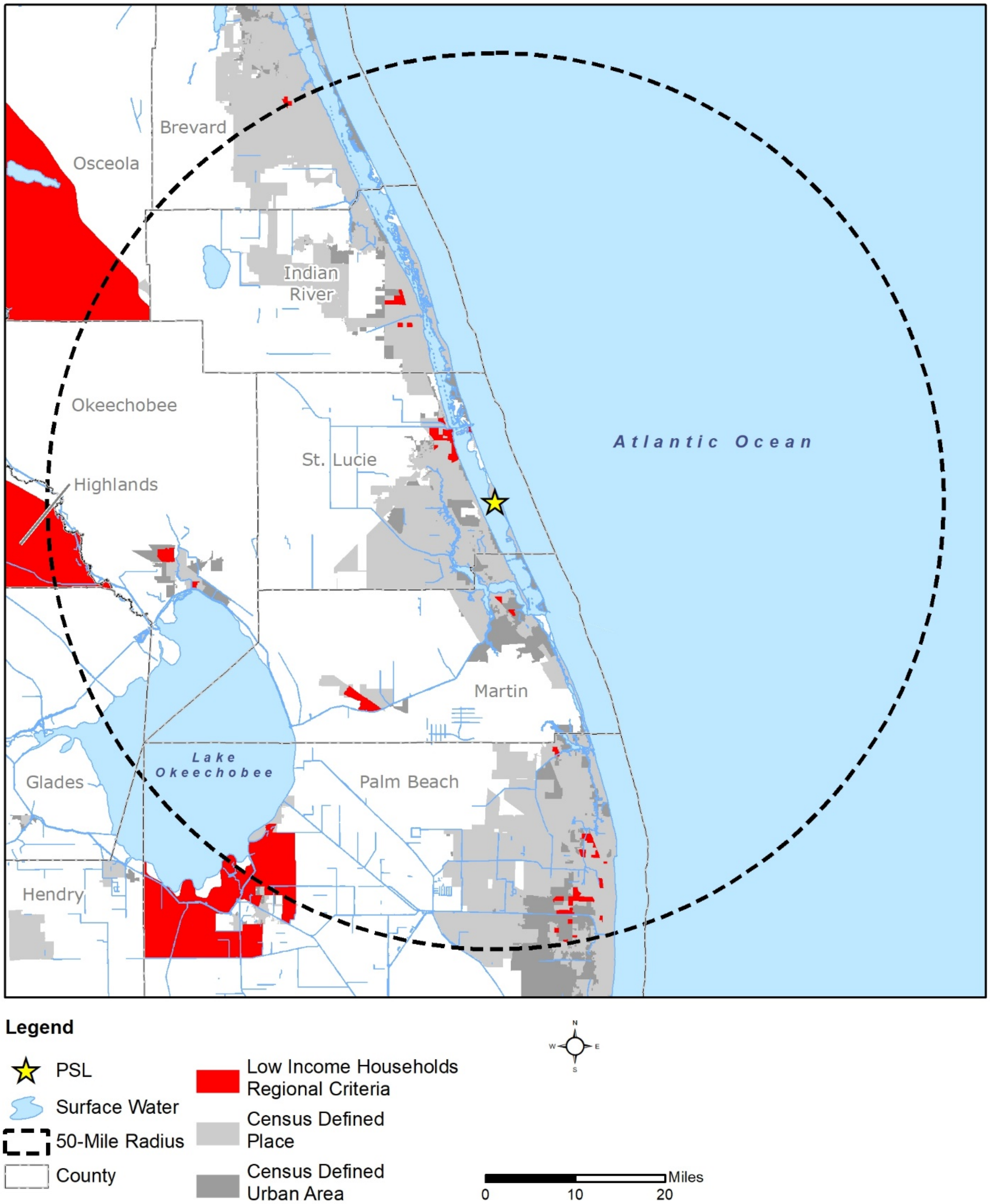



**Figure 3.11-15 Low Income Households (Regional)**

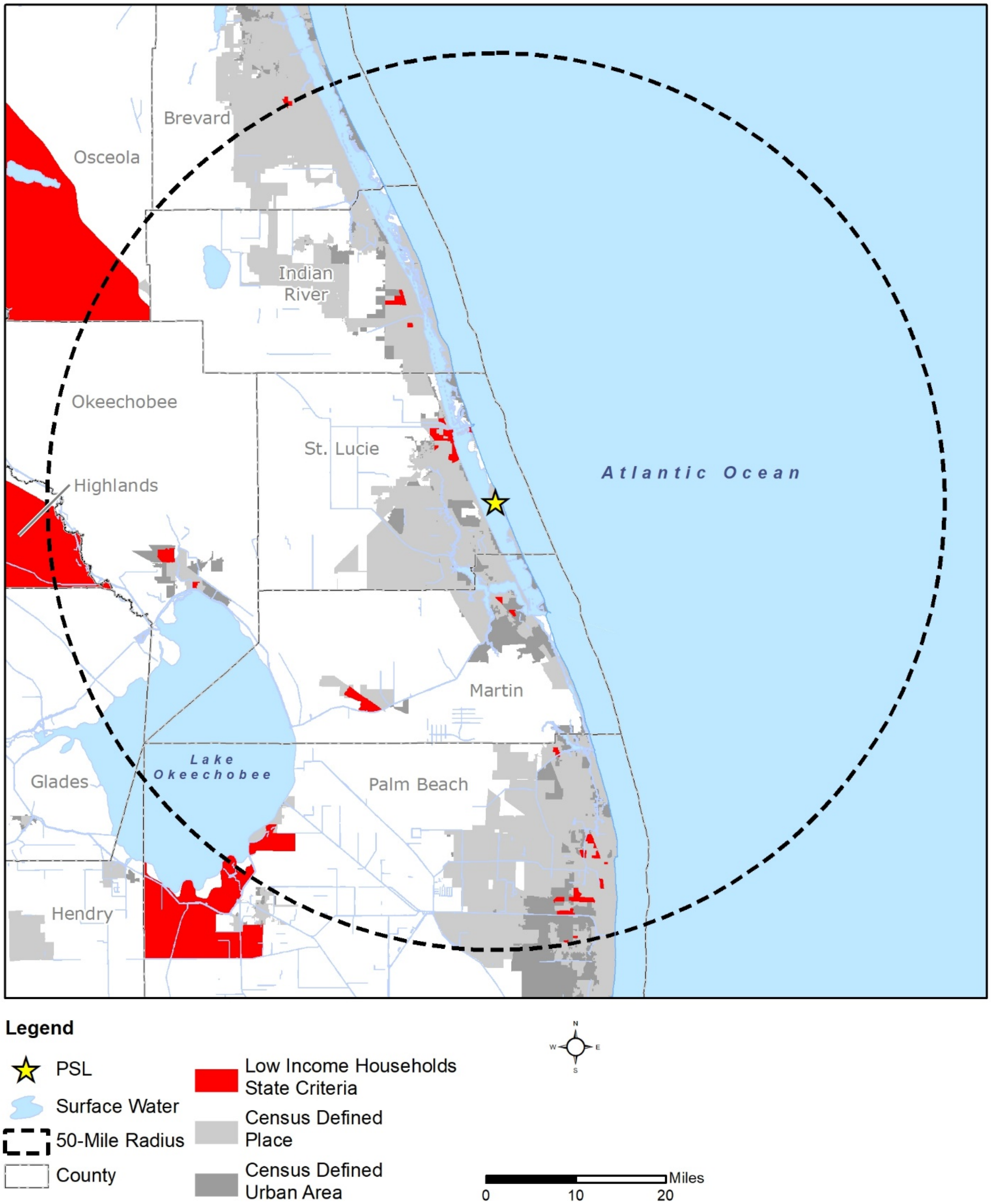



**Figure 3.11-16 Low Income Households (State)**

## 3.12 Waste Management

In addressing the plant's radioactive and nonradioactive waste management systems and programs, NRC Regulatory Guide 4.2, Supplement 1, Revision 1, specifies that the information being requested in this section can be incorporated by reference to Section 2.2 of the ER (NRC 2013b, Section 3.11). Therefore, consistent with NRC Regulatory Guide 4.2, FPL is providing the information below to address PSL's radioactive and nonradioactive waste management systems and program.

### 3.12.1 Radioactive Waste Management

Section 2.2.6 includes a discussion of PSL's liquid, gaseous, and solid radwaste systems. The section provides a description of the systems, management of LLMW, radwaste storage, spent fuel storage, and permitted facilities currently utilized for offsite processing and disposal of radioactive wastes.

### 3.12.2 Nonradioactive Waste Management

Section 2.2.7 includes a discussion of PSL's RCRA nonradioactive waste management program, types of wastes generated, waste minimization practices, and permitted facilities currently utilized for disposition of wastes.

# 4.0 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND MITIGATING ACTIONS

The environmental report must contain analyses of the environmental impacts of the proposed action, including the impacts of refurbishment activities, if any, associated with license renewal and the impacts of operation during the renewal term, for those issues identified as Category 2 issues . . . 10 CFR 52.53(c)(3)(ii)]

> *The report must contain a consideration of alternatives for reducing adverse impacts . . . for all Category 2 license renewal issues . . . . [10 CFR 51.53(c)(3)(iii)]*
>
> *The environmental report must include an analysis that considers . . . the environmental effects of the proposed action . . . and alternatives available for reducing or avoiding adverse environmental effects. [10 CFR 51.45(c)]*
>
> *The environmental report shall . . . discuss . . . the impact of the proposed action on the environment. Impacts shall be discussed in proportion to their significance. [10 CFR 51.45(b)(1)]*
>
> *The information submitted . . . should not be confined to information supporting the proposed action but should also include adverse information. [10 CFR 51.45(e)]*

The NRC has identified and analyzed 78 environmental issues that it considers to be associated with nuclear power plant license renewal and has designated these issues as Category 1, Category 2, or uncategorized. The NRC designated an issue as Category 1 if the following criteria were met:

- The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristic.
- A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts that would occur at any plant, regardless of which plant is being evaluated (except for offsite radiological impacts-collective impacts from other than the disposal of spent fuel and high-level waste).
- Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely to be not sufficiently beneficial to warrant implementation.

If the NRC concluded that one or more of the Category 1 criteria could not be met, the NRC designated the issue Category 2, which requires plant-specific analysis. The NRC designated one issue as uncategorized (chronic effects of electromagnetic fields), signifying that the categorization and impact definitions do not apply to this issue. Until such time that this uncategorized issue is categorized, applicants for license renewal are not required to submit information on this issue [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Footnote 6]; therefore, this issue is not included in Tables 4.0-1, 4.0-2, or 4.0-3, nor is it addressed in Section 4.9. NRC rules do not require analyses of Category 1 issues that were resolved using generic findings [10 CFR Part 51, Subpart A, Appendix B, Table B-1] as described in the GEIS. Therefore, an applicant may reference the GEIS findings for Category 1 issues, absent new and significant information. The NRC provides guidance on new and significant information in Regulatory Guide 4.2, Supplement 1, Revision 1 (NRC 2013b). In this guidance, new and significant information is defined as follows:

- Information that identifies a significant environmental issue not considered or addressed in the GEIS and, consequently, not codified in Table B-1, Summary of Findings on NEPA Issues for License Renewal of Nuclear Plants, in Appendix B, Environmental Effect of Renewing the Operating License of a Nuclear Power Plant, to Subpart A, National Environmental Policy Act – Regulations Implementing Section 102(2), of 10 CFR Part 51; or
- Information not considered in the assessment of impacts evaluated in the GEIS, leading to a seriously different picture of the environmental consequences of the action than previously considered, such as an environmental impact finding different from that codified in Table B-1.
- Further, any new activity or aspect associated with the nuclear power plant that can act upon the environment in a manner or an intensity and/or scope (context) not previously recognized.

### 4.0.1 Category 1 License Renewal Issues

*The environmental report for the operating license renewal stage is not required to contain analyses of the environmental impacts of the license renewal issues identified as Category 1 issues in Appendix B to subpart A of this part. [10 CFR 51.53(c)(3)(i)]*

*[A]bsent new and significant information, the analyses for certain impacts codified by this rulemaking need only be incorporated by reference in an applicant's environmental report for license renewal . . . . (61 FR 28467)*

FPL has determined that, of the 60 Category 1 issues, seven are not applicable to PSL because they result from design or operational features that do not exist at the facility. Table 4.0-1 lists these seven issues and provides a brief explanation of why they are not applicable to the site. Table 4.0-2 lists the 53 issues which are applicable to the site. FPL reviewed the NRC findings on these 53 issues and identified no new and significant information concerning the impacts addressed by these findings (Chapter 5). Therefore, as permitted by 10 CFR 51.53(a), FPL adopts and incorporates by reference the NRC findings and analyses for these Category 1 issues.

### 4.0.2 Category 2 License Renewal Issues

*The environmental report must contain analyses of the environmental impacts of the proposed action, including the impacts of refurbishment activities, if any, associated with license renewal and the impacts of operation during the renewal term, for those issues identified as Category 2 issues in Appendix B to subpart A of this part. [10 CFR 51.53(c)(3)(ii)]*

*The report must contain a consideration of alternatives for reducing adverse impacts, as required by § 51.45(c), for all Category 2 license renewal issues . . . . [10 CFR 1.53(c)(3)(iii)]*

The NRC designated 17 issues as Category 2. FPL has determined that, of the 17 issues shown in Table 4.0-3, six issues are not applicable to PSL because they are applicable to plants with a different type of cooling system or to a plant with greater groundwater withdrawals. For the 11 issues applicable to the site, the corresponding sections contain the required analyses. These analyses include conclusions regarding the significance of the impacts relative to renewal of the PSL Units 1 and 2 OLs and, when applicable, discuss potential mitigation alternatives to the extent appropriate. With the exception of threatened and endangered species/EFH, historic and cultural resources, and environmental justice, PSL has identified the significance of the impacts associated with each issue as SMALL, MODERATE, or LARGE, consistent with the criteria that the NRC established in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Footnote 3 as follows:

SMALL: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the NRC has concluded that those impacts that do not exceed permissible levels in the NRC's regulations are considered small.

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. For issues where probability is a key consideration (i.e., accident consequences), probability was a factor in determining significance.

Consistent with NRC guidance, PSL identified the significance of the impacts for the three Category 2 issues of threatened and endangered species/EFH, historic and cultural resources, and environmental justice as follows:

- For threatened and endangered species (ESA), the significance of the effects from license renewal can be characterized based on a determination of whether continued nuclear power plant operations, including refurbishment, (1) would have no effect on federally listed species; (2) are not likely to adversely affect federally listed species; (3) are likely to adversely affect federally listed species; or (4) are likely to jeopardize a federally listed species or adversely modify designated critical habitat. For EFH

(Magnuson Stevens Fishery Conservation and Management Act), the significance of effects from license renewal can be characterized based on a determination of whether continued nuclear power plant operations, including refurbishment, would have: (1) no adverse impact; (2) minimal adverse impact; or (3) substantial adverse impact to the essential habitat of federally managed fish populations. (NRC 2013a)

- For historic and cultural resources (NHPA), the significance of the effects from license renewal can be characterized based on a determination that: (1) no historic properties are present (no effect); (2) historic properties are present but would not be adversely affected (no adverse effect); or (3) historic properties are adversely affected (adverse effect). (NRC 2013b)
- For environmental justice, impacts would be based on disproportionately high and adverse human health and environmental effects on minority and low-income populations. (NRC 2013b)

In accordance with NEPA practice, PSL considered ongoing and potential additional mitigation in proportion to the significance of the impact to be addressed (i.e., impacts that are SMALL receive less mitigation consideration than impacts that are LARGE).

### 4.0.3 Uncategorized License Renewal Issues

The NRC determined that its categorization and impact-finding definitions did not apply to chronic effects of electromagnetic fields. Because the categorization and impact finding definitions do not apply as noted in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Footnote 5, applicants are not currently required to submit information on this issue.

### 4.0.4 Format of Issues Reviewed

Chapter 4 follows Regulatory Guide 4.2, Supplement 1, Revision 1 (NRC 2013b) regarding content for the license renewal issues identified in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. For Category 1 issues, the generic issues resolved by NRC in NUREG-1437, Rev. 1 (NRC 2013a), FPL presents the results of its new and significant information review. For Category 2 issues which were not resolved in NUREG-1437, Rev. 1, FPL presents a site-specific analysis. The format for Category 2 issues is described below.

- *Issue*: Title of the issue.
- *Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1*: The findings for the issue from 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants.
- *Requirement*: Restatement of the applicable 10 CFR 51.53 requirement.
- *Background*: A background excerpt from the applicable section of the GEIS. The specific section of the GEIS is referenced for the convenience of the reader.

- *Analysis*: An analysis of the environmental impact, taking into account information provided in the GEIS and 10 CFR Part 51, Subpart A, Appendix B, as well as current site-specific information. If an issue is not applicable, the analysis lists the explanation. The analysis section also provides a summary conclusion of the environmental impacts and identifies, as applicable, either ongoing or additional planned mitigation measures to reduce adverse impacts.

**Table 4.0-1 Category 1 Issues Not Applicable to PSL**

| Issue | Comment |
|---|---|
| **Land Use** | |
| Offsite land use in transmission line ROWs | All in-scope transmission lines subject to the evaluation of environmental impacts for license renewal are located completely within the PSL site boundaries. |
| **Surface Water Resources** | |
| Altered salinity gradients | PSL does not have cooling towers and does not discharge to an estuary. |
| Altered thermal stratification of lakes | PSL does not discharge to a lake. |
| **Groundwater Resources** | |
| Groundwater quality degradation (plants with cooling ponds in salt marshes) | PSL does not utilize cooling ponds. |
| **Terrestrial Resources** | |
| Cooling tower impacts on vegetation (plants with cooling towers) | PSL uses once-through cooling. |
| **Aquatic Resources** | |
| Impingement and entrainment of aquatic organisms (plants with cooling towers) | PSL uses once-through cooling. |
| Thermal impacts on aquatic organisms (plants with cooling towers) | PSL uses once-through cooling. |

**Table 4.0-2 Category 1 Issues Applicable to PSL (Sheet 1 of 2)**

| Resource | Issue |
|---|---|
| Land Use | Onsite land uses |
| | Offsite land uses |
| Visual Resources | Aesthetic impacts |
| Air Quality | Air quality impacts (all plants) |
| | Air quality effects of transmission lines |
| Noise | Noise impacts |
| Geologic Environment | Geology and soils |
| Surface Water Resources | Surface water use and quality (non-cooling system impacts) |
| | Altered current patterns at intake and discharge structures |
| | Scouring caused by discharged cooling water |
| | Discharge of metals in cooling system effluent |
| | Discharge of biocides, sanitary wastes, and minor chemical spills |
| | Surface water use conflicts (plants with once-through cooling systems) |
| | Effects of dredging on surface water quality |
| | Temperature effects on sediment transport capacity |
| Groundwater Resources | Groundwater contamination and use (non-cooling system impacts) |
| | Groundwater use conflicts (plants that withdraw less than 100 gallons per minute) |
| | Groundwater quality degradation resulting from water withdrawals |
| Terrestrial Resources | Exposure of terrestrial organisms to radionuclides |
| | Cooling system impacts on terrestrial resources (plants with once-through cooling systems or cooling ponds) |
| | Bird collisions with plant structures and transmission lines |
| | Transmission line right-of-way management impacts on terrestrial resources |
| | Electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock) |
| Aquatic Resources | Entrainment of phytoplankton and zooplankton (all plants) |
| | Infrequently reported thermal impacts (all plants) |
| | Effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication |
| | Effects of nonradiological contaminants on aquatic organisms |
| | Exposure of aquatic organisms to radionuclides |

**Table 4.0-2 Category 1 Issues Applicable to PSL (Sheet 2 of 2)**

| Resource | Issue |
|---|---|
| Aquatic Resources (cont.) | Effects of dredging on aquatic organisms |
| | Effects on aquatic resources (non-cooling system impacts) |
| | Impacts of transmission line right-of-way management on aquatic resources |
| | Losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses |
| Socioeconomics | Employment and income, recreation, and tourism |
| | Tax revenues |
| | Community services and education |
| | Population and housing |
| | Transportation |
| Human Health | Radiation exposures to the public |
| | Radiation exposures to plant workers |
| | Human health impact from chemicals |
| | Microbiological hazards to plant workers |
| | Physical occupational hazards |
| Postulated Accidents | Design-basis accidents |
| Waste Management | Low-level waste storage and disposal |
| | Onsite storage of spent nuclear fuel |
| | Offsite radiological impacts of spent nuclear fuel and high-level waste disposal |
| | Mixed-waste storage and disposal |
| | Nonradioactive waste storage and disposal |
| Uranium Fuel Cycle | Offsite radiological impacts—individual impacts from other than the disposal of spent fuel and high-level waste |
| | Offsite radiological impacts—collective impacts from other than the disposal of spent fuel and high-level waste |
| | Nonradiological impacts of the uranium fuel cycle |
| | Transportation |
| Termination of Nuclear Power Plant Operations and Decommissioning | Termination of plant operations and decommissioning |

**Table 4.0-3 Category 2 Issues Applicability to PSL**

| Resource Issue | Applicability | ER Section |
|---|---|---|
| ***Surface Water Resources*** | | |
| Surface water use conflicts (plants with cooling ponds or cooling towers using makeup water from a river) | Not Applicable | 4.5.1 |
| ***Groundwater Resources*** | | |
| Groundwater use conflicts (plants that withdraw more than 100 gallons per minute) | Not Applicable | 4.5.3 |
| Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river) | Not Applicable | 4.5.2 |
| Groundwater quality degradation (plants with cooling ponds at inland sites) | Not Applicable | 4.5.4 |
| Radionuclides released to groundwater | Applicable | 4.5.5 |
| ***Terrestrial Resources*** | | |
| Effects on terrestrial resources (non-cooling system impacts) | Applicable | 4.6.5 |
| Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river) | Not Applicable | 4.6.4 |
| ***Aquatic Resources*** | | |
| Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds) | Applicable | 4.6.1 |
| Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds) | Applicable | 4.6.2 |
| Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river) | Not Applicable | 4.6.3 |
| ***Special Status Species and Habitats*** | | |
| Threatened, endangered, and protected species and essential fish habitat | Applicable | 4.6.6 |
| ***Historic and Cultural Resources*** | | |
| Historic and cultural resources | Applicable | 4.7 |
| ***Human Health*** | | |
| Microbiological hazards to the public (plants with cooling ponds or canals or cooling towers or that discharge to a river) | Applicable | 4.9.1 |
| Electric shock hazards | Applicable | 4.9.2 |
| ***Postulated Accidents*** | | |
| Severe accidents | Applicable | 4.15.2 |
| ***Environmental Justice*** | | |
| Minority and low-income populations | Applicable | 4.10.1 |
| ***Cumulative Impacts*** | | |
| Cumulative Impacts | Applicable | 4.12 |

## 4.1 Land Use and Visual Resources

Impacts to land use and visual resources are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. FPL conducted a new and significant information review and identified no new and significant information related to land use and visual resources. Therefore, the analyses and findings regarding this issue in the GEIS (NUREG-1437, Revision 1) and 10 CFR Part 51, Subpart A, Appendix B, Table B-1 are incorporated herein by reference, and no further analysis is required.

## 4.2 Air Quality

Impacts to air quality are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. FPL conducted a new and significant information review and identified no new and significant information related to air quality. Therefore, the analyses and findings regarding this issue in the GEIS (NUREG-1437, Revision 1) and 10 CFR Part 51, Subpart A, Appendix B, Table B-1 are incorporated herein by reference, and no further analysis is required.

## 4.3 Noise

Impacts to noise are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. FPL conducted a new and significant information review and identified no new and significant information related to noise. Therefore, the analyses and findings regarding this issue in the GEIS (NUREG-1437, Revision 1) and 10 CFR Part 51, Subpart A, Appendix B, Table B-1 are incorporated herein by reference, and no further analysis is required.

## 4.4 Geology and Soils

Impacts to geology and soils are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. FPL conducted a new and significant information review and identified no new and significant information related to geology and soils. Therefore, the analyses and findings regarding this issue in the GEIS (NUREG-1437, Revision 1) and 10 CFR Part 51, Subpart A, Appendix B, Table B-1 are incorporated herein by reference, and no further analysis is required.

## 4.5 Water Resources

Impacts to water resources evaluated in the GEIS and considered to be generic (the same or similar at all plants), or Category 1 are listed in Section 4.0.1. FPL conducted a new and significant information review and identified no new and significant information related to water resources Category 1 issues. Therefore, the analyses and findings regarding this issue in the GEIS (NUREG-1437, Revision 1) and 10 CFR Part 51, Subpart A, Appendix B, Table B-1 are incorporated herein by reference, and no further analysis is required. The Category 2 issues for water resources are discussed below.

### 4.5.1 Surface Water Use Conflicts (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)

#### 4.5.1.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL or MODERATE. Impacts could be of small or moderate significance, depending on makeup water requirements, water availability, and competing water demands.

#### 4.5.1.2 Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action on water availability and competing water demands, the flow of the river . . . must be provided.

#### 4.5.1.3 Background [GEIS Section 4.5.1.1]

Nuclear power plant cooling systems may compete with other users relying on surface water resources, including downstream municipal, agricultural, or industrial users. Closed-cycle cooling is not completely closed, because the system discharges blowdown water to a surface water body and withdraws water for makeup of both the consumptive water loss due to evaporation and drift (for cooling towers) and blowdown discharge. For plants using cooling towers, the makeup water needed to replenish the consumptive loss of water to evaporation can be significant and is reported at 60 percent or more of the condenser flow rate. Cooling ponds will also require makeup water as a result of naturally occurring evaporation, evaporation of the warm effluent, and possible seepage to groundwater.

Consumptive use by plants with cooling ponds or cooling towers using makeup water from a river during the license renewal term is not expected to change unless power uprates, with associated increases in water use, are proposed. Such uprates would require an environmental assessment by the NRC. In the 1996 GEIS, application of this issue applied only to rivers with low flow to define the difference between plants located on "small" versus "large" rivers. However, any river, regardless of size, can experience low flow conditions of varying severity during periods of drought and changing conditions in the affected watershed such as upstream diversions and use of river water. NRC has subsequently determined that use of the term "low flow" in categorizing river flow is of little value considering that all rivers can experience low flow conditions.

Population growth around nuclear power plants has increased demand on municipal water systems, including systems that rely on surface water. Municipal intakes located downstream from a nuclear power plant could experience water shortages, especially in times of drought. Similarly, water demands upstream from a plant could impact the water availability at the plant's intake.

Water use conflicts associated with plants with cooling ponds or cooling towers using makeup water from a river with low flow were considered to vary among sites because of differing site-specific factors, such as makeup water requirements, water availability (especially in terms of varying river flow rates), changing or anticipated changes in population distributions, or changes in agricultural or industrial demands.

#### 4.5.1.4 Analysis

The normal, and emergency, source of cooling water for PSL is the Atlantic Ocean. PSL utilizes a once-through cooling system and does not utilize cooling ponds or cooling towers (FPL 2001). Therefore, this issue is not applicable and further analysis is not required.

### 4.5.2 Groundwater Use Conflicts (Plants with Closed-Cycle Cooling Systems that Withdraw Makeup Water from a River)

#### 4.5.2.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Water use conflicts could result from water withdrawals from rivers during low-flow conditions, which may affect aquifer recharge. The significance of impacts would depend on makeup water requirements, water availability, and competing water demands.

#### 4.5.2.2 Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action on water availability and competing water demands . . . must be provided. The applicant shall also provide an assessment of the impacts of the withdrawal of water from the river on alluvial aquifers during low flow.

#### 4.5.2.3 Background [GEIS Section 4.5.1.2]

In the case of plants with cooling towers or cooling ponds that rely on a river for makeup of consumed (evaporated) cooling water, it is possible water withdrawals from the river could lead to groundwater use conflicts with other users. This situation could occur because of the interaction between groundwater and surface water, especially in the setting of an alluvial aquifer in a river valley. Consumptive use of the river water, if significant enough to lower the river's water level, would also influence water levels in the alluvial aquifer. Shallow wells of nearby groundwater users could therefore have reduced water availability or go dry. During times of drought, the effect would occur naturally, although withdrawals for makeup water would increase the effect.

#### 4.5.2.4 Analysis

As presented in Section 4.5.1.4, PSL utilizes a once-through cooling system and does not utilize a closed-cycle cooling system. Therefore, this issue is not applicable and further analysis is not required.

### 4.5.3 Groundwater Use Conflicts (Plants that Withdraw more than 100 GPM)

#### 4.5.3.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Plants that withdraw more than 100 gpm could cause groundwater use conflicts with nearby groundwater users.

#### 4.5.3.2 Requirement [10 CFR 51.53(c)(3)(ii)(C)]

If the applicant's plant pumps more than 100 gallons (total onsite) of groundwater per minute, an assessment of the impact of the proposed action on groundwater must be provided.

#### 4.5.3.3 Background [GEIS Section 4.5.1.2]

A nuclear plant may have several wells with combined pumping in excess of 100 gpm (378 liters per minute). Overall site pumping rates of this magnitude have the potential to create conflicts with other local groundwater users if the cone of depression extends to the offsite well(s). Large offsite pumping rates for municipal, industrial, or agricultural purposes may, in turn, lower the water level at power plant wells. For any user, allocation is normally determined through a state-issued permit.

Groundwater use conflicts have not been observed at any nuclear power plants, and no significant change in water well systems is expected over the license renewal term. If a conflict did occur, it might be possible to resolve it if the power plant relocated its well or wellfield to a different part of the property. The siting of new wells would be determined through a hydrogeologic assessment.

#### 4.5.3.4 Analysis

As presented in Section 3.6.3.2, there are no onsite water supply wells at PSL. Five recovery wells previously permitted as part of the former remediation system near the DTA are no longer pumped. The permit expired in 2009 and recovery wells RW-1 and RW-3 were plugged and abandoned. The other remaining recovery wells, RW-2, RW-4, and RW-5, are being monitored and sampled as part of the GWPP.

No groundwater withdrawal is being conducted at PSL; therefore, this issue is not applicable and further analysis is not required.

### 4.5.4 Groundwater Quality Degradation (Plants with Cooling Ponds at Inland Sites)

#### 4.5.4.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Inland sites with closed-cycle cooling ponds could degrade groundwater quality. The significance of the impact would depend on cooling pond water quality, site hydrogeologic conditions (including the interaction of surface water and groundwater), and the location, depth, and pump rate of water wells.

#### 4.5.4.2 Requirement [10 CFR 51.53(c)(3)(ii)(D)]

If the applicant's plant is located at an inland site and utilizes cooling ponds, an assessment of the impact of the proposed action on groundwater quality must be provided.

#### 4.5.4.3 Background [GEIS Section 4.5.1.2]

Some nuclear power plants that rely on unlined cooling ponds are located at inland sites surrounded by farmland or forest or undeveloped open land. Degraded groundwater has the potential to flow radially from the ponds and reach offsite groundwater wells. The degree to which this occurs depends on the water quality of the cooling pond; site hydrogeologic conditions (including the interaction of surface water and groundwater); and the location, depth, and pump rate of water wells. Mitigation of significant problems stemming from this issue could include lining existing ponds, constructing new lined ponds, or installing subsurface flow barrier walls. Groundwater monitoring networks would be necessary to detect and evaluate groundwater quality degradation. The degradation of groundwater quality associated with cooling ponds has not been reported for any inland nuclear plant sites.

#### 4.5.4.4 Analysis

As presented in Section 4.5.1.4, PSL utilizes a once-through cooling system and does not utilize cooling ponds. Therefore, this issue is not applicable and further analysis is not required.

### 4.5.5 Radionuclides Released to Groundwater

#### 4.5.5.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL or MODERATE. Leaks of radioactive liquids from plant components and pipes have occurred at numerous plants. Groundwater protection programs have been established at all operating nuclear power plants to minimize the potential impact from any inadvertent releases. The magnitude of impacts would depend on site-specific characteristics.

#### 4.5.5.2 Requirement [10 CFR 51.53(c)(3)(ii)(P)]

An applicant shall assess the impact of any documented inadvertent releases of radionuclides into groundwater. The applicant shall include in its assessment a description of any GWPP used for the surveillance of piping and components containing radioactive liquids for which a pathway to groundwater may exist. The assessment must also include a description of any past inadvertent releases and the projected impact to the environment (e.g., aquifers, rivers, lakes, ponds, ocean) during the license renewal term.

#### 4.5.5.3 Background [GEIS Section 4.5.1.2]

The issue is relevant to license renewal because all commercial nuclear power plants routinely release radioactive gaseous and liquid materials into the environment. These radioactive releases are designed to be planned, monitored, documented, and released into the environment at designated discharge points. But over the years, there have been numerous events at nuclear power reactor sites which involved unknown, uncontrolled, and unmonitored releases of liquids containing radioactive material into the groundwater.

The majority of the inadvertent liquid release events involved tritium, which is a radioactive isotope of hydrogen. However, other radioactive isotopes, such as cesium and strontium, have also been inadvertently released into the groundwater. The types of events include leakage from spent fuel pools, buried piping, and failed pressure relief valves on an effluent discharge line.

In 2006, the NRC's executive director for operations chartered a task force to conduct a lessons-learned review of these incidents. On September 1, 2006, the task force issued its report: "Liquid Radioactive Release Lessons Learned Task Force Report."

The most significant conclusion dealt with the potential health impacts on the public from the inadvertent releases. Although there were numerous events during which radioactive liquid was released to the groundwater in an unplanned, uncontrolled, and unmonitored fashion, based on the data available, the task force did not identify any instances where public health and safety was adversely impacted.

On the basis of the information and experience with these leaks, the NRC concludes that the impact to groundwater quality from the release of radionuclides could be SMALL or MODERATE, depending on the magnitude of the leak, the radionuclides involved, hydrogeologic factors, the distance to receptors, and the response time of plant personnel in identifying and stopping the leak in a timely fashion.

#### 4.5.5.4 Analysis

A description of the PSL GWPP is presented in Section 3.6.2.4. Table 3.6-2 presents well construction details for the PSL groundwater monitoring wells, while Figure 3.6-6 shows the locations of the onsite wells. Table 3.6-6 presents information on 25 registered water wells located within a 5-mile band (none within a 2-mile band) around the PSL property boundary, while Figure 3.6-8 shows the location of these offsite wells.

As presented in Section 3.6.2.4, no gamma or difficult-to-detect radionuclides, other than naturally occurring radionuclides, were identified in well samples between 2016 and 2020. Tritium has been detected in groundwater monitoring wells in the vicinity of the DTA, TLO, and mixed plume area, as discussed in Section 3.6.4.2, but all current measurements are far below the 30,000 pCi/L reporting limit for PSL and below the EPA's 20,000 pCi/L safe drinking water standard. Further, the groundwater at the site is not potable because of its salinity, and in the vicinity of the plant generally flows toward and discharges into the intake canal, where it is significantly diluted.

Therefore, because water from plant uses continues to be processed and monitored in compliance with licensing and permitting, PSL concludes that impacts from radionuclides to groundwater are SMALL and do not warrant additional mitigation measures beyond PSL's existing GWPP.

## 4.6 Ecological Resources

Impacts to ecological resources evaluated in the GEIS and considered to be generic (the same or similar at all plants), or Category 1 are listed in Section 4.0.1. FPL conducted a new and significant information review and identified no new and significant information related to ecological resources Category 1 issues. Therefore, the analyses and findings regarding these issues in the GEIS (NUREG-1437, Revision 1) and 10 CFR Part 51, Subpart A, Appendix B, Table B-1 are incorporated herein by reference, and no further analysis is required. The Category 2 issues for ecological resources are discussed below.

The Category 2 issue concerning impacts of the proposed action to threatened and endangered species presented in Section 4.6.6 also addresses the potential for impacts to these species regarding environmental effects/stresses of continued operations identified in terrestrial and aquatic ecological resources Category 1 issues.

### 4.6.1 Impingement and Entrainment of Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)

#### 4.6.1.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, OR LARGE. The impacts of impingement and entrainment are small at many plants but may be moderate or even large at a few plants with once-through and cooling pond cooling systems, depending on cooling system withdrawal rates and volumes and the aquatic resources at the site.

#### 4.6.1.2 Requirement [10 CFR 51.53(c)(3)(ii)(B)]

If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current CWA 316(b) determinations or equivalent state permits and supporting documentation. If the applicant cannot provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from impingement and entrainment.

#### 4.6.1.3 Background [GEIS Section 4.6.1.2]

Impingement occurs when organisms are held against the intake screen or netting placed within intake canals. Most impingement involves fish and shellfish. At some nuclear power plants, other vertebrate species may also be impinged on the traveling screens or on intake netting placed within intake canals.

Entrainment occurs when organisms pass through the intake screens and travel through the condenser cooling system. Aquatic organisms typically entrained include ichthyoplankton (fish eggs and larvae), larval stages of shellfish and other macroinvertebrates, zooplankton, and phytoplankton. Juveniles and adults of some species may also be entrained if they are small enough to pass through the intake screen openings, which are commonly 0.38 inches at the widest point.

The magnitude of the impact would depend on plant-specific characteristics of the cooling system (including location, intake velocities, screening techniques, and withdrawal rates) and characteristics of the aquatic resource (including population distribution, status, management objectives, and life history).

#### 4.6.1.4 Analysis

The intake cooling water system for PSL Units 1 and 2 is a once-through cooling system. Cooling water is pumped from the Atlantic Ocean using intake cooling water pumps. This non-contact cooling water is pumped through heat exchangers to provide cooling for a wide variety of plant equipment and is discharged to the discharge canal.

The intake structures are located 1,200 feet offshore where the water is nearly 23 feet deep. The designs of the structures feature a large concrete base with a vertical cylindrical opening in the center and a concrete velocity cap supported by columns extending approximately 6 feet from the base. The velocity cap configuration was designed to reduce impingement of marine organisms by converting vertical flow into horizontal flow at the intake. The design takes into account that fish are able to detect and avoid a horizontal velocity, but not a vertical velocity. The location of the velocity caps at mid-depth also helps reduce entrainment, based on data demonstrating that plankton densities are much lower at mid-depth than at the ocean surface. Water withdrawn from the structures is conveyed through separate buried pipes, beneath the beach and dune system, to the intake canal. Inside diameters of the pipes, which correspond to those of the vertical cylindrical openings in the concrete bases of the structures, are 16 feet for the large intake and 12 feet for the small intakes.

In addition, FPL has installed and maintains three barriers in the intake canal to reduce marine life residence time in the canal, particularly sea turtles, and to facilitate the return of turtles to the ocean. These include deployment of a 12.7-centimeter (5-inch) mesh barrier net across the channel midway between SR A1A and the canal headwall, a 20.3-centimeter (8-inch) mesh barrier net immediately east of SR A1A, and installation of a rigid barrier across the north-south arm of the intake canal.

As indicated in the current IWFP No. FL0002208 for PSL Units 1 and 2, both units have documentation of CWA Section 316(b) compliance indicating that the existing intake structure reflects BTA for minimizing environmental impacts at the plant. Pending application of the new 316(b) standards for existing facility, the FDEP has applied Section 316(b) to PSL based on best professional judgment. (FDEP 2020c; NRC 2003)

As presented in Section 3.7.7 and discussed below, periodic monitoring of entrainment and impingement of fish and aquatic species has been conducted to verify that PSL is utilizing the BTA to reduce impacts to fish and other wildlife surrounding the plant.

Impingement studies were conducted from 1976–1978 at the request of the NRC for Unit 1's OL. Annual fish impingement was estimated to be between 34,000 (1978) and 131,000 (1976); annual shellfish impingement was estimated at 26,000 (1976) to 37,000 shellfish (1978). The mean number of fish impinged per 24-hour period was 222, and the mean number of shellfish was 82. The dominant taxa impinged included anchovy (*Anchoa* spp.), grunt (*Haemulidae*), jack (*Carangidae*), croaker (*Micropogonias* spp.), mojarro (*Gerreidae*), shrimp (*Panaeidae*), and blue crab (*Callinectes sapidus*). In 1979, the NRC granted an amendment to the operating license for Unit 1 which discontinued the monitoring requirement, stating that impingement losses were insignificant when compared to the fish populations in the site vicinity and the number of commercially harvested shrimp on Florida's east coast.

When Unit 2 was added, it was acknowledged that the impingement impacts would double with the doubling of the intake flow. However, the NRC estimated, that even with the doubling in weight of impinged organisms, impingement would still only be equal to less than half of 1 percent of the commercial catch of fish and shellfish in either St. Lucie or Martin counties. Therefore, the NRC concluded the combined estimates for impingement of the two units would still be insignificant.

Entrainment studies were also conducted as part of the effort and went on from 1977 to 1983. Paired bongo nets were used to collect ichthyoplankton in the intake canal and nearshore habitats. Six ocean stations, as well as one station in the intake canal, and one station in the discharge canal were sampled twice a month during the day using paired 20-centimeter, 505-micron mesh bongo nets. The offshore station's nets were towed for 15 minutes just below the surface. A mid-depth sample was taken near the intake, and oblique tows were taken in the canals.

Sample analysis showed the mid-water samples near the intake had lower densities of ichthyoplankton than the surface samples, the intake canal had lower densities than the ocean, and the discharge canal had lower densities than the intake canal. It was also noted that most of the larval fish collected in the intake canal were damaged. The most common larval fish collected were herrings (*Clupea* spp.) and anchovies (*Engraulis* spp.), suggesting unidentifiable eggs collected were likely the same species. Blennies (*Blenniiformes* spp.), gobies (*Gobiidae* spp.), mojarras (*Gerreidae* spp.), drums (*Aplodinotus* spp., Rafinesque spp.) and jacks (*Caranx* spp.) were also dominant. It was determined that approximately 0.4 percent of the fish eggs and larvae passing the intake would be subject to entrainment.

Additional entrainment studies were conducted in January 2006 to October 2007 in response to the release of the Phase II rule to characterize the biological community in the vicinity of PSL. However, in 2007 the Phase II rule was suspended. The results were utilized as part of a 2010 biological characterization report to determine the most appropriate water source for PSL. The original compliance strategy was to demonstrate that the design, technology, and operational measures already implemented for the plant, including relocation of the plant CWIS from the Indian River Lagoon (Big Mud Creek), as proposed in the original plant design, to the marine offshore environment (Atlantic Ocean), and the use of velocity caps at the three intakes, meet the national performance standards for BTA.

The results were as follows: Dominant fish collected in the ocean trawls were anchovies (especially *Anchoa hepsetus* and *A. lamprotenia*), comprising approximately 89 percent of the catch, followed by herrings (*Clupeidae*) at approximately 5 percent. Shellfish densities were low (less than one per 100 cubic meters) throughout the study and were dominated by commercial shrimp (*Penaeidae*) and swimming crabs (*Portunus* spp.).

Plankton samples were collected by pumping intake water as it is drawn into the intake canal through a 1-meter diameter plankton net with 30-micron mesh. Densities in the intake canal were low throughout the study. A high percentage of the catch in the intake canal was unidentifiable (74.5 percent) due to developmental stage (35 percent undeveloped), damaged (24 percent), or otherwise unidentifiable (15 percent). Drums (9.5 percent) and anchovies (4 percent) were the most commonly identified. Densities of shellfish in the intake canal were also low throughout the study and dominated by brachyuran crabs (*Brachyura*, 64 percent), sergestid shrimp (*Sergestoidea*, 9 percent), and caridean shrimp (*Caridea*, 7 percent).

As part of the current 316(b) requirements, and in response to IWFP No. FL0002208, issued on November 4, 2016, an entrainment study was completed in 2017 for the PSL site, which supplements the data found in the Phase II demonstration (2006–2007 data mentioned above) and support the site-specific determination of BTA for entrainment. The reports required under the final rule at 40 CFR Part 122.21(r), which encompass compliance with both impingement and entrainment standards, with the April 2021 NPDES permit renewal application. (FPL 2021b)

An estimated 4.7 billion fish life stages and 64.4 billion invertebrates were entrained using the Year 1 (October 2006 to October 2007) sampling results, and 16.1 billion fish life stages and 121.3 billion invertebrates were entrained using the Year 2 (2017 to 2018) sampling results. Unidentified eggs were the most commonly entrained fish in both years; 55.1 percent for Year 1 and 74.6 percent for Year 2. The top three dominant fish types (identified) were those in the Herring family, the Combtooth blenny family, and the Drum family. Brachyuran crabs were the most commonly entrained invertebrates in both years, with 70.4 percent in Year 1 and 62.0 percent in Year 2. Brachyuran crabs were followed in dominance in the two years by Anomuran crab (non-Thalassinidea) and the infraorder of ghost and mud shrimp. Importantly, no federally or state-listed species have been subject to entrainment. Accounting for just the average annual commercial catch (2015 to 2019), the estimated foregone fishery yield attributable to PSL entrainment represents approximately 5.9 percent of the county's catch. This percentage would be substantially reduced when the recreational landings are considered. Based on the 316(b) studies, FPL concluded that the data and analysis do not support additional means to further reduce impingement or entrainment. (FPL 2021b)

FPL concludes that impacts from impingement and entrainment of aquatic organisms during the proposed operating term would be SMALL. Any additional mitigation measures that might be implemented in the future under the 316(b) rule and the new BO, would further reduce the SMALL impacts.

### 4.6.2 Thermal Impacts on Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)

#### 4.6.2.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Most of the effects associated with thermal discharges are localized and not expected to affect overall stability of populations or resources. The magnitude of impacts, however, would depend on site-specific thermal plume characteristics and the nature of aquatic resources in the area.

#### 4.6.2.2 Requirement [10 CFR 51.53(c)(3)(ii)(B)]

If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of a 316(a) variance in accordance with 40 CFR Part 125, or equivalent state permits and supporting documentation. If the applicant cannot provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from thermal changes.

#### 4.6.2.3 Background [GEIS Section 4.6.1.2]

Because characteristics of both the thermal discharges and the affected aquatic resources are specific to each site, the NRC classified heat shock as a Category 2 issues that required a site-specific assessment for license renewal. The NRC found the potential for thermal discharge impacts to be greatest at plants with once-through cooling systems, primarily because of the higher discharge temperatures and larger thermal plume area compared to plants with cooling towers.

The impact level at any plant depends on the characteristics of its cooling system (including location and type of discharge structure, discharge velocity and volume, and three-dimensional characteristics of the thermal plume) and characteristics of the affected aquatic resources (including the species present and their physiology, habitat, population distribution, status, management objectives, and life history).

#### 4.6.2.4 Analysis

PSL's current NPDES Permit No. FL0002208 establishes thermal limitations and a mixing zone for PSL's cooling water discharge in accordance with FAC 62-302.520, "Thermal Surface Water Criteria." PSL operates in compliance with thermal discharge provisions of Florida's surface water quality standards; a variance to these standards is not applicable to PSL operations. The thermal limitations and thermal mixing zone dimensions were originally established in 1987 (FDEP 2016a). To support the EPU, using historic data and thermal modelling, FPL predicted the need to increase the maximum heated water temperature at the point of discharge for Outfall D-001 from 113°F to 115°F and requested this permit change. Consequently, FDEP required FPL to conduct a post-uprate thermal monitoring study to verify modeling predictions for the thermal mixing zone and conduct a biological study to demonstrate the discharge temperature increase due to the uprate would not have an adverse effect on the balanced, indigenous population of fish and shellfish in the vicinity of the discharge.

Baseline monitoring commenced in August 2011 and continued through October 2012. The EPU was completed in December 2012 and the first post-EPU sampling event was conducted in January 2013. Post-EPU monitoring continued through February 2015. Sampling was performed every other month for a total of eight baseline sampling events and 12 post-EPU events.

Collectively, data collected during the plan of study indicates that a diverse assemblage of fish and shellfish exist in the nearshore waters of the Atlantic Ocean offshore PSL. These faunal communities, as well as the monitored water quality parameters, exhibit considerable spatial and temporal variability.

Similar to the results of the 316(a) monitoring effort at PSL in the 1970s, data collected during the current EPU-associated biological study provide no evidence that the recent plant EPU has affected the abundance or composition of faunal communities in the vicinity of the plant. Based on the huge capacity of the receiving water body (the Atlantic Ocean) to dissipate heat, the effectiveness of the offshore discharge pipes in diffusing heated cooling water, the limited spatial area historically affected by thermal discharges, and the small change in discharge temperatures resulting from the EPU, the absence of any detectable EPU effects on faunal communities is not unexpected.

The studies were reviewed and approved by the FDEP and as a result, the thermal limitations and thermal mixing zone originally established in 1987 were continued in the current permit (FDEP 2016a). In accordance with 10 CFR 51.53(c)(3)(ii)(B), FPL provides in Attachment B a copy of its state-issued NDPES permit that establishes thermal limitations and a thermal mixing zone in accordance with Florida's surface water quality standards. There are no planned operational changes during the proposed SLR operating term that would increase the temperature of PSL's existing thermal discharge. Thus, the thermal impacts on aquatic organisms during the proposed SLR operating term would be SMALL and mitigation measures are not warranted.

### 4.6.3 Water Use Conflicts with Aquatic Resources (Plant with Cooling Ponds or Cooling Towers Using Makeup Water from a River)

#### 4.6.3.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL or MODERATE. Impacts on aquatic resources in stream communities affected by water use conflicts could be of moderate significance in some situations.

#### 4.6.3.2 Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action on water availability and competing water demands, the flow of the river, and related impacts on stream (aquatic)…ecological communities must be provided.

#### 4.6.3.3 Background [GEIS 4.6.1.2]

Increased temperatures and/or decreased rainfall would result in lower river flows, increased cooling pond evaporation, and lowered water levels in the Great Lakes or reservoirs. Regardless of overall climate change, droughts could result in problems with water supplies and allocations. Because future agricultural, municipal, and industrial users would continue to share their demands for surface water with power plants, conflicts might arise if the availability of this resource decreased.

Water use conflicts with aquatic resources could occur when water to support these resources is diminished either because of decreased water availability due to droughts; increased demand for agricultural, municipal, or industrial usage; or a combination of such factors. Water use conflicts with biological resources in stream communities are a concern due to the duration of license renewal and potentially increasing demands on surface water.

#### 4.6.3.4 Analysis

As presented in Section 2.2.3, PSL utilizes a once-through cooling system and does not utilize cooling ponds or cooling towers. Therefore, this issue is not applicable, and further analysis is not required.

### 4.6.4 Water Use Conflicts with Terrestrial Resources (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)

#### 4.6.4.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL or MODERATE. Impacts on terrestrial resources in riparian communities affected by water use conflicts could be of moderate significance.

#### 4.6.4.2 Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action of water availability and competing water demands, the flow of the river, and related impacts on riparian (terrestrial) ecological communities must be provided.

#### 4.6.4.3 Background [GEIS Section 4.6.1.1]

Water use conflicts with terrestrial resources in riparian communities could occur when water that supports these resources is diminished either because of decreased availability due to droughts; increased water demand for agricultural, municipal, or industrial usage; or a combination of such factors. For future license renewals, the potential range of impact levels at plants with cooling ponds or cooling towers using makeup water from a river cannot be determined at this time.

#### 4.6.4.4 Analysis

As presented in Section 2.2.3, PSL utilizes a once-through cooling system and does not utilize cooling ponds or cooling towers. Therefore, this issue is not applicable and further analysis is not required.

### 4.6.5 Effects on Terrestrial Resources (Non-Cooling System Impacts)

#### 4.6.5.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Impacts resulting from continued operations and refurbishment associated with license renewal may affect terrestrial communities. Applications of BMPs would reduce the potential for impacts. The magnitude of impacts would depend on the nature of the activity, the status of the resources that could be affected, and the effectiveness of mitigation.

#### 4.6.5.2 Requirement [10 CFR 51.53(c)(3)(ii)(E)]

All license renewal applicants shall assess the impact of refurbishment, continued operations, and other license renewal-related construction activities on important plant and animal habitats.

#### 4.6.5.3 Background [GEIS Section 4.6.1.1.]

Continued operations and refurbishment activities could continue to affect onsite terrestrial resources during the license renewal term at all operating nuclear power plants. Factors that could potentially result in impacts include landscape maintenance activities, stormwater management, and elevated noise levels. These impacts would be similar to past and ongoing impacts.

The characteristics of terrestrial habitats and wildlife communities currently on nuclear powerplant sites have generally developed in response to many years of typical operations and maintenance programs. While some may have reached a relatively stable condition, some habitats and populations of some species may have continued to change gradually over time. Operations and maintenance activities during the license renewal term are expected to be similar to current activities. Because the species and habitats present on the site (i.e., weedy species and habitats they make up) are generally tolerant of disturbance, it is expected that continued operations during the license renewal term would maintain these habitats and wildlife communities in their current state or maintain current trends of change.

Terrestrial habitats and wildlife could be affected by ground disturbance from refurbishment-related construction activities. Land disturbed during the construction of new ISFSIs would range from about 2.5-10 acres. Other activities may include new parking areas for plant employees, access roads, buildings, and facilities. Temporary project support areas for equipment storage, worker parking, and material laydown areas could also result in the disturbance of habitat and wildlife.

Successful application of environmental review procedures, employed by the licensees at many of the operating nuclear plant sites, would result in the identification and avoidance of important terrestrial habitats. In addition, the application of BMPs to minimize the area affected; to control fugitive dust, runoff, and erosion from project sites; to reduce the spread of invasive nonnative plant species; and to reduce wildlife disturbance in adjacent habitats, could greatly reduce the impacts of continued operations and refurbishment activities.

### 4.6.5.4 Analysis

#### *4.6.5.4.1 Refurbishment Activities*

As presented in Section 2.3, no SLR-related refurbishment activities have been identified. Therefore, there would be no SLR-related refurbishment impacts to important plant and animal habitats, and no further analysis is required.

#### *4.6.5.4.2 Operational Activities*

Terrestrial resources are described in Section 3.7.2. No SLR-related construction activities or changes in operational practices have been identified that would involve disturbing habitats. PSL would continue to conduct ongoing plant operational and maintenance activities during the proposed SLR operating term. However, these activities are anticipated to occur within previously disturbed habitats. As discussed in Section 3.1.4, the need for expansion of the ISFSI is not yet determinable. If expansion occurred, it would likely be on already disturbed land.

Operational and maintenance activities that PSL might undertake during the renewal term, such as maintenance and repair of plant infrastructure (e.g., roadways, piping installations, fencing, and other security infrastructure), would likely be confined to previously disturbed areas of the site. Furthermore, as presented in Section 9.6, FPL has administrative controls in place at PSL to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs, permit modifications, surveys and monitoring of species and habitats, or acquisition of new permits as needed. In addition, regulatory programs that the site is currently subject to, such as stormwater management, spill prevention, dredging, and herbicide use, further serve to minimize impacts to terrestrial resources.

In summary, adequate management programs and regulatory controls are in place to ensure that important plant and animal habitats are protected during the proposed SLR operating term for PSL. Therefore, FPL concludes the impacts to the terrestrial ecosystems from the proposed SLR are SMALL and no additional mitigation measures beyond current management programs and existing regulatory controls are required.

## 4.6.6 Threatened, Endangered, and Protected Species, and EFH

### 4.6.6.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

The magnitude of impacts on threatened, endangered, and protected species, critical habitat, and EFH would depend on the occurrence of listed species and habitats and the effects of power plant systems on them. Consultation with appropriate agencies would be needed to determine whether status species or habitats are present and whether they would be adversely affected by continued operations and refurbishment associated with license renewal.

#### 4.6.6.2 Requirement [10 CFR 51.53(c)(3)(ii)(E)]

All license renewal applicants shall assess the impact of refurbishment, continued operations, and other license renewal-related construction activities on important plant and animal habitats. Additionally, the applicant shall assess the impact of the proposed action on threatened and endangered species in accordance with federal laws protecting wildlife, including but not limited to, the ESA, and EFH in accordance with the Magnuson-Stevens Fishery Conservation and Management Act.

#### 4.6.6.3 Background [GEIS Section 4.6.1.3]

There are several federal acts that provide protection to certain species and habitats that are treated here under a single issue. The issue includes impacts to biological resources such as threatened and endangered species and their critical habitat under the ESA, EFH as protected under the Magnuson-Stevens Fishery Conservation and Management Act, and impacts to mammalian species protected under the MMPA.

Factors that could potentially result in impacts on listed terrestrial species include habitat disturbance, cooling tower drift, operation and maintenance of cooling systems, transmission line ROW maintenance, collisions with cooling towers and transmission lines, and exposure to radionuclides. The listed species on or in the vicinity of nuclear power plants also range widely, depending on numerous factors such as the plant location and habitat types present.

Potential impacts of continued operations and refurbishment activities on federally or state-listed threatened and endangered species, protected marine mammals, and EFH could occur during the license renewal term. Factors that could potentially result in impacts to these species and habitats include impacts of refurbishment, other ground-disturbing activities, release of contaminants, effects of cooling water discharge on dissolved oxygen, gas supersaturation, eutrophication, thermal discharges, entrainment, impingement, reduction in water levels due to the cooling system operations, dredging, radionuclides, and transmission line ROW maintenance.

#### 4.6.6.4 Analysis

##### *4.6.6.4.1 Refurbishment Activities*

As presented in Section 2.3, no SLR-related refurbishment activities have been identified. Therefore, there would be no license renewal-related refurbishment impacts to threatened, endangered, and protected species, or EFH, and no further analysis is required.

##### *4.6.6.4.2 Operational Activities*

As presented in Section 3.7.8.1, there are 49 federally protected or listed species which are either threatened, endangered, candidate, or species of concern with the potential to occur in

St. Lucie County. In addition, as presented in Section 3.7.8.2, the FFWCC and FNAI have designated 56 plant and animal species that do not have a federal listing status but are state listed as threatened or endangered.

Federally Listed Species

FPL has re-initiated consultation with the NMFS and NRC when required by its incidental take statement under Section 7 of the ESA. In 1999 FPL exceeded its anticipated incidental take limit established by the 1997 and reinitiated consultation. A 2001 BO was issued with a number of changes. It stated that FPL would exceed its take limits for a calendar year if any of the following occur: (1) more than 1,000 sea turtles are captured; (2) more than 1 percent of the total number of loggerhead and green turtles (combined) are injured/killed due to plant operation; (3) more than two Kemp's ridley sea turtles are injured/killed due to plant operation; or (4) if any hawksbill or leatherback sea turtles are injured/killed due to plant operation. In the case where 1 percent of the combined loggerhead and green turtle captures is not a whole number, it is rounded up (e.g., 520 combined captures = take limit of 6).

In 2006, FPL exceeded its sea turtle take limit at PSL, and the NRC was required to reinitiate a Section 7 consultation with the NMFS. FPL identified the contributing factors that led to exceeding the take limit in 2006 and responded by cleaning the intake pipes and other compensatory measures. PSL continued to operate under the 2001 BO until NMFS issued a new BO in March 2016. The most significant change in the new BO is to the IST, which states that FPL would exceed its take limit if: (1) more than 623 loggerheads, 500 green turtle, seven hawksbills, eight Kemp's ridleys, or five leatherbacks are captured annually; (2) more than seven green turtles or three loggerheads are documented with severe causal injuries annually; (3) more than five green turtles or three loggerhead are documented as causal mortalities annually; (4) more than one hawksbill, Kemp's ridley, or leatherback are documented with either a severe causal injury or is a causal mortality every two years; (5) more than one smalltooth sawfish is captured every five years or any smalltooth sawfish are ever killed.

Between 2015 and 2019, there were 1,312 loggerheads, 1,028 green turtles, 38 Kemp's ridleys, eight hawksbill, four leatherback, and one olive ridley captured. There were 19 causal mortalities (four loggerheads and 15 green turtles). There was one causal injury to a green turtle requiring transport to a rehabilitation facility.

Since 2017 there have been three sawtooth sawfish captures in the intake canal. Further, FPL exceeded its take limit for non-lethal captures of Kemp ridleys (2018 and 2019), and green sea turtles causal mortalities (2018) under the latest BO issued by NMFS. Thus, the NRC reinitiated Section 7 consultations with the NMFS. Further, two giant manta rays were captured and released in September 2020 and October 2020, and have become part of the consultation process.

Further, the federally protected Nassau grouper, eastern indigo snake, crested caracara, Everglade snail kite, Florida scrub jay, ivory billed woodpecker, piping plover, red knot, wood stork, Anastasia beach mouse, southeastern beach mouse, cassius blue butterfly, ceraunus blue butterfly, Miami blue butterfly, Johnson's seagrass, Lakela's mint, and tiny polygala have the potential to occur at PSL, but are not currently documented as occurring onsite. Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to these species. Thus, continued operation of the PSL under the proposed SLR in not likely to adversely affect these species.

The continued operation of PSL under the proposed SLR may affect and is likely to adversely affect the loggerhead, green, Kemp's ridley, hawksbill, and leatherback sea turtles, as well as the smalltooth sawfish, scalloped hammerhead shark, and giant manta ray. An ongoing Section 7 consultation is occurring with the NMFS and the NRC. Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. With adherence to these controls, as well as compliance with the terms and conditions and reasonable and prudent measures identified in the pending BO, the continued operation of PSL under the proposed SLR will not jeopardize the continued existence of these species or adversely modify the designated critical habitat for the loggerhead sea turtle.

State Listed Species

As documented in Section 3.7.8, the following state-protected species have been documented at the PSL Units 1 and 2 site: the least tern (*Sterna antillarum*), black skimmer (*Rynchops niger*), American oystercatcher (*Haematopus palliateus*), Florida sandhill crane (*Antigone canadensis pratensis*), little blue heron (*Egretta caerulea*), reddish egret (*Egretta rufescens*), gopher tortoise (*Gopherus polyphemus*), southeastern American kestrel (*Falco sparverius paulus*), large flowered rosemary (*Conradina grandiflora*), inkberry (*Scaevola plumieri*), and coastal vervain (*Glandularia maritima*). (Foster and Wheeler 2001)

The state-listed Florida pine snake, Gopher frog, burrowing owl, reddish egret, scrub bluestem, terrestrial peperomia, burrowing four o'clock, common prickly pear, barbed wire cactus, Guiana plum, sea lavender, yellow butterwort, satinleaf, false buttonweed, yellow nickerbean, and many-flowered grass-pink have the potential to occur at PSL, but are not currently documented as occurring onsite. Compliance with all regulatory requirements associated with protected species will be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to these species. Thus, continued operation of the PSL under the proposed SLR is not likely to adversely affect these species.

Birds Protected Under the MBTA

Migratory movements or local flight patterns might result in the occurrence of snail and swallow-tailed kites, roseate spoonbill, purple gallinule, eastern towhee, and yellow-crowned night-heron. Habitat for these species may be located on portions of the PSL site not utilized for operations. However, activities on the PSL site are evaluated to ensure compliance under the MBTA. When necessary, consultation with responsible agencies is conducted to maintain compliance with existing regulations. Compliance with all regulatory requirements associated with these species will continue to be an administrative control practiced by FPL for the life of the PSL facility. Adherence to these controls, as well as compliance with laws and regulations, will minimize impacts to these species. The continued operation of PSL is not likely to impact these species.

Essential Fish Habitat and Highly Migratory Fish Species

As discussed in Section 3.7.8.6, EFH exists near the PSL site. Twenty-one species with EFH were located within the 6-mile radius (NOAA 2018). EFH for the Atlantic sharpnose shark (Atlantic stock), bigeye thresher shark, blacknose shark (Atlantic stock), blacktip shark (Atlantic stock), bluefish, bonnethead shark (Atlantic stock), bull shark, Caribbean reef shark, coastal migratory pelagics, corals, great hammerhead shark, lemon shark, nurse shark, sailfish, sandbar shark, scalloped hammerhead shark, skipjack tuna, snapper grouper, spinner shark, spiny lobster, summer flounder, and tiger shark occur within a 6-mile radius of PSL. As discussed in Sections 3.7.3 and 3.7.7, studies have been conducted to evaluate the effects of the operation of PSL on aquatic habitat. Furthermore, PSL maintains an environmental control program to ensure that all site activities comply with applicable environmental regulations (i.e., water withdrawal increase, NPDES discharge point, thermal effluents, wastewater discharge increase, air emissions increase). Thus, the operation of PSL under the proposed SLR is expected to have minimal impact on EFH.

In addition, HMS managed by NOAA fisheries include tunas, some sharks, swordfish, billfish, and other highly sought-after fish such as Pacific mahi mahi. EFH has been designated and described for over forty Atlantic HMS. Of these designated HMS, 16 are denoted as occurring within a 6-mile radius of PSL. The Atlantic sharpnose shark (Atlantic stock), bigeye thresher shark, blacknose shark (Atlantic stock), blacktip shark (Atlantic stock), bonnethead shark (Atlantic stock), bull shark, Caribbean reef shark, great hammerhead shark, lemon shark, nurse shark, sailfish, sandbar shark, scalloped hammerhead shark, skipjack tuna, spinner shark, and tiger shark are all considered HMS within a 6-mile radius of PSL.

Conclusions of Category II Issues Related to Protected Species

As presented in Section 9.6, FPL has administrative controls in place at PSL to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs. In addition, regulatory programs that the site is subject to, such as those presented in Chapter 9, further serve to minimize impacts to any threatened, endangered, and protected species. Compliance with all regulatory requirements associated with these species will continue to be an administrative control practiced by FPL for the life of the PSL facility. Adherence to these controls, as well as compliance with laws and regulations, will minimize impacts to these species. Maintenance activities necessary to support SLR likely would be limited to previously disturbed areas onsite, and no additional land disturbance has been identified for the purpose of the SLR. In an effort to obtain an independent review and verification of species requiring consideration, letters requesting consultation have been submitted to the USFWS, FWC, and NMFS. Responses to these requests have not yet been received. Copies of the consultation letters to the USFWS, FWC, and NMFS are included in Attachment C.

In summary, no SLR-related refurbishment activities have been identified. The continued operation of the site has the potential to adversely affect the five species of documented sea turtles, the smalltooth sawfish, scalloped hammerhead shark, and the giant manta ray. The NRC has reinitiated the ESA Section 7 consultation with the NMFS. The results of the pending BO will determine if mitigation measures beyond FPL's current management programs and existing regulatory controls are warranted.

Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practiced by FPL for the licensed life of the PSL facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to the remaining federal and state listed species, birds protected under the MBTA, EFH, and highly migratory fish species.

### 4.6.6.5 Category I Issues

#### *4.6.6.5.1 Federally Listed Aquatic Species and Designated Critical Habitat*

As discussed above, several federally listed aquatic species are present at the PSL site or have the potential to occur onsite or in the adjacent Atlantic Ocean. The action area for aquatic species would be the vicinity of the plant's intake structure and discharge piping. PSL also has a backup intake on Big Mud Creek for emergency use only. The following Category I aquatic ecology issues are identified as being related to the effects of a nuclear plant's intake and/or discharge.

The Category I issues the NRC identified for impacts to aquatic species with regard to the intake and discharge structures include the following:

- Entrainment of phytoplankton and zooplankton.
- Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses.
- Effects of dredging on aquatic organisms.
- Infrequently reported thermal impacts (all plants).
- Effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication.
- Effects of nonradiological contaminants on aquatic organisms.
- Exposure of aquatic organisms to radionuclides.

Entrainment of Phytoplankton and Zooplankton

The plant's intake traveling screens are 0.375-inch mesh wire. The aquatic threatened and endangered species identified for the PSL intake vicinity have pre-natal, larval, and/or juvenile forms or life history that do not lend themselves to passage through the small screen size as detailed in the following. Because the screen size is effective in preventing entrainment, there would not be a concern with entrainment-induced sub-lethal stresses.

Sawfish are yolk-sac viviparous, scalloped hammerheads are viviparous, and giant manta rays are ovoviviparous and do not have larval forms that would be subject to entrainment. Atlantic sturgeon generally remain in riverine habitats until they are at least a year old; therefore, they would likely not be entrained due to their size. (NOAA 2021c) As discussed in Section 3.7.8.1.1, no larval Nassau grouper or juveniles smaller than 20 inches in length have been collected or observed in Florida waters (NOAA 2021c); therefore, Nassau grouper is not at risk for entrainment. Sea turtle hatchings would not be entrained based on this mesh size (NOAA 2021d).

As discussed in Section 4.6.1.4, entrainment studies were conducted in 2006-2007 and 2017-2018. The lost total annual foregone fishery yield as attributable to PSL was estimated to be a very small fraction of the combined harvest from commercial and recreational fishing. FPL does not believe the number and type of organisms entrained provide a compelling basis under 316(b) for additional entrainment reduction measures. The entrainment of phytoplankton and zooplankton would not significantly affect forage availability for any federally listed species.

<u>Losses from Predation, Parasitism, and Disease Among Organisms Exposed to Sublethal Stresses</u>

The NRC's biological assessment (2019) that considered sea turtles and smalltooth sawfish assessed the potential for injury and mortality in the trip through the intake pipes. The NRC examined sea turtle injury and mortality data (2001–2018) and concluded that under current operating conditions, injuries sustained by sea turtles due to travel through the intake pipes are mostly minor scrapes with moderate and severe scrapes occurring at relatively low to extremely low rates. (NRC 2019a)

The NRC also considered injury and mortality during residence in the intake canal, concluding that the various permanent and temporary intake canal barriers do not appear to cause injury to sea turtles. The information considered by the NRC included that FPL did not report any instances of sea turtles sustaining causal injuries requiring rehabilitation from interactions with intake canal barriers and no sea turtle scrape injuries attributable to intake canal barriers over the period of 2001–2018. There were mortalities from drowning from entanglement in nets reported during this same time period. Sea turtle injury or mortality associated with entrapment in the intake wells is fairly uncommon because sea turtles cannot normally access the intake wells due to the barrier nets. Over the 2001–2018 period, FPL reported only one intake well-related injury. (NRC 2019a)

Since 2005, only four smalltooth sawfish have entered the intake canal through the intake pipes, three of which occurred subsequent to the 2016 BO. In its 2019 biological assessment, the NRC considered the three occurrences of smalltooth sawfish entry in the intake canal (initial plant operation through 2018) and concluded that smalltooth sawfish may experience minor or moderate injury, but such effects would be short-term and would not affect long-term health, susceptibility to predation, reproduction, or otherwise affect the ability to perform essential life history functions. (NRC 2019a)

In addition to sea turtles and smalltooth sawfish, as presented in Section 3.7.7.5, PSL has had two incidents of giant manta rays in 2020 and two scalloped hammerhead sharks (1997 and 2012). The giant manta rays and scalloped hammerhead sharks were captured and only had minor scrapes as a result of travel through the intake pipe.

Effects of Dredging

As discussed in Section 3.7.3, PSL performs bathymetric surveys of the cooling system to determine the need for dredging. Dredging has only occurred once in the past 17 years. Any future dredging would be conducted under federal and state permits that consider potential impacts to federally protected species.

Infrequently Reported Thermal Impacts

With regard to threatened and endangered species, thermal impacts consist of cold shock, creation of thermal plume migration barriers, and changes in distribution. PSL is located in a warm climate and a decrease in the thermal discharge would not be expected to result in cold shock impacts. As described in Section 3.6.1.2.6, modeling studies presented by the AEC and the NRC in the operating stage FESs indicate that under typical conditions, the areas of the thermal plumes to the 2°F isotherm (above ambient) from the PSL Units 1 and 2 diffusers would be approximately 180 acres and 75 acres, respectively. Thus, aquatic organisms can easily navigate around PSL's thermal discharges' mixing zone. As discussed in Section 3.7.7.2, data collected during 2010 benthic study and aquatic environment studies completed between 2011 and 2015 indicates that a diverse assemblage of fish and shellfish exist in the nearshore waters of the Atlantic Ocean offshore PSL. These faunal communities, as well as the monitored water quality parameters, exhibit considerable spatial and temporal variability. Similar to the results of the 316(a) monitoring effort at PSL in the 1970s, data collected during these studies provide no evidence that PSL operations affected the abundance or composition of faunal communities in the vicinity of the plant. FPL's biological studies for the thermal impacts of the previously implemented EPU was determined by FDEP to successfully show that PSL's thermal discharge would not have an adverse effect on the balanced, indigenous population of fish and shellfish in the vicinity of the discharge (FDEP 2016a).

Effects of Cooling Water Discharge on Dissolved Oxygen, Gas Supersaturation, and Eutrophication

FPL performed a study of the thermal discharge impacts of EPU. The study indicated that the heated water exiting the diffusers at 115°F would be cooled down to 96°F within about 12.5 seconds. The study estimated that the potential decrease in dissolved oxygen concentration due to the increase in discharge temperature is on the order of about 0.01 mg/L.

FDEP determined that FPL's 2010 biological study for the thermal impact of the previously implemented EPU successfully showed that PSL's thermal discharge would not have an adverse effect on the indigenous population of fish and shellfish in the vicinity of the discharge (FDEP 2016a).

PSL's cooling water discharge is permitted by the NPDES industrial wastewater facility permit for PSL (FL0002208), which includes limitations for nutrients, chemicals, and temperature. The NPDES permit also requires monitoring to ensure discharges are within the permit limitations. As discussed in Section 3.6.1.2.5 and 9.3, over the 5-year period 2016–2020, there has been one noncompliance event. On May 17, 2016, FPL notified the FDEP with an initial 24-hour oral notification of a trial usage of chemicals for water treatment that had not been properly permitted prior to the usage. A follow-up e-mail for this non-compliance event was submitted the following day (May 18, 2016), satisfying the conditions of certification 3-day written confirmation. There have been no notices of violation associated with PSL wastewater discharges to receiving surface waters. As discussed in Sections 3.6.1.2.1 and 3.6.4.1, PSL is in compliance with its NPDES permit.

Effects of Nonradiological Contaminants on Aquatic Organisms

PSL has not proposed any refurbishment activities or construction of new facilities that could affect the cooling water discharge for the proposed SLR operating term. Condenser tubes are titanium at PSL and would not contribute leached metals to the cooling water discharge. The cooling water discharge is authorized under Permit No. FL0002208, which specifies water treatment chemicals and biocides, their dosage rates, and sets a total residual oxidant concentration at the eastern end of the discharge canal as at or below 0.10 mg/L (FDEP 2020b). There is no evidence of an ecological impact to receiving waters, the Atlantic Ocean, as a result of PSL's cooling water discharge.

Exposure of Federally Listed Aquatic Species to Radionuclides

As part of the 2013 GEIS analysis, the NRC conducted a review of all operating nuclear power plants to evaluate the potential impacts of radionuclides on aquatic biota from continued operations. The NRC selected 15 representative plants to calculate estimated dose rates for aquatic biota from nuclear plants. The total estimated dose rates for aquatic biota for these plants were all less than 0.2 rad/d (0.002 Gy/d), considerably less than the U.S. Department of Energy's guideline value of 1 rad/d (0.01 Gy/d). On the basis of these calculations and a review of the available literature, the NRC concluded that the impact of routine radionuclide releases from past and current operations and refurbishment activities on aquatic biota would be SMALL for all nuclear plants and would not be expected to appreciably change during a license renewal term.

Radioactivity onsite and in the surrounding area is monitored through the REMP to identify any undue accumulation of radioactivity in any sector of the environment. Continued compliance with NRC radiological effluent limits and implementation of the REMP will ensure that aquatic organisms' exposure to radionuclides is well within guidelines and adverse trends are detected. Given that the NRC's analysis indicates that routine nuclear power plant operations do not pose a significant adverse impact to aquatic biota, and that PSL operates in compliance with NRC radioactive effluent standards, there would be no affect to federally listed aquatic species from plant-related radioactivity exposure.

Federally Listed Terrestrial Species

As discussed above, several federally listed terrestrial species are present or potentially present onsite. The Category 1 issues related to terrestrial resources include the following:

- Exposure of terrestrial organisms to radionuclides.
- Cooling system impacts on terrestrial resources.
- Bird collisions with plant structures and transmission lines.
- Transmission line right-of-way management impacts on terrestrial resources.
- Electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock).

Given the in-scope transmission lines do not cross terrestrial habitat, transmission ROW management and the effects of electromagnetic fields are not expected to impact the federally listed species present at PSL. The potential for impacts related to the remaining Category 1 issues are discussed below.

Exposure of Federally Listed Terrestrial Species to Radionuclides

As part of the 2013 GEIS analysis, the NRC conducted a review of all operating nuclear power plants to evaluate the potential impacts of radionuclides on terrestrial biota from continued operations. The NRC selected 15 representative plants to calculate estimated dose rates for terrestrial biota from nuclear plants. The maximum estimated dose rate calculated for any of the nuclear power plants was 0.0354 rad per day, which is below the guideline value of 0.1 rad per day for a riparian animal receptor. (NRC 2013b, Table 4.6-1) On the basis of these calculations and a review of the available literature, the NRC concluded that the impact of routine radionuclide releases from past and current operations and refurbishment activities on terrestrial biota would be SMALL for all nuclear plants and would not be expected to appreciably change during a license renewal term.

Radioactivity onsite and in the surrounding area is monitored through the REMP to identify any undue accumulation of radioactivity in any sector of the environment. Continued compliance with NRC radiological effluent limits and implementation of the REMP will ensure that terrestrial organisms' exposure to radionuclides is well within guidelines and adverse trends are detected. Given that the NRC's analysis indicates that routine nuclear power plant operations do not pose a significant adverse impact to terrestrial biota, and that PSL operates in compliance with NRC radioactive effluent standards, there would be no affect to federally listed terrestrial species from plant-related radioactivity exposure.

Cooling System Impacts on Federally Listed Terrestrial Organisms

The activities or conditions NRC identified for impacts to terrestrial resources as a consequence of operation of a plant's cooling water system are the following:

- Physical alterations include increased water temperatures, humidity, and fogging.

- Reduced water availability due to surface water use.
- Contaminants in surface water.
- Reduced water availability due to groundwater withdrawals.
- Contaminants in groundwater; potential for groundwater quality degradation by contaminants present in cooling ponds and cooling canals.
- Disturbance of wetlands from maintenance dredging of onsite cooling ponds, disposal of dredged material from such dredging.
- Erosion of shoreline wetlands.
- Impingement of waterfowl at the cooling water intakes.

Given the cooling system's source water and discharge receiving waterbody is the Atlantic Ocean and PSL utilizes submerged intake and discharge structures in the Atlantic Ocean, there is minimal opportunity for the cooling system to impact terrestrial species. The operation of the cooling system would not pose a risk beyond the small impact determined in the 2013 GEIS. The cooling system would not affect the federally listed terrestrial species.

Bird Collisions with Plant Structures and Transmission Lines

PSL does not have natural draft cooling towers and the tallest plant structures are the reactor containment structures and the metrological tower, which is located away from structures. The aboveground in-scope transmission lines are those from the turbine buildings to the switchyard adjacent to the power block. Given the lower profile of the structures and the short distance of the in-scope transmission lines, these structures would not pose a bird collision hazard beyond that considered in the 2003 GEIS.

FPL provides protection to federally protected avian species through a corporate avian protection plan. This plan adheres to the Avian Power Line Interaction Committee and USFWS guidelines regarding birds and powerlines electrical energy production. The avian protection plan provides guidance for reporting bird mortalities, dealing with bird injuries, nest-management procedures, permitting issues, construction design standards to minimize collision and electrocution, staff training, and mortality risk assessment. FPL construction and design standards include the use of bird discouragers, perch guards, and insulator shields to limit the potential for electrocution (FPL 2018c).

## 4.7 Historic and Cultural Resources

The following sections address the historic and cultural issues applicable to PSL, providing background on issues and analyses regarding the proposed SLR operating term.

### 4.7.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

Continued operations and refurbishment associated with license renewal are expected to have no impacts on historic and cultural resources because no refurbishment or construction-related activities have been identified. The NHPA requires the federal agency to consult with the SHPO and appropriate Native American tribes to determine the potential effects on historic properties and mitigation, if necessary.

### 4.7.2 Requirement [10 CFR 51.53(c)(3)(ii)(K)]

All applicants shall identify any potentially affected historic or archaeological properties and assess whether any of these properties will be affected by future plant operations and any planned refurbishment activities in accordance with the NHPA.

### 4.7.3 Background [GEIS Section 4.7.1]

The NRC will identify historic and cultural resources within a defined APE. The license renewal APE is the area that may be impacted by land-disturbing or other operational activities associated with continued plant operations and maintenance during the license renewal term and/or refurbishment. The APE typically encompasses the nuclear power plant site, its immediate environs, including viewshed, and the transmission lines within this scope of review. The APE may extend beyond the nuclear plant site and transmission lines when these activities may affect historic and cultural resources.

Continued operations during the license renewal term and refurbishment activities at a nuclear power plant can affect historic and cultural resources through (1) ground-disturbing activities associated with plant operations and ongoing maintenance (e.g., construction of new parking lots or buildings), landscaping, agricultural or other use of plant property; (2) activities associated with transmission line maintenance (e.g., maintenance of access roads or removal of danger trees); and (3) changes to the appearance of nuclear power plants and transmission lines. Licensee renewal environmental reviews have shown that the appearance of nuclear power plants and transmission lines has not changed significantly over time; therefore, additional viewshed impacts to historic and cultural resources are not anticipated.

### 4.7.4 Analysis

#### 4.7.4.1 Refurbishment Activities

As discussed in Section 2.3, no SLR-related refurbishment activities have been identified. Therefore, there would be no SLR-related refurbishment impacts to historic and cultural resources, and no further analysis is required.

#### 4.7.4.2 Operational Activities

As discussed in Section 3.8.5, there have been four previous cultural resource investigations conducted within the PSL property. There are five cultural resources on the 1,132-acre PSL property. One cultural resource on the property has been determined potentially eligible for the NRHP. As discussed in Section 3.8, no SLR-related ground-disturbing activities have been identified. Therefore, no adverse effects are anticipated during the proposed SLR operating term for any sites within the PSL property.

The area within a 6-mile radius of the site, especially along the Indian River, may be archaeologically sensitive based on the location of archaeological sites in areas that have been surveyed for cultural resources (Table 3.8-2). However, adverse impacts would only occur to such sites as a result of soil-intrusive activities. Because FPL has no plans to conduct such soil intrusive activities at any location outside of the PSL property boundary under an SLR, no adverse effects to these archaeological sites would occur.

As discussed in Section 3.8.4, there is one NRHP-listed aboveground historic property within the 6-mile APE of PSL. Due to topography, vegetation, and distance, no potential adverse effects to any NRHP-listed properties are expected as a result of the continued operation of PSL, including viewshed, aesthetic, and noise impacts.

There are 15 above ground historic properties which have been determined eligible for the NRHP within the 6-mile PSL APE (Table 3.8-2). Nine of the 15 properties are within the viewshed of PSL, while six of the properties are not within the viewshed of PSL. As no refurbishment, or construction-related activities are planned at PSL, there will be no change in viewshed from what is currently exists.

There are 10 archaeological sites listed as potentially eligible for the NRHP based on SHPO review within 6 miles of PSL APE (Table 3.8-2). Adverse impacts, however, would only occur to such sites as a result of soil intrusive activities. Because FLP has no plans to conduct such soil-intrusive activities at any location outside the property boundary under a renewed license, no adverse effects to these archaeological sites would occur.

As discussed above, no SLR-related refurbishment or construction activities have been identified. While nine NRHP eligible historic properties are within the viewshed of PSL, no offsite NRHP-listed historic properties will be adversely impacted as a result of continued operation of PSL, and there are no plans to alter operations, expand existing facilities, or disturb additional land for the purpose of SLR. As described in Section 3.8, the Florida SHPO/DHR and Native American groups recognized as potential stakeholders have been notified by FPL of the proposed action (Attachment D).

## 4.8 Socioeconomics

Impacts to socioeconomics are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. FPL conducted a new and significant information review and identified no new and significant information related to socioeconomics. Therefore, the analyses and findings regarding these issues in the GEIS (NUREG-1437, Revision 1) and 10 CFR Part 51, Subpart A, Appendix B, Table B-1 are incorporated herein by reference, and no further analysis is required.

## 4.9 Human Health

Impacts to human health evaluated in the GEIS and considered to be generic (the same or similar at all plants), or Category 1 are listed in Section 4.0.1. FPL conducted a new and significant information review and identified no new and significant information related to human health Category 1 issues. Therefore, the analyses and findings regarding these human health Category 1 issues in the GEIS (NUREG-1437, Revision 1) and 10 CFR Part 51, Subpart A, Appendix B, Table B-1 are incorporated herein by reference, and no further analysis is required. The Category 2 issues for human health are discussed below.

### 4.9.1 Microbiological Hazards to the Public (Plants with Cooling Ponds or Canals, or Cooling Towers that Discharge to a River)

#### 4.9.1.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. These organisms are not expected to be a problem at most operating plants except possibly at plants using cooling ponds, lakes, or canals, or that discharge into rivers. Impacts would depend on site-specific characteristics.

#### 4.9.1.2 Requirement [10 CFR 51.53(c)(3)(ii)(G)]

If the applicant's plant uses a cooling pond, lake, or canal or discharges into a river, an assessment of the impact of the proposed action on public health from thermophilic organisms in the affected water must be provided.

#### 4.9.1.3 Background [GEIS Section 4.9.1.1.3]

*N. fowleri*, which is the pathogenic strain of the free-living amoebae Naegleria spp., appears to be the most likely microorganism that may pose a public health hazard resulting from nuclear power plant operations. Increased populations of *N. fowleri* may have significant adverse impacts.

Since *Naegleria* concentrations in freshwater can be enhanced by thermal effluents, nuclear power plants that use cooling lakes, canals, ponds, or rivers experiencing low-flow conditions may enhance the populations of naturally occurring thermophilic organisms.

Changes in microbial populations and in the public use of water bodies might occur after the operating license is issued and the application for license renewal is filed. Other factors could also change, including the average temperature of the water, which could result from climate change that affected water levels and air temperature. Finally, the long-term presence of a power plant might change the natural dynamics of harmful microorganisms within a body of water.

#### 4.9.1.4 Analysis

PSL withdraws and discharges cooling water from the Atlantic Ocean. The incoming cooling water is treated with sodium hypochlorite and other biocides (FDEP 2016a; FDEP 2020d). After passing through the condensers, the now-heated cooling water is released into the discharge canal. As discussed in Section 3.10.1, the onsite discharge canal is posted no trespassing and authorized personnel only, and has fencing at SR A1A and along the beach at eastern end of the discharge canal. Mangrove swamp is along the north and south sides of the discharge canal. The fencing, natural barriers, and signage restrict public access.

The water in the discharge canal would have temperatures favorable to thermophilic microbes; however, the water would continue to have biocides and would retain at least some ability to prohibit microbiological growth. The saline content of the water in the discharge canal would not be conducive to promoting *N. fowleri* because the species does not live in seawater (CDC 2020). While the discharge canal is closed to the public, FPL workers and contractors do perform work at near the discharge canal. *Legionella* is a respiratory hazard; given the discharge canal does not have mechanical sprayers or other equipment to create aerosols or droplets, the potential for exposure to *Legionella* is minimized. Any work at or near the discharge canal would be conducted under the plant's occupational safety program.

At the eastern end of the discharge canal the water is discharged back to the Atlantic Ocean in accordance with the plant's NPDES industrial wastewater permit through two underground pipes. The water is released through submerged diffusors at 1,500 feet and farther offshore. The discharge is rapidly mixed and diluted with the ocean water. Navigation buoys flank the discharge area in the Atlantic Ocean, directing vessels to stay out of the discharge area. (FPL 2001, Sections 2.1 and 3.1.3.2)

Given the discharge canal is restricted for public access, it does not represent a public health hazard.

The discharge from the canal is to the Atlantic Ocean, not a river, which is specified as a concern in NRC's finding for this human health issue. Also, given the discharge in the Atlantic Ocean is diffused and promotes rapid mixing with ocean water, it would not enhance the growth of thermophilic microorganisms. One of the thermophilic microorganisms of concern, *N. fowleri,* does not live in seawater. Additionally, the ocean discharge is 1,500 feet offshore and located away from public access beaches. Given the discharge from the canal is to the ocean rather than a river and the thermal discharge would not enhance the growth of thermophilic microorganisms, the discharge to the Atlantic Ocean does not represent a public health hazard.

As directed for license renewal applicants in RG 4.2, FPL consulted with the FDOH regarding the potential existence and concentration of thermophilic microorganisms of concern in the waters of the Atlantic Ocean receiving the plant's thermal discharge. Correspondence is included in Attachment E.

### 4.9.2 Electric Shock Hazards

#### 4.9.2.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Electrical shock potential is of small significance for transmission lines that are operated in adherence with the NESC. Without a review of conformance with NESC criteria of each nuclear power plant's in-scope transmission lines, it is not possible to determine the significance of the electrical shock potential.

#### 4.9.2.2 Requirement [10 CFR 51.53(c)(3)(ii)(H)]

If the applicant's transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the NESC for preventing electric shock from induced currents, an assessment of the impact of the proposed action on the potential shock hazard from the transmission lines must be provided.

#### 4.9.2.3 Background [GEIS Section 4.9.1.1.5]

Design criteria for nuclear power plants that limit hazards from steady-state currents are based on the NESC, adherence to which requires that utility companies design transmission lines so that the short-circuit current to ground produced from the largest anticipated vehicle or object is limited to less than 5 milliamperes (mA). With respect to shock safety issues and license renewal, three points must be made. First, in the licensing process for the earlier licensed nuclear plants, the issue of electrical shock safety was not addressed. Second, some plants that received operating licenses with a stated transmission line voltage may have chosen to upgrade the line voltage for reasons of efficiency, possibly without reanalysis of induction effects. Third, since the initial NEPA review for those utilities that evaluated potential shock situations under the provision of the NESC, land use may have changed, resulting in the need for a reevaluation of this issue. The electrical shock issue, which is generic to all types of electrical generating stations, including nuclear plants, is of SMALL significance for transmission lines that are operated in adherence with the NESC. Without a review of the conformance of each nuclear plant's transmission lines, within this scope of review with NESC criteria, it is not possible to determine the significance of the electrical shock potential generically.

#### 4.9.2.4 Analysis

As discussed in Section 3.10.2, the in-scope transmission lines are within the owner-controlled area of PSL. The in-scope transmission lines span the distance from the plant's main and start-up transformers to the switchyard, and the majority of this span is within the fenced switchyard or within the fenced and guarded protected area. The portion not within these two fenced areas spans the intake canal and a narrow area between the intake canal and the switchyard and still lie within the owner-controlled area. Thus, the in-scope transmission lines do not pose a shock hazard risk to the public.

The transmission system owner is responsible for the portion of the in-scope transmission lines from the switchyard to the elevated tower connection sections. The transmission system owner maintains clearances for these lines in accordance with NESC specification D-7, which is based on ANSI C2-2007 and the minimum clearances for 230-kV transmission lines over equipment and pedestrians are met with large margins. FPL is responsible for the portion of the in-scope transmission lines from the elevated tower connections to the high-voltage bushings of the main and start-up transformers. To meet the NESC in effect at the time of construction[1], a minimum clearance of 15.4' between accessible portions of the bridge crane and to the nearest 230-kV conductor was required. A minimum clearance 20'0" is maintained for conditions, which would result in the most severe degree of transmission line sag, due to factors such as heat, ampere loading, and wind.

As discussed in Section 3.10.2, work on and near the transmission lines is governed by plant procedures and PSL's comprehensive health and safety program. Given these conditions, the human health impact from electric shock hazards during the proposed SLR operating term would be SMALL.

## 4.10 Environmental Justice

The following sections address the environmental justice issues applicable to PSL, providing background on the issues and the analyses regarding the proposed SLR operating term.

### 4.10.1 Minority and Low-Income Populations

#### 4.10.1.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

Impacts to minority and low-income populations and subsistence consumption resulting from continued operations and refurbishment associated with license renewal will be addressed in plant-specific reviews. See the NRC's "Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions."

#### 4.10.1.2 Requirement [10 CFR 51.53(c)(3)(ii)(N)]

Applicants shall provide information on the general demographic composition of minority and low-income populations and communities (by race and ethnicity) residing in the immediate vicinity of the plant that could be affected by the renewal of the plant's operating license, including any planned refurbishment activities, and ongoing and future plant operations.

#### 4.10.1.3 Background [GEIS Section 4.10.1]

Disproportionately high and adverse human health effects occur when the risk or rate of exposure to an environmental hazard for a minority or low-income population is significant and exceeds the risk or exposure rate for the general population or for another appropriate comparison group. Disproportionately high environmental effects refer to impacts or risk of impact on the natural or physical environment in a minority or low-income community that are significant and appreciably exceed the environmental impact on the larger community. Such effects may include biological, cultural, economic, or social impacts. Minority and low-income populations are subsets of the general public residing around the site and all are exposed to the same risks and hazards generated from operating a nuclear power plant.

[1] Per Section 0.13.B.2 of the current code (2017 NESC) existing installations, including maintenance and replacement that currently comply with prior editions of the code, need not be modified to comply with these rules except as may be required for safety reasons by administrative authority.

Continued reactor operations and other activities associated with license renewal could have an impact on air, land, water, and ecological resources in the region around each nuclear power plant site, which might create human health and environmental effects on the general population. Depending on the proximity of minority and low-income populations in relation to each nuclear plant, the environmental impacts of license renewal could have a disproportionate effect on these populations.

The location and significance of environmental impacts may affect population groups that are particularly sensitive because of their resource dependencies or practices (e.g., subsistence agriculture, hunting, or fishing) that reflect the traditional or cultural practices of minority and low-income populations. The analysis of special pathway receptors can be an important part of the identification of resource dependencies or practices. Special pathways take into account the levels of contaminants in native vegetation, crops, soils and sediments, surface water, fish, and game animals on or near the power plant sites in order to assess the risk of radiological exposure through subsistence consumption of fish, native vegetation, surface water, sediment, and local produce; the absorption of contaminants in sediments through the skin; and the inhalation of airborne particulates.

### 4.10.1.4 Analysis

#### *4.10.1.4.1 Refurbishment Activities*

As presented in Section 2.3, no SLR-related refurbishment activities have been identified. Therefore, there would be no SLR-related refurbishment impacts to minority and low-income populations, and no further analysis is applicable.

#### *4.10.1.4.2 Operational Activities*

The consideration of environmental justice is required to assure that federal programs and activities will not have disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. FPL's analyses of the Category 2 issues defined in 10 CFR 51.53(c)(3)(ii) determined that environmental impacts from the continued operation of PSL during the SLR operating term would either be SMALL or non-adverse. Therefore, high or adverse impacts to the general human population would not occur.

As described in Section 3.10, PSL maintains a REMP. With this program, FPL monitors important radiological pathways and considers potential radiation exposure to plant and animal life in the environment surrounding PSL. The results of the program indicate PSL has created no adverse environmental effects or health hazards. Therefore, no environmental pathways have been adversely impacted and are not anticipated to be impacted during the proposed PSL SLR operating term.

Section 3.11.2 identifies the locations of minority and low-income populations as defined by NRR Office Instruction LIC-203 (NRC 2020c). Section 3.11.3 describes the search for subsistence populations near PSL, of which none were found. The figures accompanying Section 3.11.2 show the locations of minority and low-income populations within a 50-mile radius of PSL. None of those locations, when considered in the context of impact pathways described in this chapter, are expected to be disproportionately impacted.

Therefore, no disproportionately high and adverse impacts or effects on members of the public, including minority, low-income, or subsistence populations, are anticipated as a result of SLR.

## 4.11 Waste Management

Impacts to waste management are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. FPL conducted a new and significant information review and identified no new and significant information related to waste management. Therefore, the analyses and findings regarding these Category 1 issues in the GEIS (NUREG-1437, Revision 1) and 10 CFR Part 51, Subpart A, Appendix B, Table B-1 are incorporated herein by reference, and no further analysis is required.

## 4.12 Cumulative Impacts

Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

Cumulative impacts of continued operations and refurbishment associated with license renewal must be considered on a plant-specific basis. Impacts would depend on regional resource characteristics, the resource-specific impacts of license renewal, and the cumulative significance of other factors affecting the resource.

Requirement [10 CFR 51.53(c)(3)(ii)(O)]

Applicants shall provide information about other past, present, and reasonably foreseeable future actions occurring in the vicinity of the nuclear plant that may result in a cumulative effect.

Background [GEIS Section 4.13]

Actions to be considered in cumulative impact analyses include new and continuing activities, such as license renewal, that are conducted, regulated, or approved by a federal agency. The cumulative impacts analysis takes into account all actions, however minor, since impacts from individually minor actions may be significant when considered collectively over time. The goal of the analysis is to identify potentially significant impacts to improve decisions and move toward more sustainable development.

For some resource areas (e.g., water and aquatic resources), the contributions of ongoing actions within a region to cumulative impacts are regulated and monitored through a permitting process (e.g., NPDES) under state or federal authority. In these cases, it may be assumed that cumulative impacts are managed as long as these actions (facilities) are in compliance with their respective permits.

Analysis

Cumulative impacts analysis involves determining if there is an overlapping or compounding of the anticipated impacts of the continued operation of PSL during the proposed SLR operating term with past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such actions.

FPL considered potential cumulative impacts during the license renewal period in its environmental analysis associated with the resources discussed in the following sections. For the purposes of this analysis, past actions are those related to the resources at the time of plant licensing and construction, present actions are those related to the resources at the time of current operation of the power plant, and future actions are considered to be those that are reasonably foreseeable through the end of plant operation, which would include the 20-year license renewal term. These criteria are in line with Regulatory Guide 4.2, Supplement 1, Rev. 1 (NRC 2013b). The geographic area over which past, present, and future actions would occur is dependent on the type of action considered and is described below for each impact area.

The impacts of the proposed action are combined with other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. These combined impacts are defined as "cumulative" in 40 CFR 1508.7 and include individually minor, but collectively significant, actions taking place over a period of time. It is possible that an impact that may be SMALL by itself could result in a MODERATE or LARGE impact when considered in combination with the impacts of other actions on the affected resource. Likewise, if a resource is regionally declining or imperiled, even a SMALL individual impact could be important if it contributes to or accelerates the overall resource decline.

As discussed in Section 2.3, no SLR-related refurbishment activities have been identified. As indicated in Section 3.1.4, no major changes to PSL Units 1 and 2 operations or plans for future expansion of plant infrastructure during the proposed SLR operating term are anticipated. The effects of past actions are already reflected in the description of the affected environment in Chapter 3. Future projects may include dredging of intake and discharge canals, with the potential renovation of PSL onsite spoils ponds. Staff has also identified a need to increase stormwater discharge capacity, which would trigger revision of the PSL SWPPP. These projects are in a conceptual phase and no construction plans developed or completion date established. Expansion of the PSL ISFSI for the proposed SLR operating term is not reasonably foreseeable, as the need for any such expansion is not apparent at this time. PSL will continue to store fuel at the onsite ISFSI under the current program.

Section 3.1.4 describes other (non-PSL) projects in the vicinity of PSL. Accel International Holdings will build a new 150,000-square foot manufacturing facility, which is expected to generate 125 new jobs by 2021. (SLC 2021j) Brightline is in the midst of constructing a new rail line to bring passengers from Southern Florida (Miami, Fort Lauderdale, and West Palm Beach) to Central Florida (Orlando). The route includes Martin and St. Lucie counties. Rail service is expected to be available by 2022 (Brightline 2021).

The NRC completed a cumulative impacts assessment of PSL operations during the initial license renewal term. In summary, the NRC concluded there were no federal project activities in the vicinity of PSL that would make it desirable for another federal agency to become a cooperating agency for the preparation of the supplemental EIS. For each impact area, the potential cumulative impacts resulting from PSL operations during the license renew period would be SMALL and mitigation is not warranted (NRC 2003)

### 4.12.1 Land Use and Visual Resources

The land use impact of PSL was characterized as SMALL in Section 4.1. As described in Section 3.1.4, the planned projects for the PSL site are not expected to require additional land. As illustrated in Figure 3.1-1, PSL is bounded by the Atlantic Ocean, Indian River Lagoon, and county parks on the north and south sides of the plant. According to St. Lucie County's future land use map, the PSL site is zoned T/U and R/C for existing and future land uses through 2040 (SLC 2020c).

Land use changes are anticipated for Accel International Holdings, Inc., expansion and Brightline rail expansion within their project boundaries. However, the land use changes for these projects are not near PSL. The Brightline project skirts the coast a few miles inland. The Accel International holdings site will be in Port St. Lucie's traditional center of commerce along I-95, several miles from PSL (Brightline 2021; SLC 2021j). Therefore, the cumulative land use impact would be SMALL.

As described in Section 3.1.1, the PSL vicinity falls primarily within coastal St. Lucie County with a small portion of Martin County. Within the vicinity of PSL on Hutchinson Island and along the Florida mainland coast (west of Indian River Lagoon and State Road 707), St. Lucie County is a populated mix of residential subdivisions and commercial area developments interspersed with wetlands, managed preserves, and natural areas dedicated to a variety of purposes.

As stated in Section 3.2.3, the dense vegetation surrounding PSL provides some screening of predominate visual features of the site, but these features are visible in some areas. However, the continued use of existing structures associated with PSL would not alter their visual impact. The visual impacts from Accel International Holdings, Inc., expansion and Brightline rail expansion are expected to be controlled by the comprehensive plans and zoning regulations of St. Lucie and Martin counties to reduce any visual impacts. Because the visual impacts due to PSL are SMALL, not expected to change or to contribute to other projects, the cumulative visual impacts are expected to be SMALL.

### 4.12.2 Air Quality and Noise

#### 4.12.2.1 Air Quality

Section 3.3.3 discusses regional air quality and PSL air emission sources. All the counties within the region are in attainment. Also as presented in Section 3.3.3, there is no mandatory Class I federal areas within 100 miles of PSL.

PSL air pollutant emissions are minimal and stem from intermittent use, maintenance and testing of stationary diesel and propane generators and miscellaneous diesel, LPG/propane, or gasoline portable and temporary equipment. The planned projects listed above could result in localized temporary air emissions from construction and demolition equipment. Implementing fugitive dust BMPs and maintaining portable equipment in proper working order will minimize air emissions. Compliance with the existing air permit and any future permit would minimize impacts to air quality.

The future land use designations for St. Lucie and Martin counties do not indicate a change from current land uses surrounding the PSL site. The county parks adjacent to the site are expected to remain the same and are not expected to have air emissions (SLC 2020b). The area will continue to experience air emissions from vehicles on the adjacent state roadways and boating in the intracoastal waterway, and air emissions from ongoing projects which would be subject to state air permitting and regulations. The cumulative air quality impact would be SMALL.

#### 4.12.2.2 Climate Change

Climate change can impact air quality as a result of changes in meteorological conditions. Air pollutant concentrations are sensitive to winds, temperature, humidity, and precipitation. Ozone levels have been found to be particularly sensitive to climate change influences. Sunshine, high temperatures, and air stagnation are favorable meteorological conditions leading to higher levels of ozone. Although surface temperatures are expected to increase, ozone levels will not necessarily increase because ozone formation is also dependent on the relative amount of precursors available. The combination of higher temperatures, stagnant air masses, sunlight, and emissions of precursors may make it difficult to meet ozone NAAQS. States, however, must continue to comply with the CAA and ensure air quality standards are met. (NRC 2015)

Meteorological conditions conducive to high air pollution potential are infrequent in southeastern Florida. The warm waters of the adjacent Gulf Stream current, located a few miles offshore, inhibit the formation of strong persistent low-level inversions while instability during the day is aided by strong insolation. Along the immediate coastline and areas such as Hutchinson Island, well developed sea-breeze conditions result in persistent, slightly stable, onshore flow.

Because the fuel sources for Units 1 and 2 do not produce carbon dioxide emissions or other GHG emissions, the continued operation of Units 1 and 2 would avoid millions of tons of GHGs from a fossil fuel-fired alternative such as the NGCC presented in Chapter 7.

Given that climate change trends in air temperature and precipitation are increasing but continued operation would contribute only small emissions of GHG from minor air emission sources, the cumulative impact on climate change from present and future actions would be SMALL. Moreover, continued operation of PSL avoids millions of tons of carbon dioxide from alternative fossil-fuel generation, positively impacting the climate change factor of carbon dioxide concentrations.

#### 4.12.2.3 Noise

PSL operations have a SMALL impact on the noise environment (NRC 2013a). The surrounding land use discussed above in Section 4.12.1 is county parkland and not likely to be developed.

Therefore, cumulative noise impacts from continued plant operations over the license renewal term would be SMALL.

### 4.12.3 Geology and Soils

Impacts to geology and soils could result from ground-disturbing activities and stormwater runoff. As noted in Section 2.3, PSL has no plans to conduct SLR-related refurbishment or replacement activities. Section 3.1.4 discusses future projects that may include dredging of intake and discharge canals, with the potential renovation of PSL onsite spoils ponds. Staff has also identified a need to increase stormwater discharge capacity, which would trigger revision of the plant SWPPP.

The NRC concluded that a site's impact on geology and soils would be SMALL (NRC 2013a). Any ground-disturbing activities onsite during the proposed SLR operating term would be governed by a stormwater construction permit and/or the SWPPP. Given ground disturbances at the PSL site would be limited to the current site area, subject to construction and stormwater permitting and applicable BMPs, therefore the cumulative land use impact would be SMALL.

### 4.12.4 Water Resources

#### 4.12.4.1 Surface Water

As described in GEIS Section 4.5, surface water use impacts for once-through cooling was generically determined to be SMALL (10 CFR Part 51, Subpart A, Appendix B, Table B-1) and PSL did not identify any new and significant information for the environmental issue. Any modifications would be under a NPDES permit issued by the FDEP, and water use impacts would be considered by FDEP prior to issuance of the permit. There are no plant operations or modifications planned for the proposed SLR operating term that would alter current patterns at the intake and discharge structures.

As for surface water quality cumulative impacts, PSL complies (see Chapter 9) with its NPDES discharge limits and the discharge rapidly mixes the Atlantic Ocean. As discussed in Section 3.6.4.1, the water quality for several water bodies near PSL are impaired; however, PSL operations do not contribute to these impairments. Therefore, the cumulative impact to surface water quality would be SMALL. Given PSL compliance with its NPDES permit and compliance with stormwater permits and regulations, PSL would have only a small contribution to the surface water quality cumulative impact.

#### 4.12.4.2 Groundwater

As presented in Section 3.6.4.2, the state of Florida has classified the groundwater in the vicinity of PSL as Class G-III waters to identify groundwater that has no reasonable potential as a future source of drinking water due to high total dissolved solids content. No groundwater is withdrawn from the site as part of plant operations. As mentioned in Section 3.6.3.2, groundwater is no longer withdrawn from PSL's former remediation system recovery wells.

It is not anticipated that groundwater withdrawal will be required during the SLR operating term. As presented above, land development in the PSL vicinity is not anticipated. PSL will continue to maintain and implement its site-specific spill prevention plans to prevent spills that would contaminate soils, groundwater, and surface water during the proposed SLR operating term. Therefore, the cumulative impact to groundwater resources would be SMALL.

#### 4.12.4.3 Climate Change

Climate change can affect the availability of water resources due to climatic changes such as changes in temperature and precipitation patterns (NRC 2013a). However, PSL withdraws saltwater exclusively from the Atlantic Ocean for operational purposes, reducing the demand on water resources. As presented above, PSL operations do not require significant surface water consumption or any groundwater withdrawals, and PSL operates in compliance with its permits for water withdrawals and discharges. Because PSL limits its water withdrawals to the Atlantic Ocean, there are no anticipated or reasonably foreseeable conflicts in water supplies and allocations.

Warmer water and higher air temperatures can reduce the efficiency of thermal power plant cooling technologies. In addition, discharge permit conditions may limit operations for some power plants as water temperatures rise (NRC 2013a). The sea surface temperature has increased between 0.5 and 1°F. over the past century. However, the sea surface temperature has been increasing faster during the past three decades (EPA 2021b).

Figure 3.6-4 illustrates PSL's average monthly intake temperatures and Figure 3.6-5 illustrates PSL's discharge temperatures for the past 5 years. PSL completed a thermal discharge study in January of 2010. The potential biological impact of the thermal discharge increase from 113°F to 115°F was evaluated using historical studies in the vicinity of PSL. The results of the study conclude that the temperature difference of the discharge from 113°F to 115°F has a minimal impact on the environment that is not measurable. An increase in discharge temperature of 2°F would be on the order of any climate change temperature increase impact over several decades. For the reasonably foreseeable future, the discharge permit conditions are not likely to limit operations because of the slow rate of change in sea temperatures. Because current impact is minimal and not measurable, the possibility exists that another small increase in temperature would not increase thermal impacts. Based on these findings, the potential cumulative impacts on water resources from present and future actions combined with climate change would be SMALL.

### 4.12.5 Ecological Resources

#### 4.12.5.1 Terrestrial

The impacts on terrestrial species during the proposed subsequent license renewal period are described as SMALL in Section 4.6.5.4. The continued operation of PSL Units 1 and 2 and is governed by regulations, PSL procedures and plans. As discussed in Section 9.6, FPL has administrative controls in place at PSL to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs, permit modifications, or acquisition of new permits as needed. Successful application of the regulations, procedures, plans, and administrative controls would result in the identification and avoidance of important terrestrial habitats. In addition, the application of BMPs to minimize the area affected; to control fugitive dust, runoff, and erosion from project sites; to reduce the spread of invasive nonnative plant species; and to reduce disturbance of wildlife in adjacent habitats could greatly reduce the impacts of continued operations (NRC 2013a). Regulatory programs that the site is currently subject to such as stormwater management, spill prevention, dredging, and herbicide usage further serve to minimize impacts to terrestrial resources. With continued application of these programs and procedures, the land-based impacts would largely be confined to PSL property and would have minimal opportunity to contribute to cumulative impacts.

As discussed in Sections 3.7.8.1 and 4.6.6.4, habitat for federally and state listed terrestrial species does occur on the PSL site. However, adherence to regulatory and permit requirements to avoid take of protected species and FPL administrative controls such as those regarding response to avian collisions with transmission lines will minimize or avoid impact to these species. FPL is not aware of any adverse impacts regarding threatened, endangered, and protected terrestrial species attributable to the site. Maintenance activities necessary to support license renewal likely would be limited to previously disturbed areas onsite of the PSL site.

As illustrated in Figure 3.1-1, PSL is bounded by the Atlantic Ocean, Indian River Lagoon, and county parks on the north and south sides of the plant. Therefore, cumulative impacts on protected species would be SMALL. Overall, the cumulative impacts to terrestrial ecological resources is anticipated to be SMALL.

#### 4.12.5.2 Aquatic

While preparing the supplemental EIS for PSL, the NRC staff reviewed the available information and concluded that the potential impacts of impingement of fish and shellfish on the debris screens of the cooling water intake system were SMALL (NRC 2003).

As discussed in Section 4.6.1.4, aquatic resource impacts due to impingement and entrainment during the proposed subsequent license period were concluded to be MODERATE. Although additional mitigation measures may be implemented in the future as a result of changes to the 316(b) rule and a new biological opinion, these measures would seek to minimize the already existing MODERATE impacts. As such, ongoing studies performed at PSL and the determinations of the FDEP as the NDPES-permitting agency will ensure that PSL continues to utilize the best technology available to minimize entrainment and impingement to.

While preparing the supplemental EIS, the NRC considered mitigation measures for the continued operation of PSL Units 1 and 2 along with cumulative impacts of past, current, and foreseeable future activities at the site. Based on that assessment, the staff expected that the measures in place at PSL Units 1 and 2 would have mitigated all impacts related to impingement and no new mitigation measures are warranted (NRC 2003).

Because PSL is cooperating with the regulatory agencies, the cumulative impacts of past, current, and foreseeable future activities at the site are expected to be SMALL.

#### 4.12.5.3 Heat Impacts

As stated in Section 4.6.2.4, the operation of PSL will have SMALL impact on the aquatic community of the Atlantic Ocean due to the thermal plume. PSL is operating in conformance with its previous NPDES permit and has submitted a renewal application, therefore it remains in compliance with CWA requirements. Because there are no planned operational changes during the proposed SLR operating term that would increase the temperature of PSL's existing thermal discharge, impacts are anticipated to be SMALL and mitigation measures are not warranted. Because there are no expected developments nearby to contribute to PSL's thermal plume the cumulative impacts are expected to be SMALL.

#### 4.12.5.4 Climate Change

Climate change effects on terrestrial species in coastal areas of Florida include loss of habitat, changes in precipitation, and changes in air temperature. Climate change loss of habitat would be due to sea level rise that could make coastal islands physically smaller and inundate coastal wetlands. Changes in temperature and precipitation due to climate change cause additional stress to terrestrial species (Stys et al 2017)

As discussed in Section 9.6, FPL has administrative controls in place at PSL to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs, permit modifications, or acquisition of new permits as needed. Adherence to regulatory and permit requirements to avoid take of protected species and FPL administrative controls such as those regarding response to avian collisions with transmission lines will minimize or avoid impact to terrestrial species. Therefore, cumulative impacts of climate change and PSL activities on terrestrial species would be SMALL.

As presented in Section 4.12.4, the impact of increased reactor discharge temperatures has a minimal impact on the environment that is not measurable. Therefore, the continued operation of PSL would be a small contributor to climate change effects that impact vulnerable aquatic species due to rising temperature. Therefore, cumulative thermal impacts to ecological communities from PSL and climate change are anticipated to be SMALL during the proposed SLR operating term.

### 4.12.6 Historic and Cultural Resources

As presented in Section 3.8, there are no refurbishment activities or other construction activities currently planned to support SLR operations. Therefore, the SLR consists of an administrative action relative to historic and cultural resources. As mentioned previously and in Section 3.1.4, reasonably foreseeable ground-disturbing activities include the potential renovation of onsite spoils ponds located within the fenced restricted area of PSL and potential increases in stormwater discharge capacity. Currently there are no construction plans to indicate if the construction is confined to previously disturbed areas or not. However, both projects pertain specifically to the site. As illustrated in Figures 3.8-6 through 3.8-8, there is very little area within the site that was not extensively disturbed for the construction of the plant. Therefore, no adverse effects are anticipated to cultural resources on the site during the proposed SLR operating term or due to reasonably foreseeable future projects.

### 4.12.7 Socioeconomics

As discussed in Section 2.5, the proposed SLR does not include plans to add permanent workers, so the SMALL adverse impacts that are the result of workers' impact on community services, education, and infrastructure including transportation would not change. As discussed in Section 3.9.5, FPL is considered a principal property taxpayer in St. Lucie County. Tax payments to the state are expected to remain relatively constant throughout the proposed SLR operating term. The economic contributions of PSL's workers would remain the same. Thus, significant beneficial socioeconomic impacts would also continue during the proposed SLR operating term.

### 4.12.8 Human Health

Radiological dose limits for protection of the public and workers have been developed by the EPA and the NRC to address the cumulative impacts of acute and long-term exposure to radiation and radioactive material. These dose limits are codified in 10 CFR Part 20 and 40 CFR Part 190. For this analysis, the region of influence is the surrounding 50-mile region.

No other nuclear facilities were presented in Section 3.1.1 as being within 50-miles of the site. As presented in Section 3.10, PSL prepares annual radiological environmental operating reports and annual radiological effluent reports. The report for 2019 indicates that doses to members of the public comply with NRC and EPA radiation protection standards and are not increasing. The three-year (2016–2018) average annual occupational dose (TEDE) was 0.081 rem. The annual TEDE limit is 5 rems [10 CFR 20.1201(a)(1)].

Operating PSL for an additional 20-year period would not cause an increase in annual radioactive effluent releases. The cumulative impact of PSL's Units 1 and 2 operation and any other radiation sources, would be expected to be SMALL, because all routine releases and occupational exposure would be subject to federal regulations.

Nonradiological human health impacts occur with temperatures optimal to grow thermophilic organisms such as those listed in Section 3.10.1. As mentioned in Section 4.9.1, these temperatures occur in the discharge canal; however, public access to the discharge canal is restricted and it does not represent a public health hazard. The discharge canal water is piped into the Atlantic Ocean, where it is rapidly mixed with the ocean which lowers the temperature, impeding any growth of thermophilic organisms. Section 4.9.1 concluded that public risk is SMALL. Section 3.10.1 states that the plant's offshore discharge is near the center of the plant's site boundary along the ocean. Therefore, the PSL's thermal discharge would not contribute to any other thermal discharges since there would be no overlap. Therefore, the cumulative nonradiological health impact is SMALL.

Compliance with the NESC and PSL procedures minimizes occupational risk from electrical shock hazards (Section 4.9.2.4). As described in Section 2.2.5.5, PSL maintains as comprehensive occupational safety program. Therefore, cumulative impacts to human health from non-radiological hazards are not expected. The cumulative impacts on human health are expected to be SMALL.

### 4.12.9 Waste Management

As presented in Section 4.11, the comprehensive regulatory controls in place for management of radiological waste and FPL's compliance with these regulations and use of licensed treatment and disposal facilities would allow the impacts to remain SMALL during the proposed SLR operating term. The NRC oversees the licensing of radiological waste treatment and disposal facilities. There are four facilities providing LLRW disposal services in the United States (NRC 2017).

As presented in Section 3.10, PSL's annual reports indicate that radiological doses to members of the public are negligible and in accordance with NRC and EPA radiation protection standards. There are no other operating nuclear power plants, fuel cycle facilities, or radiological waste treatment and disposal facilities within the 50-mile region of PSL (NRC 2021a).

As presented in Sections 2.2.6 and 2.2.7, PSL has programs in place to manage its hazardous and nonhazardous waste streams. PSL also ensures that only licensed or permitted facilities are used for treatment and disposal of its waste streams. Continuation of existing systems and procedures to ensure proper storage and disposal during the proposed SLR operating term would allow the impacts to be SMALL. The other facilities within the 50-mile region of PSL are also required to comply with appropriate EPA and state requirements for the management of radioactive and nonradioactive wastes. Thus, the cumulative waste management impact would be SMALL.

## 4.13 Impacts Common to all Alternatives: Uranium Fuel Cycle

Impacts to the uranium fuel cycle are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. FPL conducted a new and significant information review and identified no new and significant information related to uranium fuel cycle. Therefore, the analyses and findings regarding these Category 1 issues in the GEIS (NUREG-1437, Revision 1) and 10 CFR Part 51, Subpart A, Appendix B, Table B-1 are incorporated herein by reference, and no further analysis is required.

## 4.14 Termination of Nuclear Power Plant Operations and Decommissioning

Impacts to the termination of nuclear power plant operations and decommissioning are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. FPL conducted a new and significant information review and identified no new and significant information related to termination of nuclear power plant operations and decommissioning. Therefore, the analyses and findings regarding these Category 1 issues in the GEIS (NUREG-1437, Revision 1) and 10 CFR Part 51, Subpart A, Appendix B, Table B-1 are incorporated herein by reference, and no further analysis is required.

## 4.15 Severe Accident Mitigation Alternatives Analysis

### 4.15.1 Category 1 Issue—Design-Basis Accidents

The following Category 1 issue related to postulated accidents was reviewed for new and significant information that could make the generic finding as described in the GEIS (NRC 2013a) inapplicable to PSL: Issue 65—Design-basis accidents.

The GEIS (NRC 2013a) concluded that because a licensee is required to maintain the plant within acceptable design and performance criteria, including during any license renewal term, impacts from design-basis accidents would not be affected by changes in plant environment because such impacts (1) are based on calculated radioactive releases that are not expected to change, (2) are not affected by plant environment because they are evaluated for the hypothetical maximally exposed individual, and (3) have been previously determined acceptable. The GEIS also observes that additional experience has contributed to improved plant performance as measured by trends in plant-specific performance indicators, a reduction in operating events, and lessons learned that improve the safety of all the operating nuclear power plants. This is also confirmed by analysis which indicates that in many instances, improved plant performance and design features have resulted in reductions in initiating event frequency, core damage frequency, and containment failure frequency.

The PSL review of new and significant information for the issue of design-basis accidents did not identify any new and significant information, and hence, no additional analysis is needed.

### 4.15.2 Category 2 Issue—Severe Accidents

In 2001, PSL submitted an application for OL renewal, which was approved in 2003. The original 40-year OL for PSL was thereby extended out to 60 years. As part of the initial license renewal process, a detailed evaluation of potential severe accident mitigation alternatives (SAMAs) was performed. A detailed cost-benefit analysis was performed on the SAMAs that could not be qualitatively screened (FPL 2001). The cost/benefit analysis included development of a Level 3 probabilistic risk analysis (PRA) for PSL, which was used to calculate conditional offsite doses and property damage for each of the PRA source term categories (STCs). By calculating the reduction in STC frequencies for each potential SAMA, a bounding present value dollar benefit of each was determined, using the guidance of NUREG/BR-0184 (NRC 1997). The benefit was then compared to a cost estimate for each, to complete the cost/benefit comparison. The conclusion of the analysis was that none of the proposed SAMAs were cost beneficial to PSL.

The review for new and significant information was informed by the current PSL PRA. Over the course of plant operation, changes are made to the plant design, operation, and maintenance practices. Periodic updates to the PSL PRA have ensured that the PRA includes the relevant changes and continues to reflect the current plant design and operation. PRA updates also include updates to the initiating event and equipment performance data using the most current industry and plant specific sources. The PRA models have been updated to reflect improvements in state-of-the-art analysis of severe accidents. Therefore, the PRA provides valuable insights into the risk significance of the plant changes over time.

The analyses follow the model approach in NEI 17-04 Revision 1 (NEI 2019b) for determination of whether or not there is new and significant information regarding the SAMA analyses. The NRC staff has reviewed the NEI 17-04 Rev. 1 document and endorsed its interim use (NRC 2019b). For the PSL SLR, the consideration of new and significant changes since the time of the initial license renewal is consistent with the GEIS (NRC 2013a), Supplement 49 (NRC 2014). Section 5.3.9 of GEIS Supplement 49 states the following:

> *New information is significant if it provides a seriously different picture of the impacts of the Federal action under consideration. Thus, for mitigation alternatives such as SAMAs, new information is significant if it indicates that a mitigation alternative would substantially reduce an impact of the Federal action on the environment. Consequently, with respect to SAMAs, new information may be significant if it indicated a given cost-beneficial SAMA would substantially reduce the impacts of a severe accident or the probability or consequences (risk) of a severe accident occurring.*

The implication of this statement is that "significance" is not solely related to whether or not a SAMA is cost beneficial but depends also on a SAMA's potential to significantly reduce risk to the public (NEI 2019b).

The following Category 2 issue (requirement) related to severe accidents has been defined by the NRC in 10 CFR 51.53(c)(3)(ii)(L):

> *If the staff has not previously considered severe accident mitigation alternatives for the applicant's plant in an environmental impact statement or related supplement or in an environmental assessment, a consideration of alternatives to mitigate severe accidents must be provided.*

The NRC finding regarding severe accidents is stated in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, as follows:

> *The probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives.*

The NRC has ruled that when a plant qualifies for the exception from the requirement to consider SAMAs in 10 CFR 51.53(c)(3)(ii)(L), the exception operates to designate this Category 2 issue as the "functional equivalent" of a Category 1 issue (NRC 2013d). Accordingly, FPL reviewed this issue for new and significant information that would cause the following generic conclusions in the GEIS (NRC 2013a) concerning this issue to be inapplicable to PSL.

1. The probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants.
2. License renewal ERs for plants for which SAMAs have been previously considered need not consider SAMAs again.

The assessment process for new and significant information related to the first conclusion included (1) interviews with subject matter experts on the validity of the conclusions of the 2013 GEIS as they relate to PSL; and (2) review of documents related to predicted impacts of severe accidents at PSL. Consideration was given to developments in plant operation and accident analysis that could have changed the assumptions made concerning severe accident consequences after SAMAs were previously evaluated by the NRC for PSL during initial license renewal (FPL 2001). Developments in the following areas included:

- New internal events information
- External events
- New source term information
- Power uprates
- Higher fuel burnup
- Other considerations including population increase and risk-beneficial plant changes implemented in response to recommendations from the Fukushima Daiichi Near Term Task Force.

No new and significant information was identified. Core damage frequency (CDF) from internal events at both PSL units has improved significantly since the previous SAMA analysis was performed (FPL 2001). This is largely due to plant modifications for risk reduction and PRA analysis refinements. Also, changes have been implemented at the site in response to Fukushima Daiichi Near Term Task Force recommendations and other plant-specific programs that are "risk-beneficial" but not fully credited in PSL PRA models. In terms of seismic risk, PSL is located in an area of lowest seismic activities in the country. The post-Fukushima evaluations of seismic risk confirmed that the most recent ground motion response spectrum developed by EPRI is lower than the sites safe shutdown earthquake assuring seismic hazards are bounded by the design basis earthquake and the risk remains low. For other external hazards, such as high winds and external floods from hurricanes, these events were screened from applicability for the IPEEE based on insignificant risk. The hazards remain insignificant with the screening evaluation recently updated to comply with ASME PRA standard RA-Sa-2009. Therefore, the NRC conclusion in the 2013 GEIS that "the probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small" is considered appropriate for the PSL SLR, is incorporated herein by reference, and no further analysis is needed.

Regarding the second conclusion, the subsections below describe the methodology and review of SAMAs to demonstrate there is no new and significant information.

The NRC approved an 11.85 percent power uprate for each unit in 2012. As part of the uprate, FPL implemented some plant changes to offset any potential increase in CDF and large, early release frequency (LERF), and ultimately reduced the CDF and LERF compared to pre-EPU values (NRC 2012a; NRC 2012b). In addition, since the EPU, the PRA was updated to include impacts related to the EPU, so the effects of the EPU are also included in the quantitative SLR SAMA evaluations.

### 4.15.3 Methodology for Evaluation of New and Significant SAMAs

#### 4.15.3.1 Overview

The evaluations of the PSL SLR SAMAs are consistent with the NEI 17-04 Revision 1 methodology (NEI 2019b), which describes a three-stage process for determining whether there is any "new and significant" information relevant to a previous SAMA analysis. In Stage 1, the SLR applicant uses PRA risk insights and risk model quantifications to estimate the percent reduction in the maximum benefit (MB) associated with (1) all unimplemented final plant-specific SAMAs for the analyzed plant and (2) those SAMAs identified as potentially cost beneficial for other U.S. nuclear power plants and that are applicable to the analyzed plant. Consistent with the NRC's rulings that new and significant information is that which "presents 'a seriously different picture' of the environmental impacts . . . compared to the previously issued final environmental impact statement," (NRC 2016a), the first stage examines whether these potentially cost-beneficial SAMA might reduce severe accident risk substantially. If it can be demonstrated that none of these SAMAs being evaluated can reduce the MB by 50 percent or more, then the applicant may document the conclusion that there is no "new and significant" information relevant to the previous SAMA analysis. If one or more of those SAMAs are shown to reduce the MB by 50% or more, then the applicant must complete Stage 2 by developing updated averted cost-risk estimates for implementing those SAMAs. If the Stage 2 assessment confirms that one or more SAMAs reduce the MB by 50 percent or more, then the applicant must complete Stage 3 by performing a cost-benefit analysis for the "potentially significant" SAMAs identified in Stage 2. Applicants able to demonstrate through the Stage 1 screening process that there is no potentially significant new information are not required to perform the Stage 2 or Stage 3 evaluations. The application of the NEI 17-04 methodology is described in the following subsections.

##### *4.15.3.1.1 Definitions of New and Significant Information*

"New" information pertains to data used in a SAMA analysis that have changed or become available since the time the preceding SAMA analysis was performed.

There are some inputs to the SAMA analysis that are expected to change, or to potentially change, for all plants. These inputs include the following:

- Updated Level 3 model consequence results, which may be impacted by multiple inputs, including, but not limited to, the following:
    - Population
    - Value of farm and non-farm wealth
    - Core inventory (e.g., due to power uprate)
    - Evacuation timing and speed
    - Level 3 methodology updates
- NUREG/BR-0058 (NRC 2004) cost-benefit methodology updates.

In addition, other changes that could be considered "new information" are dependent on plant activities or site-specific changes. These types of changes include the following:

- Identification of a new hazard (e.g., a fault that was not previously analyzed in the seismic analysis).
- Updated plant risk model (e.g., a fire PRA that replaces the individual plant examination of external events [IPEEE] analysis).
    - Impacts of plant changes that are included in the plant risk models will be reflected in the model results and do not need to be assessed separately.
- Non-modeled modifications/changes to the plant.
    - Modifications determined to have no risk impact need not be included (e.g., replacement of the condenser vacuum pumps), unless they impact a specific input to SAMA (e.g., a new low-pressure turbine in the power conversion system that results in a greater net electrical output).

For risk model updates performed to reflect the latest PRA model state of the practice, it is noted that the actual physical plant risk may not have changed; however, because the best-estimate assessment or understanding of the risk has changed, it is considered new information.

The current PSL PRA models (internal events, internal floods, and fire) were used to determine the level of significance of new information. Consistent with the NEI methodology, these PRA models reflected the most up-to-date understanding of plant risk at the time of analysis (NEI 2019b). Regarding seismic hazards, screening performed as part of PSL's IPEEE and reevaluated in response to Fukushima identified that PSL had no significant seismic hazard susceptibilities or vulnerabilities. The PSL updated other external hazards assessment also screened all other external hazards as not applicable to the site. These findings are consistent with the IPEEE findings.

As noted above, the criterion established for a potential SAMA being "significant" is if the MB calculated for PSL would be reduced by a factor of two or more if the SAMA were implemented. If it can be shown that a particular SAMA would not reduce the CDF or any of the significant Level 2 release category group frequencies in the models of record by more than a factor of two, then that particular SAMA could not reduce the MB by more than a factor of two. Therefore, that SAMA would not be considered potentially significant and would not be evaluated further in assessing the significance of new information. This criterion was applied to the SAMA screening evaluation presented in Section 4.15.4.

As seen in the subsequent sections, for PSL, all SAMAs were screened out either qualitatively or quantitatively in accordance with the NEI 17-04 methodology. Therefore, the "Stage 2" NEI 17-04 was not required, and the Level 3 PRA was not updated. Existence of a SAMA that would reduce MB by 50 percent or more and also be potentially cost-beneficial, would indicate the existence of "new and significant" information relevant to the previous SAMA analysis.

### 4.15.4 Analysis

#### 4.15.4.1 Stage 1 Assessment—Overview

The list of candidate SAMAs for the PSL SLR was developed from plant-specific and industry sources. For the plant-specific portion, the initial PSL license renewal SAMA evaluation was examined to identify all SAMAs that could not be qualitatively screened, and that were found not to be cost effective. Evaluating these items is appropriate for determining if there is any new and significant information for PSL and the PRA since the time of the initial license renewal in regard to the potential plant improvements.

For evaluation of the industry sources, the GEIS (NRC 2013a) supplements were examined for SAMAs found to be potentially cost effective at plants similar to PSL. SAMAs found to be cost effective at similar plants (pressurized water reactors) were considered for their significance at PSL (NRC 2014).

The list of SAMAs collected was evaluated qualitatively to screen any that are not applicable to PSL, or already exist at PSL. In addition, plant specific PSL SAMAs were screened if the implementation cost identified in the initial license renewal exceeded the maximum attainable benefit (MAB).

The remaining SAMAs were then grouped based on similarities in mitigation equipment or risk-reduction benefits, and all were evaluated for the impact they would have on the PSL CDF and significant STC group frequencies if implemented. If any of the SAMAs reduced the total CDF or at least one significant STC group frequency by at least 50 percent, then the SAMA would be retained for a full Level 3 PRA evaluation of the reduction in MB. As seen in Sections 4.15.4.2 and 4.15.4.3, all SAMAs were screened without the need to perform a Level 3 update.

The quantitative evaluations performed for this analysis use the PSL internal events, internal flood, and internal fire models. The internal events models contain sufficient information to determine CDF and the significant STC groups (i.e., LERF and LLRF). The PSL internal flood and fire models are capable of determining impacts to the CDF and LERF. This approach is sufficient to evaluate the SAMAs for new and significant information, given the bounding approach to the quantitative analyses and to the conservatism in the NEI approach. The LLRF contribution from significant external hazards is expected to be proportional to that of internal events, given the large free volume and robustness of the PSL containment. Containment phenomena such as steam overpressure and hydrogen detonation progress similarly regardless of the initiating event. If neither the total CDF, the total LERF, nor the internal events LLRF is reduced by >50 percent, then the MB would also not be reduced by >50 percent. SAMAs screened in this manner are not considered "significant" and are conclusively screened as part of the Stage 1 assessment.

#### 4.15.4.2 Stage 1 Assessment—Identification and Qualitative Screening

A total of 283 industry SAMAs and 50 PSL-specific SAMAs were collected for evaluation in the PSL SLR. All but 81 were qualitatively screened using the criteria discussed in Section 4.15.4.1.

Table 4.15-1 presents the 81 SAMAs that were not qualitatively screened. The first column presents number assigned to each SAMA for tracking purposes. The second column identifies the plant from which the SAMA originated (i.e., PSL or an industry SAMA); the third column identifies the SAMA number from the source plant; the fourth column provides a description of the SAMA. The fifth column discusses the grouping of the SAMAs, and the sixth column identifies the name assigned to the SAMA group.

A total of 22 SAMA groups were identified for quantitative screening evaluation.

#### 4.15.4.3 Stage 1 Assessment—Quantitative Screening

This section presents the quantitative screening of the PSL SAMAs. The NEI 17-04 methodology considers a potential SAMA to be significant if it reduces the MB by at least 50 percent. The Stage 1 quantitative screening process evaluates this using the criteria of total CDF and no STC frequency being reduced by at least 50 percent. Because the MB is the sum total of the contribution of each STC, if no STC decreases by at least 50 percent, then the total MB reduction cannot exceed 50 percent. However, the approach of evaluating every STC is not necessary to ensure the MB reduction is less than 50 percent. In reality, many individual STCs have a frequency that is insignificant, and while an insignificant STC could in theory be reduced by >50 percent, its impact on MB would be negligible. Additionally, many STCs have conditional offsite consequences that are negligible compared to the dominant STC groups (i.e., LERF and LLRF).

Therefore, the significant STC groups (i.e., LERF and LLRF) are examined for percentage reduction. If neither the total CDF, total LERF, nor total LLRF is reduced by >50 percent, then the MB is also not reduced by >50 percent. SAMAs screened in this manner are not considered "significant" and are conclusively screened as part of the Stage 1 assessment.

Table 4.15-2 presents the quantitative screening results from the bounding SAMA evaluations. As seen in Table 4.15-2, none of the bounding quantitative screening evaluations result in a reduction of total CDF, total LERF, or total LLRF greater than 50 percent. The evaluations were selected conservatively to provide assurance that they are bounding. In some cases, some measures (e.g., internal flooding LERF) yield an individual reduction greater than 50 percent, but when combined with the other hazards, no SAMA results in a collective CDF or significant STC group frequency (LERF) reduction of greater than 50 percent.

### 4.15.5 Conclusions

Appropriate qualitative screening criteria were applied to the industry SAMAs identified for consideration. For the remaining industry SAMAs and for the PSL-specific SAMAs to be evaluated, a series of bounding quantitative analyses were performed. These analyses demonstrate that none of the SAMAs considered for quantitative evaluation would reduce the PSL MB by 50 percent or greater.

Therefore, it is concluded that there is no new and significant information that would alter the conclusions of the original SAMA analysis for PSL.

**Table 4.15-1 Grouping of Related Industry and PSL-Specific SAMAs for Bounding Evaluation (Sheet 1 of 8)**

| St. Lucie SAMA # | Plant | Plant SAMA # | SAMA Description | Grouped Assessment | Case Name |
|---|---|---|---|---|---|
| 73 | Callaway | 188 | Install a permanent, dedicated generator for the normal charging pump (NCP), and an MDAFW pump and battery charger to address SBO events in which the TDAFP is unavailable. | Quantitatively evaluate. During SBO events, the FLEX strategy can recover a charging pump, but FLEX credits initial availability of the TDAFW pump. Evaluate the benefit of additional permanent independently installed AFW. FLEX is not credited in the PRA. | AFW |
| 260 | Vogtle 1, 2 | 5 | Install permanent, dedicated generator for one motor driven AFW pump and a battery charger | | |
| 283 | Wolf Creek | 14 | Install a permanent, dedicated generator for the NCP (similar to SAMA 1), and a motor-driven AFW pump and battery charger to address SBO events in which the TDAFW pump is unavailable. | | |
| 218 | Seabrook 1 | 193 | Hardware change to eliminate MOV AC power dependency. | SAMA reduces occurrence of CIV failure. Quantitatively evaluate improved reliability of CIVs. | CIV |
| 307 | St Lucie | 88 | Install self-actuating containment isolation valves. | | |
| 311 | St Lucie | 96 | Add redundant and diverse limit switch to each containment isolation valve. | | |
| 330 | St Lucie | 161 | Add penetration valve leakage control system. | SAMA evaluates the maximum benefit of installing a leakage control system for CIVs. | CIVLEAK |
| 273 | Waterford 3 | 40 | Use the fire water system as a backup source for the containment spray system | Quantitatively evaluate improvements to containment spray reliability | CSS |
| 80 | Calvert Cliffs 1, 2 | 74 | Automate demineralized water (DW) makeup to condensate storage tank. | Quantitatively evaluate maximum benefit of U1 CST improvements. U2 CST does not require makeup. | CST |
| 109 | Crystal River 3 | 38 | Additional condensate storage tank (CST) replacement water sources. | | |

**Table 4.15-1 Grouping of Related Industry and PSL-Specific SAMAs for Bounding Evaluation (Sheet 2 of 8)**

| St. Lucie SAMA # | Plant | Plant SAMA # | SAMA Description | Grouped Assessment | Case Name |
|---|---|---|---|---|---|
| 161 | Kewaunee | 172 | Provide additional alarm for extremely low CST level. | Quantitatively evaluate maximum benefit of U1 CST improvements. U2 CST does not require makeup. | CST |
| 203 | Salem 1, 2 | 7 | Install "B" train auxiliary feedwater storage tank (AFWST) makeup including alternate water source. | | |
| 204 | Salem 1, 2 | 8 | Install high pressure pump powered with portable diesel generator and long-term suction source to supply the AFW header. | | |
| 271 | Waterford 3 | 34 | Use fire water system as a backup for steam generator inventory | | |
| 263 | Waterford 3 | 1 | Provide additional DC battery capacity | This SAMA is similar to the plant specific SAMAs related to battery improvements. Quantitatively evaluate improved battery capacity. | DC-CHG |
| 297 | St Lucie | 59 | Use fuel cells instead of lead-acid batteries. | SAMA removes DC power dependency on battery chargers. Quantitatively evaluate improved DC power source capability. | |
| 320 | St Lucie | 145 | Make procedural changes only for the RCS depressurization option. | This SAMA relates to actions to depressurize the reactor during accident sequences. The first LRA analyzed this SAMA and found no reduction in risk. However, PRA model improvements since the first LRA may have changed these results. Therefore, quantitatively evaluate improved HEP for all cases involving failed depressurization. The updated PSL model credits depressurization following LOCA, to achieve SDC, and to prevent induced SGTR. | DEPRESS |

**Table 4.15-1 Grouping of Related Industry and PSL-Specific SAMAs for Bounding Evaluation (Sheet 3 of 8)**

| St. Lucie SAMA # | Plant | Plant SAMA # | SAMA Description | Grouped Assessment | Case Name |
|---|---|---|---|---|---|
| 97 | Cook 1, 2 | 160 | Provide self-cooled ECCS seals. | Quantitatively evaluate risk improvements for removing ECCS cooling dependency. PSL containment spray pumps and U1 LPSI pump seals require cooling by CCW during recirculation. Other ECCS pumps do not require seal cooling. This SAMA is focused on removing the ECCS pump seal cooling dependency on CCW. | ECCS-COOL |
| 287 | St Lucie | 13 | Replace ECCS pump motors with air-cooled motors. | | |
| 324 | St Lucie | 151 | Provide self-cooled ECCS seals. | | |
| 136 | Indian Point 2 | 54 | Install flood alarm in the 480-V ac switchgear room. | At PSL, floods in 1RAB19-45 dominates U1 flood risk, and floods in 2RAB19-45 dominates U2 flood risk. Quantitatively evaluate benefit of flood mitigation in these areas. | FLOOD |
| 150 | Indian Point 3 | 62 | Install flood alarm in the 480-V AC switchgear room. | | |
| 160 | Kewaunee | 169 | Provide flood protection for MCC-52E, -62E, and -62H. | | |
| 202 | Salem 1, 2 | 6 | Enhance flood detection for 84' auxiliary building and enhance procedural guidance for responding to service water flooding. | | |
| 233 | Sequoyah 1, 2 | 279 | Improve internal flooding response procedures and training to improve the response to internal flooding events. | | |
| 64 | Callaway | 162 | Install a large volume EDG fuel oil tank at an elevation greater than the EDG fuel oil day tanks. | Quantitatively evaluate maximum benefit of removing dependence on fuel oil transfer pumps. | FuelOilXfer |
| 282 | Wolf Creek | 13 | Install an alternative fuel oil tank with gravity feed capability to address fuel oil transfer failure events. | | |

**Table 4.15-1 Grouping of Related Industry and PSL-Specific SAMAs for Bounding Evaluation (Sheet 4 of 8)**

| St. Lucie SAMA # | Plant | Plant SAMA # | SAMA Description | Grouped Assessment | Case Name |
|---|---|---|---|---|---|
| 315 | St Lucie | 117 | Provide an additional HPSI pump with independent diesel. | SAMA improves injection capability for small LOCA, SBO and once-through-cooling. Quantitatively evaluate improved/alternate HPI injection source. | HPSIP |
| 316 | St Lucie | 118 | Install independent AC HPSI system. | | |
| 318 | St Lucie | 126 | Replace two of the four safety injection pumps with diesel pumps. | | |
| 326 | St Lucie | 155 | Provide a centrifugal charging pump. | | |
| 15 | Braidwood 1, 2 | 3 | Auto-start of standby SX pump. | Quantitatively Evaluate. PSL does not have auto start of ICW pumps on low header pressure. A low-pressure alarm is provided on the MCR board. All pumps start on SI signal. Evaluate impact of low-pressure auto start on non-SI signal initiators. | ICW |
| 41 | Byron 1, 2 | 3 | Auto-start of standby SX pump. | | |
| 13 | Braidwood 1, 2 | 1 | Diesel-driven SX pump in a new dedicated building. | Quantitatively evaluate adding new diesel driven ICW pump in a new dedicated building. | ICW |
| 39 | Byron 1, 2 | 1 | Diesel-driven SX pump in a new dedicated building. | | |
| 102 | Crystal River 3 | 8 | Provide a temporary pump to replace RWP. | | |
| 27 | Braidwood 1, 2 | 19 | Replace motor-operated valves (MOVs) in the RHR discharge line with valves that can isolate an ISLOCA event. | Quantitatively evaluate to determine the maximum benefit of SAMAs associated with ISLOCAs. | ISLOCA |
| 52 | Byron 1, 2 | 19 | Replace MOVs in the RHR discharge line with valves that can isolate an ISLOCA event. | | |
| 131 | Indian Point 2 | 21 | Install additional pressure or leak monitoring instrumentation for ISLOCA. | | |
| 132 | Indian Point 2 | 22 | Add redundant and diverse limit switches to each containment isolation valve. | | |

**Table 4.15-1 Grouping of Related Industry and PSL-Specific SAMAs for Bounding Evaluation (Sheet 5 of 8)**

| St. Lucie SAMA # | Plant | Plant SAMA # | SAMA Description | Grouped Assessment | Case Name |
|---|---|---|---|---|---|
| 144 | Indian Point 3 | 19 | Install additional pressure or leak monitoring instrumentation for ISLOCA. | Quantitatively evaluate to determine the maximum benefit of SAMAs associated with ISLOCAs. | ISLOCA |
| 262 | Vogtle 1, 2 | 16 | Enhance procedures for ISLOCA response | | |
| 280 | Wolf Creek | 4 | Proceduralize operator actions to perform local isolations of any valves that fail to close remotely in an interfacing system LOCA (ISLOCA). | | |
| 308 | St Lucie | 89 | Install additional instrumentation for ISLOCA sequences. | | |
| 309 | St Lucie | 90 | Increase frequency of valve leak testing. | | |
| 310 | St Lucie | 95 | Ensure all ISLOCA releases are scrubbed. | | |
| 311 | St Lucie | 96 | Add redundant and diverse limit switch to each containment isolation valve. | | |
| 325 | St Lucie | 152 | Separate non-vital buses from vital buses. | This SAMA addresses 480V AC non-vital loads that fail to shed on the vital busses, causing potential diesel overload. Quantitatively evaluate elimination of loadshed failures. | LOADSHED |
| 298 | St Lucie | 71 | Install gas turbine generators. | Quantitatively evaluate measures to reduce LOSP risk. | LOSP |
| 299 | St Lucie | 75 | Provide a connection to alternate offsite power source. | | |
| 300 | St Lucie | 76 | Implement underground offsite power lines. | | |
| 323 | St Lucie | 149 | Provide digital large break LOCA protection. | SAMA provides early warning for LOCA precursors. Quantitatively evaluate elimination of medium and large break LOCA | M&LBLOCA |

**Table 4.15-1 Grouping of Related Industry and PSL-Specific SAMAs for Bounding Evaluation (Sheet 6 of 8)**

| St. Lucie SAMA # | Plant | Plant SAMA # | SAMA Description | Grouped Assessment | Case Name |
|---|---|---|---|---|---|
| 322 | St Lucie | 148 | Install secondary-side guard pipes up to the MSIVs. | Protects against rapid depressurization and induced SGTR during a secondary line break. Quantitatively evaluate elimination of secondary line break inside containment | MSMFLBIC |
| 319 | St Lucie | 140 | Install a system of relief valves that prevents any equipment damage from a pressure spike during an ATWS. | SAMA mitigates consequence of an ATWS pressure challenge by adding additional pressure-relief capacity. PSL installed the Dedicated Diverse Scram system (diverse to RPS) to reduce the likelihood/consequence of an ATWS. Quantitatively evaluate successful pressure relief for additional ATWS mitigation capability. | NOATWS |
| 81 | Calvert Cliffs 1, 2 | 77 | Increase size of PORVs for bleed and feed | Quantitatively evaluate U1 maximum benefit. At PSL U1, the success criteria for once-through-cooling or ATWS is 2 of 2 PORVs. For U2 it is 1 of 2 PORVs. Evaluate maximum benefit of enlarging U1 PORVs. | PORV |
| 108 | Crystal River 3 | 35 | Update PORV controls to open automatically when operator action was previously required. | Quantitatively evaluate. At PSL only manual actuation of the PORVs is modeled. Evaluate maximum benefit of automatic actuation. | |
| 321 | St Lucie | 146 | Defeat 100% load rejection capability. (Interpreted as "Provide 100%…") | PSL has developed a procedure (GOP-123, *Turbine Shutdown – Full Load to Zero Load*) that provides detailed instruction for load rejection events. The SAMA suggests that 100% secondary load rejection capability following an SBO or turbine trip would reduce RCS pressure challenges. Quantitatively evaluate elimination of stuck open RCS - PORVs/SRVs following trip. | |

**Table 4.15-1 Grouping of Related Industry and PSL-Specific SAMAs for Bounding Evaluation (Sheet 7 of 8)**

| St. Lucie SAMA # | Plant | Plant SAMA # | SAMA Description | Grouped Assessment | Case Name |
|---|---|---|---|---|---|
| 4 | Arkansas Nuclear One-2 | CW-06 | Proceduralize shedding CCW loads to extend the CCW heat-up time. | Quantitatively evaluate: PSL RCPs use Byron Jackson N-9000 "no-leak" seals. On loss of CCW, automatic RCP trip would protect seals. | RCP-SEAL |
| 86 | Cook 1, 2 | 10 | Eliminate RCP thermal barrier dependence on CCW, such that loss of CCW does not result directly in core damage. | | |
| 239 | Sequoyah 1, 2 | Added | Automate the tripping of RCPs on loss of component cooling water | | |
| 243 | Three Mile Island-1 | 8 | Automate reactor coolant pump trip on high motor bearing cooling temperature. | | |
| 284 | St Lucie | 8 | Eliminate RCP thermal barrier dependence on CCW, such that loss of CCW does not result directly in core damage. | SAMA reduces the likelihood of an RCP Seal LOCA from loss of CCW. Quantitatively evaluate risk improvement for no RCP seal failure. | RCP-SEAL |
| 143 | Indian Point 3 | 18 | Route the discharge from the MSSVs through a structure where spray water would condense the stream and remove fission products. | Quantitatively evaluate to determine the maximum benefit of SAMAs associated with SGTRs. | SGTR |
| 193 | Prairie Island 1, 2 | Added | Purchase of a gagging device that could be used to close a stuck-open SG safety valve on the ruptured steam generator prior to core damage in SGTR events. | | |
| 240 | Sequoyah 1, 2 | Added | Purchase or manufacture a "gagging device" that could be used to close a stuck-open steam generator safety valve for a SGTR event prior to core damage | | |
| 244 | Three Mile Island-1 | 10 | Automate BWST refill. | | |

**Table 4.15-1 Grouping of Related Industry and PSL-Specific SAMAs for Bounding Evaluation (Sheet 8 of 8)**

| St. Lucie SAMA # | Plant | Plant SAMA # | SAMA Description | Grouped Assessment | Case Name |
|---|---|---|---|---|---|
| 275 | Waterford 3 | 71 | Manufacture a gagging device for a steam generator safety valve and develop a procedure or work order for closing a stuck open valve | Quantitatively evaluate to determine the maximum benefit of SAMAs associated with SGTRs. | SGTR |
| 302 | St Lucie | 81 | Add other SGTR coping features. | | |
| 303 | St Lucie | 82 | Increase secondary-side pressure capacity such that an SGTR would not cause the relief valves to lift. | | |
| 305 | St Lucie | 85 | Establish a maintenance practice that inspects 100% of the tubes in an SG. | | |
| 187 | Palo Verde 1, 2, 3 | 23 | Enhance procedures to direct steam generator flooding for release scrubbing. | The first license renewal considered that the current procedural direction to feed and cool the ruptured SG and to also isolate the SG met the intent of this SAMA to reduce releases. However, this SAMA will be quantitatively evaluated to determine maximum benefit associated reducing SGTR risks. | SGTR |
| 274 | Waterford 3 | 61 | Direct steam generator flooding after a steam generator tube rupture, prior to core damage | | |
| 3 | Arkansas Nuclear One-2 | CC-20 | Make containment sump recirculation outlet MOVs 2CV-5649-1 and 2CV-5650-2 diverse from one another. | Higher failure rate of sump valves due to infrequent flow test and common cause considerations make valves potentially important to risk. Quantitatively evaluate benefit of diverse valve types by removing CCF to open. | SUMP |
| 327 | St Lucie | 158 | Improve RHR sump reliability. | SAMA reduces possibility of sump plugging. Quantitatively evaluate elimination of sump plugging. | |

**Table 4.15-2 Summary of Aggregate SAMA Maximum Benefits (Sheet 1 of 2)**

| # | Case | Figure of Merit | Unit 1 | | | Unit 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | Base | SAMA | MB% | Base | SAMA | MB% |
| 1 | AFW | CDF | 4.85E-05 | 4.74E-05 | 2.4% | 3.81E-05 | 3.78E-05 | 0.6% |
| | | LERF | 2.51E-06 | 2.46E-06 | 1.8% | 1.94E-06 | 1.94E-06 | 0.0% |
| | | LLRF | 1.57E-07 | 1.48E-07 | 5.7% | 1.57E-07 | 1.50E-07 | 4.5% |
| 2 | CIV | CDF | 4.85E-05 | 4.85E-05 | 0.0% | 3.81E-05 | 3.81E-05 | 0.0% |
| | | LERF | 2.51E-06 | 1.53E-06 | 39.1% | 1.94E-06 | 1.11E-06 | 43.0% |
| | | LLRF | 1.57E-07 | 1.57E-07 | 0.0% | 1.57E-07 | 1.57E-07 | 0.0% |
| 3 | CIVLEAK | CDF | 4.85E-05 | 4.85E-05 | 0.0% | 3.81E-05 | 3.81E-05 | 0.0% |
| | | LERF | 2.51E-06 | 2.23E-06 | 11.2% | 1.94E-06 | 1.69E-06 | 12.9% |
| | | LLRF | 1.57E-07 | 1.57E-07 | 0.0% | 1.57E-07 | 1.57E-07 | 0.0% |
| 4 | CSS | CDF | 4.85E-05 | 4.85E-05 | 0.0% | 3.81E-05 | 3.80E-05 | 0.3% |
| | | LERF | 2.51E-06 | 2.51E-06 | 0.0% | 1.94E-06 | 1.94E-06 | 0.0% |
| | | LLRF | 1.57E-07 | 1.54E-07 | 1.9% | 1.57E-07 | 1.57E-07 | 0.0% |
| 5 | CST | CDF | 4.85E-05 | 4.50E-05 | 7.4% | 3.81E-05 | 3.81E-05 | 0.0% |
| | | LERF | 2.51E-06 | 2.33E-06 | 7.0% | 1.94E-06 | 1.94E-06 | 0.0% |
| | | LLRF | 1.57E-07 | 1.50E-07 | 4.5% | 1.57E-07 | 1.57E-07 | 0.0% |
| 6 | DC-CHG | CDF | 4.85E-05 | 4.84E-05 | 0.2% | 3.81E-05 | 3.81E-05 | 0.0% |
| | | LERF | 2.51E-06 | 2.50E-06 | 0.4% | 1.94E-06 | 1.94E-06 | 0.1% |
| | | LLRF | 1.57E-07 | 1.48E-07 | 5.7% | 1.57E-07 | 1.54E-07 | 1.9% |
| 7 | DEPRESS | CDF | 4.85E-05 | 4.71E-05 | 2.9% | 3.81E-05 | 3.77E-05 | 0.9% |
| | | LERF | 2.51E-06 | 2.32E-06 | 7.8% | 1.94E-06 | 1.83E-06 | 5.6% |
| | | LLRF | 1.57E-07 | 1.49E-07 | 5.1% | 1.57E-07 | 1.49E-07 | 5.1% |
| 8 | ECCS-COOL | CDF | 4.85E-05 | 4.85E-05 | 0.0% | 3.81E-05 | 3.81E-05 | 0.0% |
| | | LERF | 2.51E-06 | 2.51E-06 | 0.0% | 1.94E-06 | 1.94E-06 | 0.0% |
| | | LLRF | 1.57E-07 | 1.57E-07 | 0.0% | 1.57E-07 | 1.57E-07 | 0.0% |
| 9 | FLOOD | CDF | 4.85E-05 | 4.82E-05 | 0.7% | 3.81E-05 | 3.76E-05 | 1.2% |
| | | LERF | 2.51E-06 | 2.18E-06 | 13.3% | 1.94E-06 | 1.93E-06 | 0.1% |
| | | LLRF | 1.57E-07 | 1.57E-07 | 0.0% | 1.57E-07 | 1.57E-07 | 0.0% |
| 10 | FuelOilXfer | CDF | 4.85E-05 | 4.82E-05 | 0.6% | 3.81E-05 | 3.81E-05 | 0.0% |
| | | LERF | 2.51E-06 | 2.50E-06 | 0.4% | 1.94E-06 | 1.94E-06 | 0.1% |
| | | LLRF | 1.57E-07 | 1.54E-07 | 1.9% | 1.57E-07 | 1.53E-07 | 2.5% |
| 11 | HPSIP | CDF | 4.85E-05 | 4.46E-05 | 8.1% | 3.81E-05 | 3.65E-05 | 4.2% |
| | | LERF | 2.51E-06 | 2.37E-06 | 5.7% | 1.94E-06 | 1.93E-06 | 0.5% |
| | | LLRF | 1.57E-07 | 1.37E-07 | 12.7% | 1.57E-07 | 1.37E-07 | 12.7% |

**Table 4.15-2 Summary of Aggregate SAMA Maximum Benefits (Sheet 2 of 2)**

| # | Case | Figure of Merit | Unit 1 | | | Unit 2 | | |
|---|---|---|---|---|---|---|---|---|
| | | | Base | SAMA | MB% | Base | SAMA | MB% |
| 12 | ICW | CDF | 4.85E-05 | 4.85E-05 | 0.1% | 3.81E-05 | 3.80E-05 | 0.1% |
| | | LERF | 2.51E-06 | 2.51E-06 | 0.0% | 1.94E-06 | 1.94E-06 | 0.0% |
| | | LLRF | 1.57E-07 | 1.33E-07 | 15.3% | 1.57E-07 | 1.24E-07 | 21.0% |
| 13 | ISLOCA | CDF | 4.85E-05 | 4.85E-05 | 0.0% | 3.81E-05 | 3.81E-05 | 0.0% |
| | | LERF | 2.51E-06 | 2.51E-06 | 0.2% | 1.94E-06 | 1.94E-06 | 0.0% |
| | | LLRF | 1.57E-07 | 1.57E-07 | 0.0% | 1.57E-07 | 1.57E-07 | 0.0% |
| 14 | LOADSHED | CDF | 4.85E-05 | 4.71E-05 | 3.0% | 3.81E-05 | 3.70E-05 | 2.9% |
| | | LERF | 2.51E-06 | 2.46E-06 | 2.1% | 1.94E-06 | 1.91E-06 | 1.7% |
| | | LLRF | 1.57E-07 | 1.50E-07 | 4.5% | 1.57E-07 | 1.25E-07 | 20.4% |
| 15 | LOSP | CDF | 4.85E-05 | 4.85E-05 | 0.1% | 3.81E-05 | 3.81E-05 | 0.1% |
| | | LERF | 2.51E-06 | 2.51E-06 | 0.1% | 1.94E-06 | 1.94E-06 | 0.2% |
| | | LLRF | 1.57E-07 | 1.51E-07 | 3.8% | 1.57E-07 | 1.50E-07 | 4.5% |
| 16 | M&LBLOCA | CDF | 4.85E-05 | 4.83E-05 | 0.5% | 3.81E-05 | 3.81E-05 | 0.1% |
| | | LERF | 2.51E-06 | 2.51E-06 | 0.2% | 1.94E-06 | 1.94E-06 | 0.0% |
| | | LLRF | 1.57E-07 | 1.46E-07 | 7.0% | 1.57E-07 | 1.54E-07 | 1.9% |
| 17 | MSMFLBIC | CDF | 4.85E-05 | 4.85E-05 | 0.0% | 3.81E-05 | 3.81E-05 | 0.0% |
| | | LERF | 2.51E-06 | 2.51E-06 | 0.0% | 1.94E-06 | 1.94E-06 | 0.0% |
| | | LLRF | 1.57E-07 | 1.56E-07 | 0.6% | 1.57E-07 | 1.57E-07 | 0.0% |
| 18 | NOATWS | CDF | 4.85E-05 | 4.84E-05 | 0.3% | 3.81E-05 | 3.79E-05 | 0.4% |
| | | LERF | 2.51E-06 | 2.51E-06 | 0.1% | 1.94E-06 | 1.94E-06 | 0.1% |
| | | LLRF | 1.57E-07 | 1.53E-07 | 2.5% | 1.57E-07 | 1.53E-07 | 2.5% |
| 19 | PORV | CDF | 4.85E-05 | 4.52E-05 | 6.8% | 3.81E-05 | 3.77E-05 | 1.0% |
| | | LERF | 2.51E-06 | 2.34E-06 | 7.0% | 1.94E-06 | 1.93E-06 | 0.7% |
| | | LLRF | 1.57E-07 | 1.49E-07 | 5.1% | 1.57E-07 | 1.55E-07 | 1.3% |
| 20 | RCP-SEAL | CDF | 4.85E-05 | 4.14E-05 | 14.6% | 3.81E-05 | 3.04E-05 | 20.2% |
| | | LERF | 2.51E-06 | 1.93E-06 | 23.0% | 1.94E-06 | 1.43E-06 | 26.5% |
| | | LLRF | 1.57E-07 | 9.94E-08 | 36.7% | 1.57E-07 | 1.02E-07 | 35.0% |
| 21 | SGTR | CDF | 4.85E-05 | 4.85E-05 | 0.1% | 3.81E-05 | 3.81E-05 | 0.0% |
| | | LERF | 2.51E-06 | 1.84E-06 | 26.6% | 1.94E-06 | 1.67E-06 | 13.7% |
| | | LLRF | 1.57E-07 | 1.58E-07 | -0.6% | 1.57E-07 | 1.59E-07 | -1.3% |
| 22 | SUMP | CDF | 4.85E-05 | 4.84E-05 | 0.2% | 3.81E-05 | 3.81E-05 | 0.0% |
| | | LERF | 2.51E-06 | 2.51E-06 | 0.0% | 1.94E-06 | 1.94E-06 | 0.0% |
| | | LLRF | 1.57E-07 | 1.56E-07 | 0.6% | 1.57E-07 | 1.56E-07 | 0.6% |

# 5.0 NEW AND SIGNIFICANT INFORMATION

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware. [10 CFR 51.53(c)(3)(iv)] The NRC has stated; however, that an applicant is not required to perform site-specific validation of GEIS conclusions. (NRC 1996c)

License renewal applicants are required to analyze only those issues the NRC has not resolved generically. While NRC regulations do not require an applicant's environmental report to contain analyses of the impacts of those Category 1 environmental issues that have been generically resolved [10 CFR 51.53(c)(3)(i)], the regulations do require that an applicant identify any new and significant information of which the applicant is aware. [10 CFR 51.53(c)(3)(iv)]

## 5.1 New and Significant Information Discussion

The NRC provides guidance on new and significant information in Regulatory Guide 4.2, Supplement 1, Revision 1 (NRC 2013b). In this guidance, new and significant information is defined as follows:

1) Information that identifies a significant environmental impact issue that was not considered or addressed in the GEIS and consequently not codified in Table B-1, "Summary of Findings on NEPA Issues for License Renewal of Nuclear Plants," in Appendix B, "Environmental Effect of Renewing the Operating License of a Nuclear Power Plant," to Subpart A, "National Environmental Policy Act—Regulations Implementing Section 102(2)," of 10 CFR Part 51; or
2) Information not considered in the assessment of impacts evaluated in the GEIS leading to a seriously different picture of the environmental consequences of the action than previously considered, such as an environmental impact finding different from that codified in Table B-1.
3) Further, any new activity or aspect associated with the nuclear power plant that can act upon the environment in a manner or an intensity and/or scope (context) not previously recognized.

Based on available guidance and the definitions of SMALL, MODERATE, and LARGE impacts provided by NRC in 10 CFR Part 51, Appendix B, Table B-1, Footnote 3, FPL considers any new information regarding Category 1 issues with MODERATE or LARGE impacts would be significant. Section 4.0.2 presents the NRC's definitions of SMALL, MODERATE, and LARGE.

## 5.2 New and Significant Information Review Process

The new and significant information assessment described below meets or addresses regulatory guidance provided above.

FPL's process is collectively carried out through its ongoing environmental planning, assessment, monitoring, and compliance activities performed by corporate and PSL management and staff and ER-specific reviews. This team has collective knowledge of the license renewal process, the PSL site, licensing and permitting, environmental and regulatory issues, initial license renewals, the NEPA process, and other nuclear industry activities which could potentially provide new and significant information.

FPL's new and significant information review included establishment of applicable and non-applicable Category 1 issues through:

- Review of the initial license renewal ER and the GEIS for its Category 1 discussions, and Supplement 2 to the GEIS,
- Identification and review of past or potential modifications to PSL, including environmental impacts; and
- Identification and assessment of equipment and operations with the potential to result in changes in emissions, releases, discharge points, land use, noise levels, etc., considering environmental reviews since initial license renewal, and those anticipated during the proposed license renewal term.

FPL applied an investigative process for purposely seeking new information related to the Category 1 environmental issues through:

- Environmental review team discussions with FPL and PSL subject matter experts on the Category 1 issues as they relate to the plant.
- Review of permits and reference materials related to environmental issues at the plant, the environmental resource areas related to Category 1 issues, and information collected for regulatory compliance status.
- Review of recent publicly available information, or information held by FPL, particularly data or reports from the past five years, related to the resource area and each applicable Category 1 impact issue, as summarized in the appropriate section of the SLR ER in Chapter 3.0, Affected Environment.
- Review of environmental monitoring and reporting required by regulations related to the PSL site and operations.
- Review of FPL environmental programs and procedures related to the PSL site and operations.
- Review of correspondence and permitting documentation related to oversight of PSL facilities and operations by state and federal regulatory agencies (activities that would bring significant issues to the plant's attention), to identify site-specific environmental concerns.

- Review of previous initial and subsequent license renewal applications for issues relevant to this PSL Units 1 and 2 SLR application.

In addition, FPL is made aware of and stays abreast of new and emerging environmental issues and concerns on an ongoing basis through:

- Review of nuclear industry publications, operational experience, and participation in nuclear industry organizations.
- Routine interface with non-nuclear FPL and NextEra Energy, Inc. business units.
- Contact with state and federal resource agencies with regulatory jurisdiction over environmental regulation.
- Development and periodic review of regulatory guidance procedures that address ongoing and emergent issues.

Information resulting from the information-seeking process was assessed to determine if it is new, and/or significant, applying the following considerations:

- Was the information included in or available for the GEIS analysis of the Category 1 issue?
- Was the information included in or available for the initial license renewal SEIS for PSL?
- Does the information identify an environmental issue not generically considered in the GEIS, and consequently, not codified in 10 CFR 51 Appendix B Table B-1?
- Does the information present a seriously different picture of the environmental consequences of the action than previously considered, leading to an impact finding different from that included in the GEIS or codified in regulation?
- Does the information involve a new activity or aspect associated with the nuclear power plant that can act upon the environment in a manner or an intensity (MODERATE or LARGE) and/or scope (context) not previously recognized?

## 5.3 FPL's New and Significant Information Review Results

As a result of this review, FPL is aware of no new and significant information regarding the environmental impacts of SLR associated with PSL, including any information that would make the findings and analyses of Category 1 issues in the GEIS inapplicable to the second period of extended operation. The findings and analyses in NUREG-1437, Revision 1 for the applicable Category 1 issues are therefore incorporated by reference. New and significant information review methodology and results applicable to the issue of severe accidents, which is the functional equivalent of a Category 1 issue for PSL (NRC 2013d) is addressed separately in Section 4.15.

# 6.0 SUMMARY OF LICENSE RENEWAL IMPACTS AND MITIGATING ACTIONS

## 6.1 License Renewal Impacts

Chapter 4 incorporates by reference NRC findings and analyses for the 53 Category 1 issues that apply to PSL, all of which have SMALL environmental impacts. In addition, Chapter 4 presents site-specific analyses of the 11 Category 2 issues. Table 6.1-1 identifies the environmental impacts that subsequent renewal of the PSL OLs would have on resources associated with Category 2 issues.

FPL has reviewed the environmental impacts of renewing the PSL OLs and concluded that further mitigation measures beyond those presented in Section 6.2 and listed in Table 6.1-1 of this ER to avoid, reduce the severity of, or eliminate adverse impacts are not warranted. This ER documents the basis for FPL's conclusion.

**Table 6.1-1 Environmental Impacts Related to SLR at PSL (Sheet 1 of 4)**

| Resource Issue | ER Section | Environmental Impact |
|---|---|---|
| ***Surface Water Resources*** | | |
| Surface water use conflicts (plants with cooling ponds or cooling towers using makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)] | 4.5.1 | No impact. Issue is not applicable because PSL utilizes a once-through cooling system and does not utilize cooling ponds or cooling towers. |
| ***Groundwater Resources*** | | |
| Groundwater use conflicts (plants that withdraw more than 100 gallons per minute) [10 CFR 51.53(c)(3)(ii)(C)] | 4.5.3 | No impact. Issue is not applicable because no groundwater withdrawal is being conducted at PSL. |
| Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)] | 4.5.2 | No impact. Issue is not applicable because PSL utilizes a once-through cooling system and does not utilize a closed-cycle cooling system. |
| Groundwater quality degradation (plants with cooling ponds at inland sites) [10 CFR 51.53(c)(3)(ii)(D)] | 4.5.4 | No impact. Issue is not applicable because PSL uses a once through cooling system and does not utilize cooling ponds. |
| Radionuclides released to groundwater [10 CFR 51.53(c)(3)(ii)(P)] | 4.5.5 | SMALL impact. Water for station use continues to be processed and monitored in compliance with licensing and permitting resulting in SMALL impacts and do not warrant additional mitigation measures. |
| ***Terrestrial Resources*** | | |
| Effects on terrestrial resources (non-cooling system impacts) [10 CFR 51.53(c)(3)(ii)(E)] | 4.6.5 | SMALL impact. No refurbishment or other SLR-related construction activities have been identified; adequate management programs and regulatory controls are in place to prevent impacts outside of previously disturbed areas. |
| Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)] | 4.6.4 | No impact. Issue is not applicable because PSL utilizes a once-through cooling system and does not utilize cooling ponds or cooling towers. |

**Table 6.1-1 Environmental Impacts Related to SLR at PSL (Sheet 2 of 4)**

| Resource Issue | ER Section | Environmental Impact |
|---|---|---|
| ***Aquatic Resources*** | | |
| Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds)<br>[10 CFR 51.53(c)(3)(ii)(B)] | 4.6.1 | SMALL impact. Additional mitigation measures that might be implemented in the future under the 316(b) rule would ensure that the impacts of impingement and entrainment would remain SMALL. |
| Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds)<br>[10 CFR 51.53(c)(3)(ii)(B)] | 4.6.2 | Because studies have been performed to show that the thermal discharge associated with PSL does not have an adverse effect on the balanced, indigenous population of fish and shellfish in the vicinity of the discharge, and because there are no planned operational changes during the proposed SLR operating term, impacts are anticipated to be SMALL, and mitigation measures are not warranted. |
| Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river)<br>[10 CFR 51.53(c)(3)(ii)(A)] | 4.6.3 | No impact. Issue is not applicable because PSL utilizes a once-through cooling system and does not utilize cooling ponds or cooling towers. |
| ***Special Status Species and Habitats*** | | |
| Threatened, endangered, and protected species and essential fish habitat<br>[10 CFR 51.53(c)(3)(ii)(E)] | 4.6.6 | SMALL impact. No refurbishment or other SLR-related construction activities have been identified; adequate management programs and regulatory controls are in place to ensure that important plant and animal habitats are protected during the proposed SLR operating term for PSL. |

**Table 6.1-1 Environmental Impacts Related to SLR at PSL (Sheet 3 of 4)**

| Resource Issue | ER Section | Environmental Impact |
|---|---|---|
| ***Historic and Cultural Resources*** | | |
| Historic and cultural resources [10 CFR 51.53(c)(3)(ii)(K)] | 4.7 | No adverse effects on historic properties. No refurbishment or other SLR-related construction activities have been identified; administrative procedures ensure protection of these type resources in the event of excavation activities. |
| ***Human Health*** | | |
| Microbiological hazards to the public (plants with cooling ponds or canals or cooling towers that discharge to a river) [10 CFR 51.53(c)(3)(ii)(G)] | 4.9.1 | No impact. Conditions necessary for optimal growth of pathogens are limited by offshore ocean location of discharge, overall distance to public beaches, ocean diffusion and rapid mixing, water temperatures, and salinity in the discharge area. Therefore, PSL's thermal discharge does not represent a public human health risk. |
| Electric shock hazards [10 CFR 51.53(c)(3)(ii)(H)] | 4.9.2 | SMALL impact. Work on and near the transmission lines is governed by plant procedures and PSL's comprehensive health and safety program. Given these conditions, the electric shock hazards during the proposed SLR operating term would be SMALL. |
| ***Postulated Accidents*** | | |
| Severe accidents [10 CFR 51.53(c)(3)(ii)(L)] | 4.15.2 | SAMA still under evaluation. |
| ***Environmental Justice*** | | |
| Minority and low-income populations [10 CFR 51.53(c)(3)(ii)(N)] | 4.10.1 | No disproportionately high and adverse impacts or effects on minority, low-income, or subsistence populations identified. |

**Table 6.1-1 Environmental Impacts Related to SLR at PSL (Sheet 4 of 4)**

| Resource Issue | ER Section | Environmental Impact |
|---|---|---|
| ***Cumulative Impacts*** | | |
| Cumulative Impacts [10 CFR 51.53(c)(3)(ii)(O)] | 4.12 | SMALL adverse to SMALL beneficial impacts. SMALL for land use and visual resources, air quality and noise, geology and soils, surface water, ground water, terrestrial ecological resources, waste management and human health. SMALL adverse to SMALL beneficial for climate change. SMALL beneficial for socioeconomics. No impact for historic and cultural resources. |

## 6.2 Mitigation

### 6.2.1 Requirements [10 CFR 51.45(c) and 10 CFR 51.53(c)(3)(iii)]

*The environmental report must include an analysis that considers and balances . . . alternatives available for reducing or avoiding adverse environmental effects. [10 CFR 51.45(c)]*

*The report must contain a consideration of alternatives for reducing adverse impacts . . . for all Category 2 license renewal issues . . . . [10 CFR 51.53(c)(3)(iii)]*

### 6.2.2 FPL Response

NRC Regulatory Guide 4.2, Supplement 1, Revision 1, *Preparation of Environmental Reports for Nuclear Power Plant License Renewal Applications*, specifies that the applicant should identify any ongoing mitigation and should address the potential need for additional mitigation. Applicants are only required to consider mitigation alternatives in proportion to the significance of the impact. (NRC 2013b)

As presented in Section 6.1, SMALL impacts associated with PSL SLR do not require the implementation of additional mitigation measures. The permits and programs presented in Chapter 9 (i.e., NPDES permit; stormwater program; air permit; spill prevention, control, and countermeasure (SPCC) plan; hazardous waste management program; cultural resource description process; and environmental review programs) that currently mitigate the operational environmental impacts of PSL are adequate. Additional mitigation of the impacts of entrainment and impingement or measures to protect listed species may be implemented in the future if determined to be necessary by the FDEP under the new 316(b) rule or by the NMF pursuant to the ongoing consultation under the ESA.

## 6.3 Unavoidable Adverse Impacts

### 6.3.1 Requirement [10 CFR 51.45(b)(2)]

*The environmental report shall . . . discuss . . . any adverse environmental effects which cannot be avoided should the proposal be implemented . . . . [10 CFR 51.45(b)(2)]*

### 6.3.2 FPL Response

An environmental review conducted at the license renewal stage differs from the review conducted in support of a construction permit, because the facility is in existence at the license renewal stage and has operated for a number of years. As a result, adverse impacts associated with the initial construction have been avoided, have been mitigated, or have already occurred. As previously discussed in Chapter 4, no SLR-related refurbishment or construction activities have been identified. Therefore, the environmental impacts to be evaluated for SLR are those associated with continued operation during the renewal term.

FPL adopts by reference NRC findings for the 54 Category 1 issues (NRC 2013a) applicable to PSL, including discussions of any unavoidable adverse impacts. In addition, FPL identified the following site-specific unavoidable adverse impacts associated with SLR:

- The majority of the land use at PSL within the plant restricted area would continue to be designated as industrial until PSL is decommissioned (decommissioning must be completed within 60 years after permanent shutdown).
- Aquatic organisms would continue to be impinged and entrained at the intake structure, but as discussed in Section 4.6.1, these impacts were determined to be SMALL.
- As discussed in Section 3.6.1, normal plant operations result in discharges containing small amounts of water treatment chemical additives to the Atlantic Ocean via outfalls at or below FDEP-approved concentrations. Compliance with the NPDES permit would ensure that impacts remain SMALL.
- Operation of PSL results in the generation of spent nuclear fuel and waste material, including LLRW, hazardous waste, and nonhazardous waste. However, specific plant design features in conjunction with a waste minimization program; employee safety training programs and work procedures; and strict adherence to applicable regulations for storage, treatment, transportation, and ultimate disposal of this waste ensure that the impact is SMALL.
- Operation of PSL results in a very small increase in radioactivity in the air and water. The incremental radiation dose to the local population resulting from PSL operations is typically less than the magnitude of the fluctuations that occur in natural background radiation. Doses to the members of the public from PSL's gaseous and liquid effluent releases would be well within the allowable limits of 10 CFR Part 20 and 10 CFR Part 50, Appendix I. There are certain low probability accident events associated with PSL operations that, should they occur, result in radiation exposure to members of the public in offsite locations.

## 6.4 Irreversible or Irretrievable Resource Commitments

### 6.4.1 Requirement [10 CFR 51.45(b)(5)]

*The environmental report shall . . . discuss . . . any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented. [10 CFR 51.45(b)(5)]*

### 6.4.2 FPL Response

The term "irreversible" applies to the commitment of environmental resources (e.g., permanent use of land) that cannot by practical means be reversed to restore the environmental resources to their former state. In contrast, the term "irretrievable" applies to the commitment of material resources (e.g., irradiated steel, petroleum) that, once used, cannot by practical means be recycled or restored for other uses. The continued operation of PSL for the period of extended operation will result in irreversible and irretrievable resource commitments, including the following:

- Uranium in the nuclear fuel consumed in the reactor that becomes high-level radioactive waste if the used fuel is not recycled through reprocessing.
- Land required for permanent storage or disposal of spent nuclear fuel, LLRWs generated as a result of plant operations, and sanitary waste generated from normal industrial operations.
- Elemental materials that will become radioactive.
- Materials used for the normal industrial operations of PSL that cannot be recovered or recycled, or that are consumed or reduced to unrecoverable forms.

Other than the above, no SLR-related refurbishment activities have been identified that would irreversibly or irretrievably commit significant environmental components of land, water, and air.

If PSL ceases operations on or before the expiration of the current OLs, the likely power generation alternatives would require a commitment of resources for construction of the replacement plant as well as for fuel to run the plant. Significant resource commitments would also be required if transmission lines are needed to connect a replacement generation plant to the electrical grid.

## 6.5 Short-Term Use Versus Long-Term Productivity of the Environment

### 6.5.1 Requirement [10 CFR 51.45(b)(4)]

*The environmental report shall . . . discuss . . . the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity . . . . [10 CFR 51.45(b)(4)]*

### 6.5.2 FPL Response

The current balance between short-term use and long-term productivity of the environment at the site has remained relatively constant since PSL began operations. The supplemental EIS for PSL evaluated the relationship between the short-term uses of the environment and the maintenance and enhancement of the long-term productivity associated with the construction and operation of PSL (NRC 2003, Section 9.1.3). The period of extended operation will not alter the short-term uses of the environment from the uses previously evaluated in the PSL FESs. The period of extended operation will postpone the availability of the site resources (land, air, water) for other uses. Denial of the application to renew the PSL OLs would lead to the shutdown of the plant and would alter the balance in a manner that depends on the subsequent uses of the site. For example, the environmental consequences of turning the site area occupied by PSL into a park or an industrial facility after decommissioning are quite different. Extending PSL operations would not alter, but only postpone, the potential long-term uses of the site that are currently possible.

In summary, no SLR-related refurbishment activities have been identified that would alter the evaluation of the PSL FES for the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity of these resources.

# 7.0 ALTERNATIVES TO THE PROPOSED ACTION

*The environmental report shall . . . discuss . . . alternatives to the proposed action . . . . [10 CFR 51.45(b)(3)]*

*The applicant shall discuss in this report the environmental impacts of alternatives and any other matters . . . . The report is not required to include discussion of need for power or economic costs and benefits of . . . alternatives to the proposed action except insofar as such costs and benefits are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation . . . . [10 CFR 51.53(c)(2)]*

*A reasonable alternative must be commercially viable on a utility scale and operational prior to the expiration of the reactor's operating license, or expected to become commercially viable on a utility scale and operational prior to the expiration of the reactor's operating license . . . . The amount of replacement power generated must equal the base-load capacity previously supplied by the nuclear plant and reliably operate at or near the nuclear plant's demonstrated capacity factor. (NRC 2013a GEIS, Section 2.3)*

## 7.1 No Action Alternative

As described in Section 2.1, the proposed action is to renew for a second time, and for an additional 20-year period, the OLs for PSL Units 1 and 2. The only other alternative under consideration is the no-action alternative, which would be the decision *not* to renew the PSL OLs. If the PSL OLs are not renewed, the 1,968 MWe (net) of baseload power would not be available to meet FPL's power generation needs during the proposed SLR operating term from 2036–2056 for Unit 1 and from 2043–2063 for Unit 2. Because FPL is a regulated utility that must meet its customers' long-term power needs, the no-action alternative will identify replacement power sources for the loss of PSL generation.

In accordance with 10 CFR 51.53(b)(3), this ER will discuss a range of replacement power sources (no-action alternative) to the proposed license renewal and a range of replacement alternatives. A reasonable alternative as described by the NRC must be technically feasible and commercially viable on a utility scale and operational prior to the expiration of the reactors' renewed OLs or expected to become commercially viable on a utility scale and operational prior to the expiration of the reactors' renewed OLs (NRC 2013a). The replacement power alternative generation must also provide adequate baseload power capacity that was previously supplied by the nuclear plant.

The replacement power sources being considered under the no-action alternative are presented in Section 7.2.1. Section 7.2.2 will identify the no-action alternative power sources evaluated that were not considered reasonable power sources for the replacement of the PSL generation.

### 7.1.1 Decommissioning Impacts

The NRC's definition of decommissioning as stated in 10 CFR 50.2 is the safe removal of a nuclear facility from service and the reduction of residual radioactivity to a level that permits the following:

- Release of the property for unrestricted use and termination of the license; or
- Release of the property under restricted conditions and termination of the license.

The NRC-evaluated decommissioning options include the following:

- Immediate dismantling soon after the facility closes (DECON).
- Safe storage and monitoring of the facility for a period of time that allows the radioactivity to decay, followed by dismantling and additional decontamination (SAFSTOR).
- Permanent entombment on the site in structurally sound material such as concrete that is maintained and monitored (ENTOMB).

All the decommissioning options must be completed within a 60-year period following permanent cessation of operations and permanent removal of fuel.

Under the no-action alternative, FPL would continue operating PSL until the existing OLs expire. Upon expiration of the OLs, FPL would initiate decommissioning procedures in accordance with NRC requirements. The NRC GEIS evaluated decommissioning environmental impacts for land use, visual resources, air quality, noise, geology and soils, hydrology, ecology, historic and cultural resources, socioeconomics, human health, environmental justice, waste management, and pollution prevention. FPL considers the GEIS description of decommissioning impacts as representing the actions it would perform for the PSL decommissioning. Therefore, FPL relies on the NRC's conclusions regarding the environmental impacts of decommissioning PSL.

Decommissioning and its associated impacts are not considered evaluation criteria used to proceed with the proposed action or select the no-action alternative. PSL will eventually require decommissioning, regardless of the NRC decision on license renewal. License renewal would only postpone decommissioning for another 20 years. The GEIS states the timing of the decommissioning does not change the environmental impacts associated with this activity. The NRC findings as described in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 state that delaying decommissioning until after the renewal term would result in SMALL environmental impacts. FPL relies on the NRC's findings.

The primary criteria used to evaluate the proposed action and the no-action alternative are the power options available for replacement of PSL generation. FPL concludes that the decommissioning impacts under the no-action alternative would not be substantially different from those following license renewal as identified in the GEIS. Decommissioning impacts would be SMALL and could overlap with operation of a PSL replacement.

## 7.2 Energy Alternatives that Meet System Generating Needs

In accordance with 10 CFR 51.53(c)(2), FPL considered a range of alternatives to replace generation if the renewed PSL OLs are not renewed. FPL considered each of the replacement alternatives identified in the NRC GEIS for license renewal (NRC 2013a, Section 2.3). These alternatives were evaluated based on their ability to provide reliable baseload power and to be operational prior to the expiration of the current OLs.

- Alternatives evaluated in this ER would need to be capable of providing approximately 1,968 MWe (net) for the regional grid.
- Alternatives evaluated in this ER would need to provide baseload generation.
- Alternatives considered must be capable of being fully operational by 2036 considering development of the technology, permitting, construction of the facilities, and connection to the grid.
- Alternatives must be electricity-generating sources that are technically feasible and commercially viable.

### 7.2.1 Energy Alternatives Considered as Reasonable

A reasonable alternative as described by the NRC must be technically feasible and commercially viable on a utility scale and operational prior to the expiration of the reactors' OLs or expected to become commercially viable on a utility scale and operational prior to the expiration of the reactors' OLs. The replacement power alternative generation must also provide baseload capacity previously supplied by the nuclear plant. The alternatives analysis identified the following power sources as meeting the NRC criteria for reasonableness in the replacement of PSL generation during the proposed SLR operating term.

- Previously licensed, but not constructed, advanced light-water nuclear reactors (ALWR) at FPL's existing Turkey Point site and new transmission integration.
- Small modular nuclear reactors (SMRs) co-located with FPL's existing Martin natural gas plant.
- Natural gas combined cycle (NGCC) plant co-located with FPL's existing Martin natural gas plant.

In addition, although not currently implemented as a source of baseload power and requiring further technological advancement to confirm viability, a solar plus energy storage alternative is conservatively considered, consisting of:

- 95 solar installations of approximately 75 MW nameplate with 56 MW battery storage facilities and transmission interconnection located within FPL's service territory.

These energy alternatives are further discussed in Section 7.2.3.

## 7.2.2 Energy Alternatives Not Considered Reasonable

The full range of energy alternatives as described in the GEIS include power sources that will require development of new generation along with power alternatives that will not require new generation, such as purchased power (NRC 2013a, Section 2.3). FPL considered all the alternatives described in the GEIS for replacement of PSL generation. This section will address the energy alternatives not considered reasonable for additional evaluation.

### 7.2.2.1 Alternatives Not Requiring New Generating Capacity

#### *7.2.2.1.1 Purchased Power*

In 2019, FPL purchased 544 MW of power from other power producers under firm contracts and an additional 351,780 megawatt hours (MWh), approximately 40 MW, in non-firm energy purchases. The mix of fuels for firm capacity supply, in their order by quantity, is coal, gas, and solid waste. The primary fuel for non-firm supply is solid waste. (FPL 2020d)

To replace PSL generation would require FPL to purchase approximately 3.6 times its current firm purchases. Purchased power would require reliance on power generation outside of FPL's control and would be subject to competing power demand to secure firm power contracts. Purchasing power from non-utility generators or power generators is not considered a reasonable no-action alternative because FPL would need to substantially increase its purchased power, introducing uncertainties in energy reliability outside of FPL's control.

Potential environmental impacts associated with purchased power could be substantial and exceed the impacts associated with the continued operation of PSL. Potential environmental impacts associated with purchased power would include those associated with the source of the generation and the transmission of the power into the FPL service area. Fossil generation results in air emissions, water use and quality issues, and land use impacts associated with the plant footprint. Solid waste-fueled generation results in air emissions. Solar has land acreage needs and converts natural habitats and agricultural lands to an industrial site. Additional transmission capacity may be required to transport electricity into the region, and this may result in impacts to communities and lands within and adjacent to the corridor. These impacts could include loss of sensitive habitat, visual and viewshed impairment, and degradation of wetlands and streams.

#### *7.2.2.1.2 Plant Reactivation or Extended Service Life*

In recent years FPL has undertaken a program to modernize its non-renewable generating units based on cost-effectiveness and has planned retirements of fossil-fired generating units that are no longer economic to operate. Delaying retirement of fossil-fired generation would result in the continued use of generation that has higher air emissions and that is not cost-effective for FPL's customers. Other modernization plans include conversion to natural gas for some units and increasing unit capacity. Unit capacity increases through 2026 for FPL and Gulf Power combined are 739 MW. FPL with Gulf Power would have to realize more than 2.6 times of capacity increases to replace PSL's generation. Extension of service life is also already part of FPL's resource plan with the SLR of Turkey Point (PTN) Units 3 & 4. (FPL 2020d)

Therefore, plant reactivation and extended service life is not considered a reasonable alternative because of the environmental impacts and cost associated with continued use of older generation sources and because cost-effective service life enhancement and extension is already being utilized rather than replacement.

#### *7.2.2.1.3 Conservation or Demand-Side Management*

Demand-side management (DSM) includes demand response that shifts electricity from a peak-use period to times of lower demand, and energy efficiency or conservation programs that reduce the amount of electricity required for existing activities and processes. A DSM alternative would be required to reduce the baseload demand in FPL's service area by 1,968 MWe to be considered a reasonable alternative. FPL implements DSM programs in its service territory. However, FPL experience with its DSM programs indicates that it is not a reasonable alternative to PSL for several reasons. DSM is not a baseload resource and is not reliable as a large-scale energy replacement. Realized savings of energy from utility DSM is uncertain because it relies on voluntary participation rather than mandatory energy efficiency from compliance with codes and standards (e.g., building codes and appliance energy use ratings). Further, the cost-effectiveness in in FPL's DSM programs (as measured by its impact on electric rates) as a viable alternative to investments in infrastructure for generation, transmission, and/or distribution has significantly dropped over the last 10 years and that trend is continuing (FPL 2019c). Factors which can impact the cost-effectiveness of DSM measures includes customer usage, fuel forecasts, emissions forecasts, and the cost of planned generation additions (FPL 2019c). Many of these factors are beyond the utilities' control. Therefore, DSM is currently not viewed as reasonable replacement alternative for PSL.

### 7.2.2.2 Alternatives Requiring New Generation Capacity

#### *7.2.2.2.1 Wind*

The wind resource potential varies across the United States, with the Midwest having greater wind resources than other regions. Onshore wind resources in FPL's service territory are limited due to the lower wind speed experienced over the geographic area. Wind speeds range from 4.0 to 5.9 meters per second at 80 meters above surface level (NREL 2017).

Replacing PSL's generating capacity would require multiple utility scale (200–500 MW) wind farms. Wind turbines are spaced for operation, so wind farms encompass many acres between the linked turbines. This acreage typically continues to be used for agriculture and other compatible purposes. Each utility scale wind installation would have a 100 or more turbines (2-MW to 4-MW size turbines) scattered in across a large land area with installation of each turbine disturbing about 5 acres of land[1]. For comparison, the coastal wind farm in Elizabeth City, North

[1]Based on DOE (2015) developed land use metrics for wind generation of 2.47 acres per MW for disturbed area and 2-MW size turbine.

Carolina, of 104 wind turbines (208 MW total) is sited on approximately 22,000 acres leased from more than 60 local landowners (Elizabeth City 2020). The number of landowners that would have to be involved in acquiring land use rights on the acreage for multiple utility scale wind farms that would be required for a PSL replacement is not a viable commercial venture. Moreover, the property setback requirements for non-participating landowners would further increase the required acreage. Furthermore, the land disturbances and conversion to power generation at each of the multiple wind farm sites could result in MODERATE to LARGE impacts on wildlife habitats, vegetation, land use, and aesthetics.

Installation and siting of offshore wind farms require careful consideration to bathymetry and offshore construction concerns. Siting is further complicated by shipping lanes, fishing rights, wildlife migration patterns, military operations, and other environmental concerns. Wind installations also pose aesthetic impact concerns, so the larger turbines require greater offshore distances to minimize aesthetic impacts. Environmental impacts associated with the construction and operation of a large utility-scale offshore wind facility could range from MODERATE to LARGE and would require multiple installations.

Wind is intermittent and therefore by itself is not capable of providing baseload power. For a wind farm to replace a baseload energy source, energy storage and additional wind turbines to charge storage facilities that will then discharge when wind is not blowing would have to be included for the facility. Energy storage technology has progressed in recent years, increasing the potential for wind farms coupled with energy storage such as battery storage to mitigate intermittent generation.

Because of the limited onshore wind resources in the eastern United States, potentially large environmental impacts associated with development of an offshore facility, and the inability of wind power to provide baseload generation, wind power (with or without energy storage) is not considered a reasonable alternative to replace the baseload generation of PSL. Nonetheless, even if wind were considered to be reasonable, the impacts discussed above show that the impacts from wind (with or without energy storage) would be higher than the impacts for renewal of the PSL OLs, as summarized in Table 8.0-1.

##### *7.2.2.2.2 Hydropower*

The U.S. Department of Energy's Oak Ridge National Laboratory assessed the ability of existing non-powered dams across the country to generate electricity. The non-powered dams in Florida do not provide the scale of power generation capacity needed to replace PSL's generation capacity (ORNL 2012). The study assessed the dam with the greatest generation potential to be approximately 27.7 MWe.

Construction of a new large-scale hydropower facility would require considerable siting considerations, such as the area that would be inundated to provide water storage for generation, as well as the overall environmental impacts associated with the development of the facility. The environmental impacts would be LARGE for land use, water resources, socioeconomics, ecology, and cultural resources.

The lack of potential for large hydroelectric power facilities at existing dams in Florida and the environmental constraints associated with the development of a new hydropower facility make hydropower an unreasonable alternative to replace the PSL generation.

##### *7.2.2.2.3 Geothermal*

The National Renewable Energy Laboratory has not identified any viable sites for geothermal energy in the eastern United States (NREL 2018). Therefore, geothermal energy is not considered a reasonable power source in the FPL service area.

##### *7.2.2.2.4 Biomass*

Biomass includes wood waste, municipal waste, manure, certain crops, and other types of waste residues used to create electricity. Using biomass-fired generation for baseload power depends on the geographic distribution, available quantities, constancy of supply, and energy content of biomass resources. FPL's purchased power includes power generated from solid waste, landfill gas, and wood products (FPL 2020d).

Biomass plants tend to be much smaller than nuclear or fossil fuel plants. To replace the PSL baseload generation, it would take the construction of several biomass plants located near reliable fuel sources that continuously produce enough biomass to fuel the plants. Large biomass plants are generally 50 MWe, with the largest ones being slightly more than 100 MWe (NRC 2019c). Replacing the generating capacity of PSL using only biomass would require the construction of 20 large facilities.

Biomass plants require storage facilities for the fuel products and for waste ash/residue for the wood, crop, and agriculture waste types. Wood waste plants require a large land area for storage and processing, and, like coal generation, they produce ash that must be disposed of in a manner that does not pollute waterways and air. Therefore, environmental impacts associated with construction of a wood waste plant could be significant, with the impact intensity level being dependent on the siting and proximity to a source of wood waste.

Utilizing municipal solid waste for electricity is also dependent on being close to large population centers that generate large amounts of waste. Air emissions are also an issue with biomass plants, and construction of a plant would require installation of maximum achievable control technology to comply with the CAA. The combustion of the fuel also results in air emissions that must be controlled to meet air quality regulations.

Overall, the construction and operation of a biomass plant of the size necessary to act as an alternative to PSL would result in MODERATE environmental impacts to land use, water quality, ecological resources, and air quality.

Generating baseload generation from biomass sources is limited because of the need to site facilities near substantial fuel sources and impacts to land from constructing and operating the facility. In addition, without the construction of multiple smaller facilities, biomass plants are unable to produce the large baseloads of electricity that nuclear and fossil fuel plants generate. Therefore, biomass is not considered a reasonable alternative to PSL's baseload generation.

##### *7.2.2.2.5 Fuel Cells*

Current fuel cell installations for large-scale stationary power are significantly smaller scale than what is needed as a reasonable replacement of PSL's generating capacity with much of the systems installed for individual customers. Larger applications generally provide from hundreds of kilowatts to tens of megawatts of power (DOE 2017; Duke Energy 2019). Fuel cells as a utility-scale generation alternative are not presently economically or technologically competitive with other alternatives. Therefore, fuel cells are not considered a reasonable alternative to PSL's baseload generation.

##### *7.2.2.2.6 Ocean Wave and Current Energy*

The technology to harness hydrokinetic energy is in development with many demonstration projects deployed around the world (DOE 2019). The Federal Energy Regulatory Commission (FERC) has licensing authority over hydrokinetic energy projects deployed in the United States. Currently, there are three licensed pilot projects and four projects seeking permits or holding a preliminary permit. The largest project is a 20-MWe marine project. The largest inland project is a 6-MWe project proposed for the Mississippi River. (83 FR 11192; FERC 2020).

Given hydrokinetic technology is in the early stages of commercial application and projects have low generation capacities, ocean wave and current energy is not considered a reasonable alternative in the necessary time frame for power supply.

##### *7.2.2.2.7 Petroleum-fired*

Petroleum-fired generation emits large amounts of carbon dioxide and hazardous air pollutants, making it undesirable for utilities looking to reduce air pollutants and comply with regulations. FPL's modernization of its non-renewable generating facilities involved converting or closing oil-fired units (FPL 2020d). Based on the greater environmental impacts and cleaner energy source policies and regulations, petroleum-fired generation is not a reasonable alternative.

##### *7.2.2.2.8 Coal-fired*

Coal-fired plants are being retired throughout the United States and FPL has plans to eliminate three of its four coal-fired generation sources from its portfolio (FPL 2020d). The NRC recently considered a supercritical pulverized coal facility as an alternative to renewing the River Bend Station Unit 1 OL, but found license renewal as the preferred alternative. The supercritical pulverized coal facility alternative had operating impacts greater than license renewal, in addition to the environmental impacts inherent with new construction projects. (NRC 2018) Based on the greater potential environmental impacts and limited technical viability, coal-fired generation is not a reasonable alternative.

### 7.2.3 Environmental Impacts of Alternatives

#### 7.2.3.1 Advanced Light-Water Reactors Nuclear Alternative

The ALWR nuclear alternative is the licensed but not built PTN Units 6 & 7 inclusive of transmission infrastructure to support the new units (i.e., a new substation and two new 500-kV lines and three new 230-kV lines to connect the substation to the existing FPL transmission system).

As proposed, PTN Units 6 & 7 would be co-located at the Turkey Point site where FPL has two additional nuclear reactors. Construction duration is an estimated 10 years with a peak construction workforce of 3,950 workers. The ALWR design would be the AP1000. Each unit would have an estimated net electrical output of 1,092 MWe. The two units would have a normal operating workforce of 806 workers. The cooling system would be a closed-cycle system, three mechanical draft cooling towers (MDCTs) for each unit. The primary source of cooling water would be reclaimed sanitary wastewater and the secondary source would be saltwater extracted from Biscayne Bay subsurface sediment through radial collector wells. A portion of the cooling system's makeup water would be returned to the environment through deep-injection wells completed in the Boulder Zone where the groundwater has salinity similar to seawater. The remaining portion of the water would be released to the atmosphere via evaporative cooling. (NRC 2016b)

The NRC previously assessed the impacts of constructing and operating PTN Units 6 & 7 and determined the adverse impacts would be SMALL for air quality, water use and quality (inclusive of consideration of activities that could impact geology and soils), waste management, and human health and NONE for environmental justice. Greater impacts were determined for land use, ecology, socioeconomics (inclusive of noise and aesthetic impacts), and historic and cultural resources and a significance level of MODERATE was assigned. (NRC 2016b) The impacts as assessed by the NRC are further summarized in Table 8.0-3.

#### 7.2.3.2 Small Modular Reactors Nuclear Alternative

This alternative is 35 SMR units (three clusters of units) based on the 60 MWe gross size of the NuScale design (NuScale 2019a) at FPL's Martin site. The units would have a closed-cycle cooling system using MDCTs. NRC's assessment of the Martin site as an as an alternative site for PTN Units 6 & 7 concluded that the AP1000 units could be supported with a cooling water source of groundwater from the Avon Park permeable zone with blowdown via deep well injection into the boulder zone (NRC 2016b, Section 9.3.3.2). FPL assumes the same makeup water source and blowdown receiving waters for the SMR units. Also, FPL assumes no additional transmission corridors would need to be developed to support SMR units at the Martin site.

The Martin site is located in western Martin County, approximately 40 miles northwest of West Palm Beach, 5 miles east of Lake Okeechobee, and 7 miles northwest of Indiantown. PSL is located approximately 28 miles northeast of the Martin site. The site is bounded on the west by the Florida East Coast Railway and the adjacent SFWMD L-65 canal; on the south by the St. Lucie canal (C-44 or Okeechobee Waterway); and on the northeast by SR 710 and the adjacent CSX railroad. (FPL 2014) The Martin site is an 11,300-acre site that includes two operating natural gas-fired combined cycle units, one natural gas/oil-fired combined cycle unit, and a solar thermal facility. The solar thermal facility is a "fuel-substitute" facility. It displaces the use of fossil fuel. The majority of the site not occupied by the generation facilities and supporting infrastructure is used for agriculture. (FPL 2014; FPL 2020d)

FPL previously estimated that approximately 568 acres is available for development at the Martin site based on the acreage of land currently occupied by the existing power plant, cooling pond, the solar thermal plant, and other protected areas that are unavailable for development (FPL 2011a). A conceptual layout for new nuclear units at the Martin site was previously prepared by FPL to support assessment of the site as an alternative site for PTN Units 6 & 7. The conceptual layout located the units in the northeast corner of the existing Martin site along the border with SR 710 (FPL 2011b).

###### *7.2.3.2.1 Land Use*

The existing site has adequate open space to support construction of a SMR plant. The land requirement for the SMR plant would be less than that of a conventional nuclear power plant. The acreage estimated for a two-unit conventional nuclear plant at the Martin site was 320 acres (NRC 2016b, Table 9-12). One of the SMR design developers, NuScale, indicates that the land requirement of an SMR facility of 1,000 MWe is less than 20 percent of that required for a 1,000 MWe conventional nuclear plant (NuScale 2019b). Martin County zoning designates the site as a mix of industrial designations (NRC 2016b, Section 9.3.3.2). The land use at the Martin site would not change under construction or operation of SMR units.

Assessment of the Martin site as an alternative site for PTN Units 6 & 7 also considered the need for widening SR 710 to support construction. The additional acreage was estimated at 473 acres (NRC 2016b, Table 9-12). Given the widening would utilize land adjacent to the existing roadway, the impact would be minimized; however, there would likely be a need to acquire land from private landowners for the expansion, which could be a noticeable land use conversion.

Therefore, the land use impact for siting a SMR plant at the Martin site would be SMALL to MODERATE. For comparison, the NRC determined the land use impact for the Martin site during its PTN 6 & 7 review to be moderate. Notably, the PTN 6 & 7 review included consideration of an additional 764-acre impact from construction of a 31-mile transmission corridor (NRC 2016b, Section 9.3.3.1).

###### *7.2.3.2.2 Visual Resources*

Containment structures for SMR units are not as tall as conventional nuclear containment structures. The NuScale design's containment structure is 76 feet in height (NuScale 2019a). The MDCTs would also have a lower profile. The visual resources impact for the SMR plant would be similar to that of the existing generating units, SMALL for both construction and operation. The construction activities and equipment to widen SR 710 would be temporary as the activities move along the length of SR 710. Once the road widening is complete the additional lanes would not further increase the road's visual impact on the surrounding viewshed. Therefore, the overall visual impact of this alternative would be SMALL.

*7.2.3.2.3 Air Quality*

GHG emissions associated with nuclear power are lower than fossil fuel-based energy sources. Nuclear power lifecycle GHG emissions are within the same order of magnitude as renewable energy sources (NRC 2013a, Section 4.12.3). The SMR alternative would have greatly reduced GHG emissions compared to emissions from a fossil fuel-fired plant. Therefore, implementation of nuclear alternative would result in a beneficial air quality impact when compared with fossil-fuel fired alternatives.

Temporary and minor effects on local ambient air quality could occur as a result of construction activities. Fugitive dust and fine particulate matter would be generated during earthmoving activities, material-handling activities, by wind erosion, and other activities and managed in accordance with regulatory requirements and BMPs (e.g., paving or stabilizing disturbed areas, water suppression, reduced material handling) would minimize such emissions. Vehicles used to haul debris, equipment, and supplies, as well as equipment used for evacuation and earthmoving, would create pollutants. All equipment would be serviced regularly, and all industrial activities would be conducted in accordance with federal, state, and local emission requirements. Emissions from construction activities would be temporary and intermittent for the duration of construction activities. With implementation of mitigation measures and properly serviced equipment impacts would be SMALL.

Air quality impacts from operation would include intermittent releases from the periodic testing and occasional use of stand-by equipment and use of other minor sources of air emissions. Air quality impacts would also result from vehicular emissions associated with plant operations. Potential emissions of criteria pollutants and carbon dioxide ($CO_2$) emissions would be minimal and similar to PSL (see Section 3.3).

The MDCTs would have air emissions and atmospheric effects from drift and plumes. Cooling tower drift is the liquid droplets that become entrained in the exhaust air stream and a plume forms when the saturated water vapor that leaves the top of the tower encounters cooler air and very small water droplets condense out of the air. Drift that leaves the top of the tower will reflect the same water chemistry as that of the circulating water. The water chemistry would be controlled by FPL and would be in accordance with any applicable limits and restrictions for use of water treatment chemicals and discharge limits.

When the small droplets within the drift or plumes are released into the air, evaporation occurs, leaving behind the solids that were once dissolved. This has the effect of introducing fine particulate matter into the atmosphere. Particulate matter emissions (e.g., $PM_{10}$ and $PM_{2.5}$) are regulated air emissions. The dissolved solids from both drift and plumes could also be deposited on the surrounding land. If the deposited solids have levels of salt and contaminants that could have impacts on vegetation, the deposition would be expected to be localized and primarily onsite. Onsite electrical equipment and the solar arrays mirrors could be impacted from drift as well as plumes. Atmospheric effects of plumes could include fogging and shadowing. The impacts due to shadowing, could impact the amount of sunlight on the solar arrays onsite and on the surrounding cultivated fields. Air modeling would be needed to quantify the amount and extent of drift and the potential for plumes. Siting of the cooling towers away from site boundaries and use of drift eliminators would mitigate offsite effects.

Overall, air quality impacts of operations and the effects of drift to offsite areas would be expected to be SMALL.

##### *7.2.3.2.4 Noise*

Sources of noise during construction would include clearing, earthmoving, foundation preparation, pile driving (if needed), concrete mixing and pouring, steel erection, and various stages of facility equipment fabrication, assembly, and installation. Additionally, a substantial number of diesel- and gasoline-powered vehicles and other equipment would be used. Projected noise levels from most construction activities at the site boundary would have levels below the 60 to 65 dBA range of acceptable day-night, 24-hour average (Ldn) noise levels set by the U.S. Department of Housing and Urban Development. Construction activities resulting in offsite sound levels above this range would be temporary.

Noise sources associated with the operation and infrastructure would include pumps, cooling towers, transformers, switchyard equipment, and loudspeakers. Many of these noise sources are confined indoors or would be infrequent. Noise from a cooling tower generally consists of sounds created by the motors, the speed reduction or power transmission units, the fans, and the cascading water, all of which combine to produce a typical sound level of 70 dBA at a horizontal distance of 1,000 feet (NRC 2019d). The operating SMR facility would have noise sources and levels not unlike those of the existing operating units. The sound would be attenuated by the surrounding buildings and structures and distance to the site border. Given sound attenuation, noise impacts to sensitive receptors are not expected. Therefore, operations-related noise impacts would be SMALL.

##### *7.2.3.2.5 Geology and Soils*

Construction-related impacts to geology would be minimal as the excavation associated with plant installation should not significantly impact geologic formations at the site. In addition, materials such as stone and gravel used in the construction of the plant and associated infrastructure would be obtained from local or regional sources. Commercial stone and gravel sources typically sell material obtained from local quarries and other sources.

Construction activities could result in erosion and sediment. Stormwater runoff and water from excavation dewatering would be managed and regulated by FDEP, the construction site's SWPPP, and use of BMPs. Through compliance with permit conditions, adherence to stormwater regulations, and applying erosion control and stormwater management SWPPP mitigation and BMPs, construction-related impacts on geology and soils would be SMALL.

Operations-related impacts on geology and soils from the SMR units would be minimized by adherence to the industrial site SWPPP. Operations-related impacts would be SMALL.

*7.2.3.2.6 Hydrology (Surface Water and Groundwater)*

Water needs for construction of an SMR plant would be similar to typical uses of water for large industrial projects. These uses include dust abatement, concrete mixing, and potable water needs. In addition, construction would require dewatering of excavations which would be managed through the installation of diaphragm walls and grouting. Operations water use would primarily be for cooling water makeup. As mentioned previously, the Martin site was assessed as an alternative site for PTN Units 6 & 7 which are proposed as AP1000 units. As part of the alternative site analysis for PTN Units 6 & 7, the potable water demand was estimated at slightly more than 1 cubic feet per second (cfs) for peak construction activities and 100 cfs (consumptive water use) for peak operations. FPL estimated the Martin site's groundwater potential at approximately 155 cfs. (FPL 2014) Construction water needs could be met by shallow groundwater, the brackish groundwater from the Avon Park permeable zone, or surface water if available due to excess flow. FPL assumes the same makeup water source for the SMR units as that concluded by NRC in their assessment of the Martin site as an as an alternative site for PTN Units 6 & 7 (i.e., groundwater from the Avon Park permeable zone).

The water demand for construction of a SMR plant would be bounded by that of AP1000 units given that the modular units would require less onsite construction. Cooling water demand for SMRs would be similar to conventional nuclear plants based on the NuScale demand (NuScale 2021); therefore, the estimates for the AP1000 units would be expected to be similar to that of a SMR plant. Given construction water demand is low and can be met with available groundwater sources or excess surface water flow, water use impacts for construction would be SMALL. Operations water demand could also be met by available groundwater supply that is not suitable for potable or freshwater needs. Therefore, operations water use impacts would also be SMALL. For comparison, the NRC determined the groundwater use impact for the Martin site during its PTN Units 6 & 7 review to be small (NRC 2016b).

Construction of the SMR nuclear plant, cooling towers, and connections with existing infrastructure could result in erosion and sediment. A construction stormwater permit would be obtained for the construction activities and adherence to the permit conditions and required BMPs would mitigate impacts to surface water resources. Through compliance with permit conditions, adherence to stormwater regulations, and applying SWPPP mitigation and BMPs, construction-related impacts on surface water quality would be SMALL.

FPL assumes the same blowdown receiving waters for the SMR units as that concluded by NRC in their assessment of the Martin site as an as an alternative site for PTN Units 6 & 7 (i.e., the AP1000 units blowdown would be disposed of via deep well injection into the boulder zone). Sanitary wastewater is also assumed to be disposed of through deep well injection. The disposal would be governed by FDEP permits which would include limits and practices to protect groundwater quality. Potential impact on groundwater quality would be from spills or stormwater infiltration. BMPs would be applied to prevent spills and minimize their effects.

Groundwater quality impacts from operating the SMR plant would be SMALL. For comparison, NRC determined the groundwater quality impact for the Martin site during its PTN Units 6 & 7 review to be small (NRC 2016b).

#### *7.2.3.2.7 Ecological Resources (Terrestrial and Aquatic)*

The Martin site's ecological setting was characterized as follows for the PTN Units 6 & 7 review (NRC 2016b, Section 9.3.3).

The proposed Martin power plant site presently supports existing power units that occupy about 300 acres along with a 6,500-acre cooling water reservoir serving those units. A 1,200-acre wetland mitigation site exists immediately north of the reservoir and contains a 400-acre wetland forest preserved as a natural area known as the Barley Barber Swamp. Other wetland habitats include freshwater marsh and wet prairie. A significant portion of the site and vicinity also exists as upland landcover classes including pine flatwoods, palmetto prairie, hardwood-conifer forest, and dry prairie. Habitats in the surrounding vicinity include pasture, rangeland, upland forest, wetland forest, freshwater marsh, and wet prairie.

The site is bounded on the west by SFWMD L-65 canal and on the south by the St. Lucie canal, also known as the C-44 canal or Okeechobee Waterway. The C-44 canal connects to Lake Okeechobee, which is 5 miles west of the Martin site, and likely contains aquatic resources that are similar to those in the lake. Lake Okeechobee is the largest lake in Florida and the center of south Florida's regional water management system, providing commercial and sport fisheries, flood control, and a source of potable and irrigation water. Onsite surface waterbodies at the Martin site include an existing cooling pond and a makeup/discharge canal that supports the fossil units, Barley Barber Swamp, and the northwest parcel mitigation area.

<u>Terrestrial</u>

As noted in Section 7.2.3.2, the conceptual layout for new nuclear units at the Martin site prepared for the alternatives analysis for PTN Units 6 & 7 located the units in the northeast corner of the existing Martin site along the border with SR 710. FPL assumes the SMR alternative would be located in the same area and have a similar layout. Based on conceptual site layout, construction would impact upland and wetlands. Permanently lost acreages estimates include 169 acres of wet prairie, dry prairie, and improved pasture, 143 acres of pine flatwoods, 87 acres of palmetto prairie, and 64 acres of freshwater marsh (NRC 2016b). Widening of SR 710 would result in a loss of an additional 195 agricultural land acres of the 473 total acres needed for the widening (NRC 2016b, Table 9-12). The loss of habitat could affect protected species including the Florida panther, Audubon's crested caracara, Everglade snail kite, wood stork, and eastern indigo snake (NRC 2016b). NRC determined the cumulative impact to area terrestrial and wetland ecological resources to be moderate with the construction and operation of AP1000 units at Martin site inclusive of a new 31-mile transmission corridor being a significant contributor to the moderate impact (NRC 2016b). A SMR plant could impact less onsite acreage and a new transmission corridor is assumed to not be needed, but operations would similarly have noise and cooling tower drift impacts. Planning would include wildlife surveys to identify protected species and habitat and design appropriate avoidance and minimization measures. However, given the potential to affect protected species, like NRC's previous assessment, a SMR plant could have a MODERATE impact to terrestrial resources from construction. While a permanent loss of habitat would continue to impact terrestrial resources, the operational effects of a SMR plant (e.g., noise, drift) would themselves have a SMALL impact on terrestrial resources.

<u>Aquatic</u>

The project would not utilize surface water other than excess flow surface water from the C-44 canal (also known as the St. Lucie canal) and wastewater discharges would be to deep well injection. Aquatic ecology impacts would be limited to impingement and entrainment of aquatic organisms from C-44 canal withdrawals and those from stormwater runoff and the potential for spills that reach surface water. Several protected species occur in Martin County, but only the Florida manatee and American alligator would likely occur near the Martin site although they have not been observed in the St. Lucie canal near the Martin site (NRC 2016b). A construction stormwater permit would be obtained for the construction activities and adherence to the permit conditions and required BMPs would mitigate impacts to surface water resources. Stormwater runoff would be managed during operations in accordance with FDEP industrial stormwater regulations and permitting, the site's SWPPP, and use of BMPs. Intake structures for the use of excess flow in the C-44 canal would also be subject to FDEP permitting. Through compliance with permit conditions and regulatory requirements, spill controls, and applying SWPPP mitigation and BMPs, construction- and operations-related impacts on aquatic resources would be SMALL. For comparison, NRC's review of the Martin site also determined that construction and operation of two AP1000 units would not contribute significant impacts to area aquatic ecology resources (NRC 2016b).

<u>Special Status Species</u>

As mentioned above, the loss of habitat could affect protected terrestrial species including the Florida panther, Audubon's crested caracara, Everglade snail kite, wood stork, and eastern indigo snake. The Florida manatee and American alligator[2] can occur near the Martin site although they have not been observed near the Martin site. Planning would include wildlife surveys to identify protected species and habitat and design appropriate avoidance and minimization measures. Therefore, construction and operations of an SMR plant MAY AFFECT, but are NOT LIKELY TO ADVERSELY AFFECT federally listed species.

#### *7.2.3.2.8 Historic and Cultural Resources*

Previous records review for historic and cultural resources for the Martin site and archaeological survey within portions of the site did not identify any archaeological sites and there are no known historic properties located within surveyed portions of the site (NRC 2016b, Section 9.3.3.7). A search of the NRHP shows that one significant historic property, the Seminole Inn in

[2] The American alligator is listed as threatened due to similarity of appearance with the American crocodile. Species listed as such are not biologically endangered or threatened and are not subject to Section 7 consultation. (USFWS 2020b; USFWS 2021c)

Indiantown, is located within 10 miles of the Martin site (NPS 2021; NRC 2016b, Section 9.3.3.7). The NRC's review of the Martin site determined that the impacts of construction and operation of two AP1000 units for cultural sources would be small. The NRC's assessment assumed that cultural resource surveys and evaluations would be conducted and FPL, in consultation with SHPO, tribes, and interested parties, would assess and resolve any adverse effects. An SMR plant could impact less onsite acreage and a new transmission corridor is assumed to not be needed. Planning would include cultural resource surveys as appropriate to allow for avoidance of identified cultural sites and design of minimization measures. Because cultural resources, both historic and archaeological, would be avoided or protected during construction and anticipated impacts from operations would be small, NO ADVERSE EFFECT would be expected to occur to cultural resources.

#### *7.2.3.2.9 Socioeconomics*

Socioeconomic Issues other than Transportation

The NRC reviewed the socioeconomic impacts of construction and operating two AP1000 units at the Martin site. The assessment was based on peak employment of 3,983 workers during construction and 806 operations workers and estimated property taxes. The NRC's assessment was that there would be a beneficial impact to the economy, but it would not be noticeable with the exception of property tax revenues to the Martin School District. (NRC 2016b) The peak construction workforce for the 800-MWe Clinch River SMR facility was estimated at 3,300 workers and the operational workforce was estimated at 500 workers (NRC 2019d, Tables 3-5 and 4-4). These estimates are below that of the AP1000 units; however, the SMR replacement alternative would have more units than Clinch River. Therefore, the socioeconomic impacts for construction and operation of the SMR plant would be expected to be similar to those characterized by NRC to the AP1000 units and SMALL beneficial.

Transportation

Development of an SMR plant at the Martin site would (like development of two AP1000 units at the site) require widening of SR 710. As discussed above, the construction and operations workforces would be similar in number to those for two AP1000 units. The NRC concluded that the impact of building and operation of the AP1000 units at the Martin site would be noticeable during building, although not destabilizing, after widening of SR 710. This assessment was based on staggered shifts during construction. Commuting traffic would result in a similar level of service for SR 710 during operations. (NRC 2016b) Likewise, the SMR plant impact on traffic would be MODERATE.

#### *7.2.3.2.10 Human Health*

Impacts on human health from construction of a SMR plant would be similar to those associated with a large industrial facility construction project. Compliance with OSHA worker protection rules would prevent safety-related accidents. The NRC evaluated nonradiological impacts on public and construction worker health from fugitive dust, occupational injuries, noise, and transport of materials and personnel to and from the construction site during environmental review of various construction and operations licensing applications for new nuclear power plants including PTN Units 6 & 7 and North Anna Unit 3. No significant impacts related to the nonradiological health of the public or workers were identified (NRC 2010; NRC 2016b). The NRC also determined that construction and operation of two AP1000 units at the Martin site would have minimal impacts nonradiological health impacts to workers and the public (NRC 2016b). Worker safety would be addressed by adherence to OSHA worker protection and other initiatives such as the contractor safety meetings. The nonradiological health impacts of construction would be SMALL.

Occupational injuries in the nuclear power industry are historically below the average U.S. industrial rate, FPL would adhere to OSHA safety standards and comply with EPA and NRC exposure limits for the public and workers for operation of the SMR plant. Therefore, health impacts from operations would be SMALL.

###### *7.2.3.2.11 Environmental Justice*

Section 3.11.2 presents the minority and low-income population in the region surrounding the PSL which is located approximately 28 miles northeast of the Martin site. The 50-mile region of PSL and the Martin site would have some overlap.

The NRC conducted an environmental justice review for two AP1000 units at the Martin site. Their analyses of impacts of building and operating new nuclear reactors at the Martin site identified noticeable adverse impacts on land use, terrestrial and wetland ecosystems, aesthetics, and traffic. The review team did not identify any special pathways through which any impacts would disproportionately affect environmental justice populations. The NRC concluded there would be no disproportionately high and adverse impacts on environmental justice populations. (NRC 2016b)

Potential impacts from construction of an SMR plant would primarily be associated with socioeconomic effects. These impacts would consist of the short-term increase in worker expenditures at local businesses and potential rental housing shortages during the construction phase of the project. The increase in traffic on roads would likely result in no disproportionately high and adverse effects to local low-income and minority communities. Given that construction activities would be conducted in accordance with permits for stormwater regulatory requirements for fugitive air emissions, BMPs, and implementation of SWPPPs and SPCC plans, no disproportionately high and adverse effects to low-income and minority populations are expected. No disproportionately high and adverse impacts to minority or low-income populations are also expected to occur for operations of a SMR plant. The SMR plant would have similar activities as the existing units such as commuting workers and plant noise. The SMR plant would not have air emissions like the fossil-fired units. Like determined by NRC, the impacts would not be expected to disproportionately affect environmental justice populations.

##### *7.2.3.2.12 Waste Management*

Solid, liquid, and gaseous wastes generated during the construction of the SMR plant would be handled according to county, state, and federal regulations. and disposed at permitted offsite treatment or disposal facilities. Therefore, construction-related waste impacts would be SMALL.

The operation of the SMR plant would result in nonhazardous, hazardous, spent nuclear fuel, and radioactive waste. The nonhazardous and hazardous waste would be managed in compliance with state regulations and disposed of in permitted facilities. FPL would implement recycling and waste minimization programs that would reduce waste volumes. The non-radiological waste impacts from operations would be SMALL given FPL's compliance with regulations, use of permitted facilities, implementation of effective practices for waste minimization. Radioactive waste would be managed onsite, transported, and disposed of in permitted facilities in accordance with NRC, U.S. Department of Transportation, and state regulations. Spent nuclear fuel would be managed onsite in accordance with NRC regulations. Therefore, environmental impacts associated with radioactive waste would be SMALL.

#### 7.2.3.3 Natural Gas-Fired Generation

An NGCC plant would consist of multiple combustion turbines, a heat recovery steam generator, and a steam turbine generator. Based on a capacity factor of 87 percent (EIA 2020a), the NGCC plant would have a design capacity of 2,262 MWe (gross) of generation to replace the current 1,968 MWe provided by PSL. The NGCC plant option would be sited on the existing Martin site. FPL assumes that the plant would utilize MDCTs and, like the SMR plant alternative, the NGCC plant would utilize groundwater for cooling water and discharge. FPL also assumes that the existing transmission line infrastructure is adequate.

In 2017 a new natural gas supply pipeline system consisting of the Sabal Trail and Florida Southeast Connection pipelines went into operation. This new pipeline system provides fuel for the existing Martin site plants. The new pipeline system will also allow future support for natural gas-fueled FPL generation facilities. (FPL 2020d) Therefore, the existing natural gas supply infrastructure is also assumed to be adequate for the NGCC replacement alternative.

##### *7.2.3.3.1 Land Use*

The NGCC plant would require approximately 100 acres based on a land use factor of 0.02 square meters per megawatt hour (NETL 2010a) and the acreage used by the typical U.S. NGCC plant (NGSA 2016). As stated in Section 7.2.3.2, FPL previously estimated that approximately 568 acres is available for development at the Martin site based on the acreage of land currently occupied by the existing power plant, cooling pond, the solar thermal plant, and other protected areas that are unavailable for development (FPL 2011a). A conceptual layout for new AP1000 units at the Martin site located the units in the northeast corner of the existing Martin site along the border with SR-710 (FPL 2011b). FPL assumes that the same location would be suitable for location of the NGCC plant alternative.

In addition to onsite land requirements, offsite land is typically required for natural gas wells and related infrastructure. However, no new gas wells are assumed to be needed, because there is currently an abundant supply of natural gas in the United States. As stated above, the Martin site is supplied by a pipeline system that is assumed adequate for future natural gas-fueled FPL generation facilities. Therefore, FPL assumes the current regional natural gas supply will be sufficient for the NGCC plant alternative at the Martin site.

Martin County zoning designates the site as industrial (NRC 2016b, Section 9.3.3.2). The land use at the Martin site would not change under construction or operation of an additional NGCC plant. Assessment of the Martin site as an alternative site for PTN Units 6 & 7 also considered the need for widening SR 710 to support construction. However, the construction workforce size for a NGCC plant would be about a third of the size the workforce needed for a nuclear plant. A construction workforce of up to approximately 1,200 workers would be needed for the NGCC plant (NRC 2019c, Section 4.10.5). Given the construction workforce would be significantly smaller, the widening of SR 710 is not assumed and the additional acreage that would be needed for the widening is not considered. Therefore, since no changes to land use would occur from development of an additional NGCC plant at the Martin site and no offsite land use conversion is indicated, the land use impacts associated with the construction and operation of the NGCC plant would be SMALL.

##### *7.2.3.3.2 Visual Resources*

Based on conceptual site layouts for the AP1000 units, the NGCC plant would be located in the northeastern corner of the existing Martin site along the border with SR-710. This area includes upland and wetlands and would require clearing and tree removal. Permanently lost acreages estimates include 169 acres of wet prairie, dry prairie, and improved pasture, 143 acres of pine flatwoods, 87 acres of palmetto prairie, and 64 acres of freshwater marsh (NRC 2016b). Construction activities would be visible from SR 710. Because the site currently has an existing NGCC power plant and a solar facility, the ongoing construction activity associated with the NGCC plant would be an extension of the existing industrial character. During operations, the tallest structures at an NGCC plant alternative would be the exhaust stacks and would join the existing exhaust stacks on the site in the area's viewshed. The addition of an NGCC plant will not significantly alter the viewshed at the Martin site. Visual impacts associated with the construction and operation of an NGCC plant would be SMALL.

##### *7.2.3.3.3 Air Quality*

Air quality impacts associated with the construction of a NGCC plant would result in the emissions of various criteria pollutants such as CO, $NO_x$, sulfur oxides ($SO_x$), PM, and volatile organic compounds (VOCs). These criteria pollutants would be released from the use of construction vehicles and equipment. VOC releases would also result from the onsite storage and dispensing of vehicle and equipment fuels. Some GHGs would also be emitted from the use of construction equipment and vehicles during the construction of the plant. Onsite activities such as land clearing and grubbing would also result in fugitive dust. The air quality impacts associated with the construction of the NGCC plant alternative would be short-term, as gas-fired power plants are generally constructed in 2 to 3 years. The air impacts during construction would be minimized by the implementation of a fugitive dust control plan and adherence to best management practices such as curtailing the idling of vehicles and construction equipment. Therefore, the construction-related impacts on air quality under the NGCC plant alternative would be SMALL.

The operational NGCC plant would be equipped with air pollution controls to ensure compliance with air quality regulations. Emission estimates for the NGCC plant based on EPA AP-42 emission factors are shown in Table 7.2-1. FPL operates several natural gas-fired plants in Florida, and Table 7.2-1 also presents actual emissions from comparable plants. As shown in Table 7.2-1, FPL's operating NGCC plants of 1,720, 2,205, and 2,209 MW capacity have actual 2019 emissions much lower than estimated using EPA's AP-42 emission factors issued in the year 2000 with the exception of one plant which was only slightly lower for nitrogen oxides.

The NGCC plant would qualify as a new major source of criteria pollutants and would be subject to the CAA prevention of significant deterioration air quality review. Therefore, the plant would have to comply with the new source performance standard for NGCC plants set forth in 40 CFR 60 Subpart KKKK and 40 CFR 60 Subpart TTTT. The plant would also qualify as a major source because of its potential to emit greater than 100 tons per year of criteria pollutants. The plant would be required to obtain a Title V permit.

The NGCC plant would be subject to the national emission standards for hazardous air pollutants (HAPs) for stationary combustion turbines if the plant was a major source of HAPs (having the potential to emit 10 tons per year of more of any single HAP or 25 tons per year or more of any combination of HAPs) [40 CFR 63.6085(b)].

The MDCTs would also have air emissions and atmospheric effects from drift and plumes. Cooling tower drift consists of the liquid droplets entrained in the exhaust air stream. A plume forms when the saturated water vapor leaving the top of the tower encounters cooler air and very small water droplets condense out of the air. Drift that leaves the top of the tower will reflect the same water chemistry as that of the circulating water. The water chemistry would be controlled by FPL.

When the small droplets within the drift or plumes are released into the air, evaporation occurs, leaving behind the solids that were once dissolved. This has the effect of introducing fine particulate matter into the atmosphere. Particulate matter emissions (e.g., $PM_{10}$ and $PM_{2.5}$) are regulated air emissions. The dissolved solids from both drift and plumes could also be deposited on the surrounding land. If the deposited solids have levels of salt that could have impacts on vegetation, the deposition would be expected to be localized primarily onsite. Onsite electrical equipment and the solar arrays mirrors could be impacted from drift as well as plumes. Atmospheric effects of plumes could include fogging and shadowing. The impacts due to shadowing, could impact the amount of sunlight on the solar arrays onsite and on the surrounding cultivated fields. Air modeling would be needed to quantify the amount and extent of drift and the potential for plumes. Siting of the cooling towers away from site boundaries and use of drift eliminators would mitigate offsite effects.

A new NGCC plant would also have to comply with Title IV of CAA [42 USC 7651] reduction requirements for $SO_2$ and $NO_x$, which are the main precursors of acid rain and the major causes of reduced visibility.

A new NGCC plant would be a major source of criteria pollutants and GHGs. Compliance with existing air quality regulations would ensure air quality impacts are minimized. Therefore, the operations-related impacts on air quality under the NGCC plant alternative would be MODERATE.

#### *7.2.3.3.4 Noise*

Construction-related noise impacts would include the operation of vehicles, earthmoving equipment, and other equipment such as generators and compressors used in the construction of the facility. Projected noise levels from most construction activities at the site boundary would have levels below the 60 to 65 dBA range of acceptable Ldn noise levels set by the U.S. Department of Housing and Urban Development. The NGCC plant alternative would be located on the Martin site with operating fossil-fuel fired plants and near SR 710. The surrounding land is mostly agricultural.

Noise impacts associated with plant operations would include noise from transformers, turbines, pumps, compressors, exhaust stack, combustion inlet filter house, condenser fans, the mechanical draft cooling towers, and high-pressure steam piping. The NGCC would have noise sources and levels not unlike those of the existing fossil-fuel fired units.). Noise from a cooling tower generally consists of sounds created by the motors, the speed reduction or power transmission units, the fans, and the cascading water, all of which combine to produce a typical sound level of 70 dBA at a horizontal distance of 1,000 feet (NRC 2019d). Given sound attenuation, noise impacts from the NCGG plant to sensitive receptors are not expected. Construction- and operations-related noise impacts associated with the NGCC plant would be SMALL.

#### *7.2.3.3.5 Geology and Soils*

Construction-related impacts to geology would be minimal as the excavation associated with plant installation should not damage geologic formations at the site. In addition, materials such as stone and gravel used in the construction of the plant and associated infrastructure would be obtained from local or regional sources. Commercial stone and gravel sources typically sell material obtained from local quarries and other sources.

Construction activities could result in erosion and sediment. Stormwater runoff and water from excavation dewatering would be managed and regulated by FDEP, the construction site's SWPPP, and use of BMPs. Through compliance with permit conditions, adherence to stormwater regulations, and applying erosion control and stormwater management SWPPP mitigation and BMPs, construction-related impacts on geology and soils would be SMALL.

Land disturbance activities initiated during the operation of the NGCC plant would comply with applicable FDEP regulations for stormwater permitting. Operations-related impacts on geology and soils from the NGCC plant would be minimized by adherence to the industrial site SWPPP. Operations-related impacts would be SMALL.

#### *7.2.3.3.6 Hydrology (Surface Water and Groundwater)*

Water needs for construction of the NGCC plant alternative would be similar to typical uses of water for large industrial projects and similar to those of the SMR plant alternative. For operations, FPL assumes that like the SMR plant alternative, groundwater would be used for makeup cooling water and blowdown disposal. The cooling water demand and consumption for NGCC plants using recirculating cooling water systems is less than that of nuclear plants based on water withdrawal and consumption factors developed by the National Energy Technology Laboratory (NETL 2010b, Appendix D). Therefore, water use and the potential for water quality impacts would be bounded by those described for the SMR plant in Section 7.2.3.2.6, SMALL for construction and operations.

#### *7.2.3.3.7 Ecological Resources (Terrestrial and Aquatic)*

Terrestrial and aquatic ecology impacts resulting from the construction of the NGCC plant would primarily result from development at the Martin site (approximately 100 acres) from land clearing, noise, and emissions of construction activities. FPL assumes the same area would be used for a NGCC plant as the SMR plant alternative. The acreage needed for the NGCC plant is less than that of a SMR plant, so the impacts described for the SMR plant in Section 7.2.3.2.7 bound those that would be expected for construction of a NGCC plant alternative. The NGCC plant alternative would, like the SMR plant alternative, use groundwater for cooling water makeup and blowdown disposal, and have similar operational effects in most aspects. However, the notable difference is exhaust stack air emissions. The addition of another large NGCC on the site could strain surrounding terrestrial and aquatic ecological resources. The terrestrial ecological impacts from construction would be MODERATE while the aquatic impacts from construction would be SMALL. Operational impacts would be SMALL to MODERATE to both terrestrial and aquatic resources. The effects of constructing and operating the NGCC plant MAY AFFECT, but NOT LIKELY TO ADVERSELY AFFECT federally listed species.

#### *7.2.3.3.8 Historic and Cultural Resources*

FPL assumes the same area would be used for a NGCC plant as the SMR plant alternative. The acreage needed for the NGCC plant is less than that of a SMR plant, so the impacts described for the SMR plant in Section 7.2.3.2.8 would bound those that would be expected for construction of a NGCC plant alternative. Because cultural resources, both historic and archaeological, would be avoided or protected during construction and anticipated impacts from operations would be small, NO ADVERSE EFFECT would be expected to occur to cultural resources.

#### *7.2.3.3.9 Socioeconomics*

The jobs created to complete construct and operate a NGCC plant would be about a third of the size the workforce needed for a nuclear plant. A construction workforce of up to approximately 1,200 construction workers and 150 operations workers would be needed for the NGCC plant (NRC 2019c, Section 4.10.5) Any boost to the local economy during construction would be short-term, and socioeconomic impacts related to the construction of the plant would be SMALL and beneficial. The socioeconomic impacts of the operation of a NGCC plant would stem from increased tax revenues and worker salaries among other impacts. Like for the SMR plant alternative described in Section 7.2.3.2.9, these would be SMALL and beneficial for the area, while tax revenue to the Martin School District could be significant (i.e., MODERATE and beneficial).

Transportation

Construction of the NGCC plant would increase vehicle traffic on SR 710. Given the construction workforce would be significantly smaller, the widening of SR 710 is not assumed for the NGCC plant alternative. This increase in traffic would be short-term, noticeable, and could strain local roadway capacity during peak times. Therefore, construction traffic impacts would be MODERATE. Because the operations of the NGCC plant would require fewer workers, operations-related transportation impacts under the NGCC plant alternative would be SMALL.

#### *7.2.3.3.10 Human Health*

Human health impacts associated with the construction of the NGCC plant would be primarily related to potential accidents and injuries resulting from accidents. Worker safety would be addressed by adherence to OSHA worker protection and other initiatives such as contractor safety meetings. Construction activities should not have any impact on local residents because construction activities would be conducted onsite. Therefore, construction-related impacts on human health under the NGCC plant alternative would be SMALL.

Impacts resulting from the operation of the NGCC plant would primarily be from air pollutant emissions. The NGCC plant would emit criteria air pollutants (Table 7.2-1). Some pollutants, such as $NO_x$, contribute to ozone formation that can create health problems. These criteria pollutants are regulated, and control equipment will be installed in the plant to limit the criteria air pollutant releases. Plant operation human health impacts would also be avoided and minimized from adherence to safety standards. Overall, the operations-related impacts to human health under the NGCC plant alternative would be SMALL.

#### *7.2.3.3.11 Environmental Justice*

As discussed in Section 7.2.3.2.11 for the SMR plant alternative, the development of a portion of the Martin site and operation of a generating plant would result in significant impacts in some resource areas. However, no special pathways through which any impacts would disproportionately affect environmental justice populations were identified during a previous NRC review. Like determined by NRC, the impacts of constructing and operating an NGCC plant would not be expected to disproportionately affect environmental justice populations.

##### *7.2.3.3.12 Waste Management*

The construction of the NGCC plant would generate land-clearing waste that would be recycled for use (e.g., wood chips for mulch, dirt for fill) or sent to area construction and demolition (C&D) landfills. If structures are demolished to site the NGCC, scrap metal and other recyclable material would be recycled if practical and the remainder sent to area C&D landfills. Construction activities would also generate sanitary and industrial wastes. These wastes will be properly managed onsite and disposed at approved offsite treatment or disposal facilities. Therefore, construction-related waste impacts would be SMALL.

Operation of the NGCC plant alternative would result in different waste streams being created from spent catalytic reduction catalysts used to control nitrous oxide emissions. This waste stream is considered hazardous and would be disposed of at a facility that handles hazardous materials. Other waste generated at the site would be characterized as hazardous or non-hazardous. These wastes would be properly managed and disposed in a permitted offsite facility. Recycling and waste minimization programs would also be implemented to minimize waste streams at the plant. Therefore, waste management impacts expected during operation of the NGCC plant would be SMALL.

#### 7.2.3.4 Multiple Solar Installations

Solar generation is intermittent by nature with no generation during nighttime hours. During the day, generation can fluctuate from hour to hour as solar irradiance varies. For a solar power facility to replace a baseload energy source, energy storage must be included for the solar facility. Energy storage technology has progressed in recent years, increasing the potential for solar facilities coupled with energy storage such as battery storage to mitigate solar's intermittent generation. For example, FPL has implemented utility-scale battery storage to provide energy storage for of its solar farms located in Florida (FPL 2020d), although the battery storage is only intended to provide peaking power.

Currently there are no utility-scale solar with storage facilities providing baseload power of the size necessary to replace PSL. There would be significant uncertainties for a project of this scope including land acquisition, development of required transmission corridors, environmental impacts and permitting, battery technology development, as well as the commercial costs associated with those factors. However, by 2029, FPL expects to have developed over approximately 10,000 MW of utility-scale solar throughout its service territory (FPL 2020d).

As a regulated utility in Florida, FPL would have certain advantages in developing and financing such a large project to help make it more viable. For instance, in recent years the Florida Public Service Commission has approved multiple solar initiatives, such as FPL SolarNow, a voluntary, community-based solar partnership pilot program, and FPL SolarTogether, a shared solar program. Similar programs may be in place in the SLR time-period to support the continued development of utility-scale solar projects. Moreover, the higher relative capacity factor and relatively mild winters in Florida help to make this option more realistic. While battery storage technology is currently costly, limited in duration, and not utilized to provide baseload power at any existing facility, advances in technology are continuing. Therefore, while recognizing the uncertainties associated with its first-of-a-kind baseload solar with storage project, including cost, land impacts and acquisition, and transmission, a solar alternative with battery storage has nevertheless been conservatively included as a possible alternative supply of baseload power by the time PSL's operating licenses expire in 2036 and 2043 (although the land impacts could be deemed prohibitive in the context of replacing an existing facility).

To provide baseload capacity replacement for PSL, the solar installation will be supported with battery storage. The solar alternative is approximately 95 solar photovoltaic (PV) facilities each having approximately 75 MW nameplate capacity and 56 MW battery storage sited within the FPL service territory. Each solar installation would provide 56 MWe of firm winter capacity. FPL assumes each installation would require a new transmission interconnection to reach existing transmission distribution infrastructure. No new transmission distribution corridors for the regional transmission network is assumed to be needed.

##### *7.2.3.4.1 Land Use*

Utility-scale solar facilities use relatively large areas of land to generate electricity. Each solar PV facility would be sited on approximately 500 acres of land. A site would be selected based on proximity to the regional transmission network and avoidance of sensitive resources, including cultural resources, wetlands, threatened and endangered species habitat, and conservation and parkland. It is assumed that each facility would require a new transmission interconnection of 1 to 5 miles long and 50 feet wide. For acreage estimates, 3.5 miles long is used for an estimated 21 acres per interconnection for a total 521 acres per solar site. These sites would be sited on available land across the FPL service territory, which encompasses much of Florida. The impacts of land use conversion for each site would be dependent on the site's location. In addition to avoiding sensitive resources, FPL would avoid prime and unique farmland as defined by the USDA. Avoiding these resources would serve to minimize land use impacts; however, by 2036, FPL would have sited approximately 200 solar facilities[3] using the most geographically desirable sites that are available and developable for industrial use. Thus, these 95 sites would largely be selected from second or third tier sites (e.g., farther from the electrical grid requiring longer connection corridors, in closer proximity to sensitive resources, desirable for residential or commercial development), increasing the land use impact of an individual site. Moreover, the cumulative acreage needed for all 95 sites would be approximately 49,000 acres. Conversion of this large acreage amount to power generation over the FPL service territory would be noticeable, particularly given the previous FPL solar build out and potential to require land desirable for other development. The conversion of large amounts of acreage concentrated in a single area or county could have destabilizing impacts for the land market and the availability of land for other development. Given the cumulative amount of land, the use of sites that would result in greater impacts, and the potential for land conversion

[3] Based on FPL's current solar facilities plus its solar expansion plan presented in the Ten Year Power Plant Site Plan 2020 – 2029 and FPL carbon reduction goals.

concentrated in a single area or county, the multiple solar installation alternative would have MODERATE to LARGE land use impacts.

##### *7.2.3.4.2 Visual Resources*

The solar facilities would require clearing land areas of 521 acres for each site. The solar PV panels could be visible to the public from offsite locations, depending on buffer areas or screening. The solar PV facilities would be sited to comply with land zoning and any required buffers or screening. Overall, the visual impacts from the construction and operation of each solar facility under the solar alternative would range from SMALL to MODERATE.

##### *7.2.3.4.3 Air Quality*

Construction activities would generate fugitive dust. Mitigation would be implemented via wetting of cleared areas and dirt roads to minimize the fugitive dust. Construction equipment and vehicles would also emit exhaust emissions. These emissions would be temporary and mitigation such as curtailing idling of vehicles would be implemented to minimize short-term air quality impacts. Construction emissions could result in localized impacts. Air quality impacts from construction of each solar facility would be SMALL. The solar facilities would not release any air emissions during operation, so there would be NO IMPACT to air quality from operations.

##### *7.2.3.4.4 Noise*

Construction of each solar facility would have noise impacts similar to those described in the NGCC plant alternative presented in Section 7.2.3.3.4 with a shorter duration. However, given the acreage of the solar installations and the need for land clearing and the number of panels that would need to be installed, as well as the potential for the solar sites to be in close proximity to residences and other sensitive receptors, noise impacts of each facility would range from SMALL to MODERATE for the duration of construction likely to be several months. No noise impacts would occur from operation of the solar PV facility.

##### *7.2.3.4.5 Geology and Soils*

Construction impacts to geology and soils resulting from the construction of the solar facilities would primarily be impacts to soils from land clearing and grubbing. These temporary soil impacts would be minimized by implementation of BMPs identified in the SWPPP. During operations, the solar facilities would be required to comply with state regulations that regulate stormwater runoff. Therefore, construction and operational impacts on geology and soils from the solar alternative would be SMALL.

##### *7.2.3.4.6 Hydrology (Surface Water and Groundwater)*

FPL assumes water used for construction of the solar facilities will be used for dust suppression, equipment washing, and sanitary systems, and that potable water will be trucked in by the construction contractor. Water quality impacts could result from erosion and runoff associated with the construction of the solar facilities. These temporary soil impacts would be minimized by implementation of BMPs identified in the SWPPP. Once in operation, water use during operations would be minimal (e.g., solar panel washing) and the water would be supplied from municipal sources, permitted surface or groundwater sources, or trucked in. FPL would operate the facilities in compliance with stormwater regulations. The water use and water quality impacts associated with the construction and operation of the solar facilities would be SMALL.

##### *7.2.3.4.7 Ecological Resources (Terrestrial and Aquatic)*

Terrestrial ecology impacts would result from the 521 acres of land development required for each of the facilities. Each of the 95 sites would be cleared, removing the vegetative cover; thus, clearing large acreages of land that support wildlife. The cumulative acreage needed for all 95 sites would be approximately 49,000 acres. Siting selection would be used to avoid high-quality terrestrial habitats, critical habitat for threatened and endangered species, and habitats identified as a priority for preservation. As mentioned in Section 7.2.3.4.1, FPL's development of approximately 200 solar installations by 2036 would require the 95 sites for the solar alternative to be selected from less desirable sites such as ones that are in closer proximity to sensitive terrestrial resources. Depending on the site, the impacts to terrestrial resources could be significant. Given the abundance of protected terrestrial species in Florida, the clearing of some of the sites would be expected to permanently remove terrestrial habitat supporting protected species and given the potential for concentration of sites, cumulative loss of habitat in a geographic area could be destabilizing. The permanent loss of terrestrial habitat would continue during operations, but no additional operational impacts to terrestrial ecological resources would occur from the solar alternative.

Construction and operations activities would comply with state stormwater regulations and surface water use would be minimal. The impacts to aquatic resources from the construction and operation of the combination alternative would be SMALL. Overall, the impacts to ecological resources would be MODERATE to LARGE.

The site selection process that would be used to select sites for the solar facilities would have criteria to avoid locations whose development would impact special status species. Surveys would be conducted as appropriate to identify special status species and habitats. Given avoidance, minimization and mitigation measures, and compliance with applicable permits, each solar facility MAY AFFECT, but NOT LIKELY TO ADVERSELY AFFECT special status species.

##### *7.2.3.4.8 Historic and Cultural Resources*

The site selection process that would be used for the solar facilities would have criteria to avoid locations whose development would impact cultural resources. With application of the site selection process, impacts to historic and cultural resources from constructing and operating the solar facilities would be NO EFFECT.

##### *7.2.3.4.9 Socioeconomics*

<u>Socioeconomic Issues Other than Transportation</u>

Each solar facility would require several months construction activities and up to 200 construction workers (NRC 2019c). Cumulatively, the construction of the solar facilities would create more construction jobs than the NGCC plant, but any economic boost would be spread over many local economies. Socioeconomic impacts related to the construction of the solar alternative would be SMALL.

The number of workers required to maintain each solar facility would be small, and it would not result in a quantifiable impact on the local economy. The property tax increase from conversion of the solar facilities acreage from agriculture to industrial to any single taxing district would be minimal. Therefore, the operations-related socioeconomic impacts under the solar alternative would be SMALL.

Transportation

The construction workforce and equipment transported to the individual sites would be less than the amount required for the other alternatives and would not be expected to strain or exceed local roadway capacities. Traffic impacts associated with the operation of each solar facility would not be quantifiable. Once the facility is in operation, very few employees would be required for facility operations. Therefore, transportation impacts for construction and operation under the solar alternative would be SMALL.

##### *7.2.3.4.10 Human Health*

During construction and operation of the solar facilities, worker safety would be addressed by following the OSHA worker protection standards. Therefore, the human health impacts associated with the construction and operation of the alternative would be SMALL.

##### *7.2.3.4.11 Environmental Justice*

Potential impacts on minority and low-income populations (environmental justice populations) from the construction of solar facilities would result from socioeconomic effects, fugitive dust, and noise. These would be temporary and short in duration. Overall, the construction and operation of the solar facilities would not be expected to have disproportionately high and adverse human health and environmental effects on environmental justice populations.

##### *7.2.3.4.12 Waste Management*

The construction of each solar facility would generate land-clearing waste that would be recycled for use (e.g., wood chips for mulch, dirt for fill) or sent to area C&D landfills. If structures are demolished at the site, scrap metal and other recyclable material would be recycled if practical and the remainder sent to area C&D landfills. Wastes generated during the construction of the solar facility would be handled according to FDEP regulations and disposed at permitted offsite treatment or disposal facilities. The operation of each solar facility is expected to generate very minimal waste from daily operations. The battery storage system at each facility would have to be replaced after several years of operation; however, much of the components are recyclable, minimizing the waste generation. Solar developers are currently assuming lifespans for solar panels to be 30 years or more (LBNL 2020). Therefore, each solar facility would be expected to have a lifespan beyond the 20-year SLR term. There would be significant waste generation upon decommissioning as would there be for decommissioning of a nuclear power plant. All waste generated at the facility will be recycled or disposed of at an offsite waste disposal facility. Therefore, waste management impacts from the solar facilities would be SMALL.

**Table 7.2-1 Air Emissions from NGCC Plant and Comparable FPL Plants**

| Emission | NGCC Alternative (Estimated tons/year)[(b)] | Martin Plant[(c)] 2019 Emissions (tons) | Sanford Plant[(c)] 2019 Emissions (tons) | Okeechobee Clean Energy Center[(c)] 2019 Emissions (tons) |
|---|---|---|---|---|
| Sulfur dioxide | 202 | 24.8 | 19.2 | 13.9 |
| Nitrogen oxides[(a)] | 773 | 593.6 | 952.1 | 193.8 |
| Carbon monoxide | 1,783 | 498.3 | 23.0 | 6.2 |
| Particulate matter-10 | 392 | 88.1 | 85.7 | 52.7 |
| Nitrous oxide | 178 | NR | NR | NR |
| Volatile organic compounds | 125 | 32.4 | 0.1 | 0.7 |
| Carbon dioxide | 6,539,189 | NR | NR | 2,184,122 |

Source: 2019 emissions – FDEP 2021e NR = not reported

a. Assumes 90 percent reduction in emissions due to operation of air pollution control equipment (selective catalytic reduction).

b. Estimates based on EPA AP-42 emission factors and estimated natural gas consumption of 146,279,905,556 feet$^3$. See formulas below.

c. Summer MW rating for Martin, Sanford, and Okeechobee is 2,209, 2,205, and 1,720, respectively. Okeechobee began commercial operations in March 2019. (FPL 2020d)

**Formulas and Sources**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Annual gas consumption (ft$^3$) | Plant size in MWe x heat rate, 6,000 Btu/kWh x 1,000 x (1/heat content = 1,033 Btu/ft$^3$) x hours in a year | | | | | | |
| Heat content of natural gas 2018 = 1,034 Btu/ft$^3$ (EIA 2020b) | | | | | | | |
| Heat rate = 6,000 Btu/kWh | | | | | | | |
| Annual MMBtu = (annual gas consumption x fuel heating average value)/1,000,000 | | | | | | | |
| Emission factor for processed natural gas (lbs/MMBtu) | **$CO_2$** | **$NO_X$** | **CO** | **PM** | **$SO_2$** | **VOC** | **$N_2O$** |
| | 110 | 0.13 | 0.03 | 0.0066 | 0.0034 | .0.0021 | 0.003 |
| Annual emissions (tons) = (emission factor) x (annual MMBtu)/2000 | | | | | | | |
| Air emission factors (EPA 2000b, Tables 3.1-1 and 3.1-2a) | | | | | | | |
| $CO_2$ = carbon dioxide; $NO_x$ = nitrogen oxides; CO = carbon monoxide; $PM_{10}$ = inhalable particles, with diameters that are generally 10 micrometers and smaller; $SO_x$ = oxides of sulfur; VOC = volatile organic carbon; $NO_2$ = nitrous oxide. | | | | | | | |

## 7.3 Alternatives for Reducing Adverse Impacts

### 7.3.1 Alternatives Considered

As noted in 10 C51.53(c)(3)(iii), "The report must contain a consideration of alternatives for reducing adverse impacts, as required by 51.45(c), for all Category 2 license renewal issues in Appendix B to Subpart A of this part." A review of the environmental impacts associated with the Category 2 issues in Chapter 4 identified no significant adverse effects except for the potential to adversely affect the five species of documented sea turtles, the smalltooth sawfish, scalloped hammerhead shark, and the giant manta ray as discussed in Section 4.6.6. The potential to adversely affect these species is being considered in an ongoing ESA Section 7 consultation occurring with the NMFS, NRC, and PSL. The NMFS is preparing a BO for the consultation which will determine if mitigation measures beyond FPL's current management programs and existing regulatory controls are warranted. Therefore, FPL concludes that the impacts associated with renewal of the PSL OLs would not require consideration of alternatives for reducing adverse impacts as specified in NRC Regulatory Guide 4.2, Revision 1 (NRC 2013b, Section 7.2). This determination assumes the existing mitigation measures discussed in Section 6.2, along with any mitigation measures resulting from the ESA Section 7 consultation, would adequately minimize and avoid environmental impacts associated with operating PSL.

### 7.3.2 Environmental Impacts of Alternatives for Reducing Adverse Impacts

No additional alternatives were considered by FPL to reduce impacts.

# 8.0 COMPARISON OF THE ENVIRONMENTAL IMPACT OF SUBSEQUENT LICENSE RENEWAL WITH THE ALTERNATIVES

*To the extent practicable, the environmental impacts of the proposal and the alternatives should be presented in comparative form . . . . [10 CFR 51.45(b)(3)]*

The proposed action is renewal of the PSL Units 1 and 2 OLs, which would preserve the option to continue to operate PSL to provide reliable baseload power and meet FPL's future system generating needs throughout the proposed 20-year SLR operating term. Chapter 4 analyzes the environmental impacts of the proposed action. The proposed action is compared to the no-action alternative, which includes both the termination of operations and decommissioning of PSL and replacement of its baseload generating capacity. The termination of operations and decommissioning impacts are presented in the GEIS (NRC 2013a), Section 14.2.2, and decommissioning impacts are analyzed in the GEIS on decommissioning, NUREG-0586, Supplement 1 (NRC 2002). The energy alternatives component of the no-action alternative is described, and its impacts analyzed, in Chapter 7.

Table 8.0-1 summarizes the environmental impacts of the proposed action and the alternatives deemed reasonable for comparison purposes. Tables 8.0-2 and 8.0-3 provide a more detailed comparison. The environmental impacts compared in Tables 8.0-1, 8.0-2, and 8.0-3 are Category 1 and 2 issues that apply to the proposed action or issues that the GEIS identified as major considerations in its analysis. Data provided in Tables 8.0-2 and 8.0-3 can be referenced to Chapter 7.

As shown in Tables 8.0-1, 8.0-2, and 8.0-3, there are no reasonable alternatives superior to that of the continued operation of PSL, providing approximately 1,968 MWe net of reliable baseload power generation. The continued operation of PSL would create significantly less environmental impact than the construction and operation of new alternative generating capacity. In addition, the continued operation of PSL will have a positive economic impact on St. Lucie County through tax revenues paid by FPL for PSL. Continued employment of plant workers will continue to provide economic benefits to the communities surrounding the plant. None of the adverse environmental impacts of license renewal are so great, individually or collectively, compared with alternatives, that preserving the option of extended operation is unreasonable.

**Table 8.0-1 Environmental Impacts Comparison Summary (Sheet 1 of 2)**

| Impact Area[a] | Proposed Action | Termination of Operations and Decommissioning | Nuclear Alternatives | | NGCC Alternative | Solar Alternative |
|---|---|---|---|---|---|---|
| | | | ALWR[c] | SMR | | |
| Land Use | SMALL | SMALL | MODERATE | SMALL to MODERATE | SMALL | MODERATE to LARGE |
| Visual Resources | SMALL | SMALL | SMALL | SMALL | SMALL | SMALL to MODERATE |
| Air Quality | SMALL | SMALL | SMALL | SMALL | MODERATE | SMALL |
| Noise | SMALL | SMALL | SMALL | SMALL | SMALL | SMALL to MODERATE |
| Geology and Soils | SMALL | SMALL | SMALL | SMALL | SMALL | SMALL |
| Surface Water | SMALL | SMALL | SMALL | SMALL | SMALL | SMALL |
| Groundwater | SMALL | SMALL | SMALL | SMALL | SMALL | SMALL |
| Terrestrial | SMALL | SMALL | MODERATE | MODERATE | MODERATE | MODERATE to LARGE |
| Aquatic | SMALL | SMALL | SMALL to MODERATE | SMALL | SMALL | SMALL |
| Special Status Species | MAY AFFECT, LIKELY TO ADVERSELY AFFECT | (b) | MAY AFFECT, NOT LIKELY TO ADVERSELY AFFECT | MAY AFFECT, NOT LIKELY TO ADVERSELY AFFECT | MAY AFFECT, NOT LIKELY TO ADVERSELY AFFECT | NO ADVERSE EFFECT |
| Historic and Cultural | NO ADVERSE EFFECT | NO ADVERSE EFFECT | MODERATE | NO ADVERSE EFFECT | NO ADVERSE EFFECT | NO ADVERSE EFFECT |
| Socioeconomics | SMALL | Termination: SMALL to LARGE; Decommissioning: SMALL | SMALL beneficial | SMALL beneficial | SMALL beneficial | SMALL beneficial |

**Table 8.0-1 Environmental Impacts Comparison Summary (Sheet 2 of 2)**

| Impact Area[a] | Proposed Action | Termination of Operations and Decommissioning | Nuclear Alternatives | | NGCC Alternative | Solar Alternative |
|---|---|---|---|---|---|---|
| | | | ALWR[c] | SMR | | |
| Transportation | SMALL | SMALL | | MODERATE | MODERATE | MODERATE |
| Human Health | SMALL | SMALL | | SMALL | SMALL | SMALL |
| Environmental Justice | No disproportionately high and adverse effects | (b) | | No disproportionately high and adverse effects | No disproportionately high and adverse effects | No disproportionately high and adverse effects |
| Waste Management | SMALL | SMALL | | SMALL | SMALL | SMALL |

a. As defined in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Footnote 3:

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.

b. NUREG-0586 Supplement 1 (NRC 2002), the decommissioning GEIS, identifies this resource area as requiring a site-specific analysis based on site conditions at the time of decommissioning, as well as the proposed decommissioning method and activities. Decommissioning PSL would at a minimum occur after the expiration of the current license term. The magnitude of impacts could vary widely based on site-specific conditions at the time and analysis of special status species and/or their habitat(s), a consideration of their presence or their habitats' presence, and environmental justice analysis, the potential for disproportionately high and adverse impacts from the impacts of decommissioning being experienced by environmental justice populations of interest as determined by the most recent USCB decennial census data when the alternative is implemented. Thus, FPL cannot forecast a level of impact for this resource area.

c. NRC 2016b, Chapters 4 and 5, Tables 4-18 and 5-24.

**Table 8.0-2 Environmental Impacts Comparison Detail**

| Impact Area | NGCC Alternative | Nuclear Alternatives | | Solar Alternative |
|---|---|---|---|---|
| | | ALWR | SMR | |
| Summary of Alternative | Multiple combustion turbines assembled in appropriate power train configurations for a total of 2,262 MWe gross. (Section 7.2.3.3) | Two-unit nuclear plant of AP1000 design providing 1,092 MWe (net) per unit. (Section 7.2.3.1) | Three SMR clusters of 12, 12, and 11 units. (Section 7.2.3.2) | 95 solar PV plus battery storage installations each with interconnection to regional grid. (Section 7.2.3.4) |
| Location | At existing Martin site. (Section 7.2.3.3) | At existing PTN site. (Section 7.2.3.1) | At existing Martin site. (Section 7.2.3.2) | 95 separate locations in FPL service territory determined via site selection process. (Section 7.2.3.4.1) |
| Cooling System | Closed-cycle cooling with mechanical draft cooling towers. (Section 7.2.3.3) | Closed-cycle cooling with mechanical draft cooling towers. (Section 7.2.3.1) | Closed-cycle cooling with mechanical draft cooling towers. (Section 7.2.3.2) | No cooling system required. |
| Land Requirements | Adequate acreage available on existing Martin site, no pipeline or additional gas fields required. (Section 7.2.3.3) | Adequate acreage available on existing PTN site. (Section 7.2.3.1) | Adequate acreage available on existing Martin site, additional 473 offsite acres for road widening. (Section 7.2.3.1) | 521 acres per facility; approximately 49,000 acres total over FPL service territory. (Section 7.2.3.4.1) |
| Workforce | 1,200 during peak construction; 150 during operations during operations. (Section 7.2.3.3.9) | 3,950 during peak construction; 806 during operations. (Section 7.2.3.1) | 3,983 during peak construction; 806 during operations. (Section 7.2.3.2.9) | 200 during peak construction; few workers during operations. (Section 7.2.3.4.9) |

**Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 1 of 15)**

| Land Use | | |
|---|---|---|
| **Proposed Action** | | **SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following:<br>Onsite land use<br>Offsite land use |
| **Termination of Operations and Decommissioning** | | **SMALL:** Temporary onsite land use changes during decommissioning are anticipated to be comparable to changes that occur during construction and operations and would not require additional land. Temporary changes in onsite land use would not change the fundamental use of the reactor site. (NRC 2013a, Section 4.12.2.1) |
| **Nuclear Alternatives** | **ALWR** | **MODERATE:** Plant to be constructed onsite near existing structures on disturbed land. Land-use impacts from placement of new transmission lines would noticeably affect existing land uses, but would not destabilize regional land-use patterns. |
| | **SMR** | **SMALL:** Plant to be constructed on the existing Martin site. SR 710 to be widened. Land clearing and land use conversion would be required. |
| **NGCC Alternative** | | **SMALL:** NGCC constructed on the existing Martin site. Land clearing and land use conversion would be required. |
| **Solar Alternative** | | **MODERATE:** 521 acres per solar facility converted to industrial use; approximately 49,000 acres total over the FPL service territory. |

**Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 2 of 15)**

| Visual Resources | | |
|---|---|---|
| **Proposed Action** | | **SMALL:** Adopting by reference the Category 1 issue finding for aesthetic impacts in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. |
| **Termination of Operations and Decommissioning** | | **SMALL:** Terminating nuclear power plant operations would not change the visual appearance of the nuclear power plant until demolition of structures. Decommissioning activities would be localized and reduced with implementation of BMPs. (NRC 2013a, Section 4.12.2.1) |
| **Nuclear Alternatives** | **ALWR** | **SMALL:** Construction and operations activities would appear similar to other ongoing onsite industrial activities because the PTN property is already aesthetically altered by the presence of existing generating units and infrastructure. |
| | **SMR** | **SMALL:** Construction and operations activities would appear similar to other ongoing onsite industrial activities because the Martin site is already aesthetically altered by the presence of existing generating units and infrastructure. The construction activities and equipment to widen SR 710 would be temporary as the activities move along the length of SR 710. Once the road widening is complete the additional lanes would not further increase the road's visual impact on the surrounding viewshed. |
| **NGCC Alternative** | | **SMALL:** Construction and operations activities would appear similar to other ongoing onsite industrial activities because the Martin site is already aesthetically altered by the presence of existing generating units and infrastructure. |
| **Solar Alternative** | | **MODERATE to LARGE:** The solar PV panels could be visible to the public from offsite locations. The solar PV facilities would be sited to comply with land zoning and any required buffers or screening. |

**Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 3 of 15)**

| Air Quality | | |
|---|---|---|
| **Proposed Action** | | **SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following:<br>Air quality impacts (all plants)<br>Air quality effects of transmission lines |
| **Termination of Operations and Decommissioning** | | **SMALL:** After termination of operations, air emissions from the nuclear power plant would continue, but at greatly reduced levels. The most likely impact of decommissioning on air quality is degradation by fugitive dust. Use of BMPs, such as seeding and wetting, can be used to minimize fugitive dust. (NRC 2013a, Section 4.12.2.1) |
| **Nuclear Plant Alternatives** | **ALWR** | **SMALL:** Physical impacts from noise would be minor. Emissions of dust and air pollutants would be limited by operational controls. FPL would comply with the State of Florida PSD permit limits and regulations for operating air emission sources. |
| | **SMR** | **SMALL:** Construction impacts would be temporary; operations impacts would be minor, and emissions being maintained within federal and state regulatory limits. |
| **NGCC Alternative** | | **MODERATE**: Construction impacts would be temporary; emission estimates during the operations period are as follows:<br>Sulfur dioxide = 257 tons per year<br>Nitrogen oxides = 983 tons per year<br>Carbon monoxide = 2,269 tons per year<br>Particulate matter 10 = 499 tons per year<br>Nitrous oxide = 227 tons per year<br>Volatile organic compounds = 159 tons per year<br>Carbon dioxide = 8.32 million tons per year |
| **Solar Alternative** | | **SMALL**: Construction impacts from land clearing and installation activities would be of short duration. No air emissions from operations. |

**Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 4 of 15)**

| Noise | | |
|---|---|---|
| **Proposed Action** | | **SMALL:** Adopting by reference the Category 1 issue finding for noise impacts in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. |
| **Termination of Operations and Decommissioning** | | **SMALL:** During decommissioning, noise would generally be far enough away from sensitive receptors outside the plant boundaries that the noise would be attenuated to nearly ambient levels and would be scarcely noticeable offsite. Noise abatement procedures could also be used during decommissioning in order to reduce noise. (NRC 2013a, Section 4.12.2.1) |
| **Nuclear Alternatives** | **ALWR** | **SMALL:** Physical impacts from noise would be minor. Human health noise impacts would comply with applicable standards. Construction and operational activities would comply with OSHA standards. |
| | **SMR** | **SMALL:** Noise impacts from construction activities would be intermittent and last only through the duration of construction; noise impacts during operations would be similar to those currently associated with the existing units. |
| **NGCC Alternative** | | **SMALL:** Noise impacts from construction activities would be intermittent and last only through the duration of construction; noise impacts during operations would be similar to those currently associated with the existing units. |
| **Solar Alternative** | | **SMALL to MODERATE:** Noise impacts from construction activities would be intermittent and last only several months; however, the disturbance activities would affect 521 acres at each location and the distance to sensitive receptors could not allow for adequate attenuation. |

**Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 5 of 15)**

| Geology and Soils | | |
|---|---|---|
| **Proposed Action** | | **SMALL:** Adopting by reference the Category 1 issue finding for geology and soils in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. |
| **Termination of Operations and Decommissioning** | | **SMALL:** Termination of nuclear plant operations is not expected to impact geology and soils. Erosion problems could be mitigated by using BMPs during decommissioning. Site geologic resources would not be affected by decommissioning. (NRC 2013a, Section 4.12.2.1) |
| **Nuclear Alternatives** | **ALWR** | **SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs. |
| | **SMR** | **SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs. |
| **NGCC Alternative** | | **SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs. |
| **Solar Alternative** | | **SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs. |

**Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 6 of 15)**

<table>
<tr><th colspan="3">Surface Water</th></tr>
<tr><td colspan="2">Proposed Action</td><td>SMALL: Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following:<br>Surface water use and quality (non-cooling system impacts)<br>Altered current patterns at intake and discharge structures<br>Scouring caused by discharged cooling water<br>Discharge of metals in cooling system effluent<br>Discharge of biocides, sanitary waste, and minor chemical spills<br>Surface water use conflicts (plants with once-through cooling systems)<br>Effects of dredging on surface water quality<br>Temperature effects on sediment transport capacity</td></tr>
<tr><td colspan="2">Termination of Operations and Decommissioning</td><td>SMALL: The NRC concluded that the impacts on water use and water quality from decommissioning would be SMALL for all plants. (NRC 2013a, Section 4.12.2.1)</td></tr>
<tr><td rowspan="2">Nuclear Alternatives</td><td>ALWR</td><td>SMALL: Construction and preconstruction impacts on surface-water use and quality would be negligible. The use of environmental BMPs along with a spill prevention plan would prevent or minimize the potential impacts of sediment transport or releases to the environment.</td></tr>
<tr><td>SMR</td><td>SMALL: Construction and operation impacts would be minimized through stormwater permitting and implementation of BMPs.</td></tr>
<tr><td colspan="2">NGCC Alternative</td><td>SMALL: Construction and operation impacts would be minimized through stormwater permitting and implementation of BMPs.</td></tr>
<tr><td colspan="2">Solar Alternative</td><td>SMALL: Construction impacts would be minimized through implementation of BMPs and complying with a construction stormwater permit. The plants would operate in compliance with stormwater regulations with minimal, if any, permitted surface water withdrawals and discharges.</td></tr>
</table>

**Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 7 of 15)**

<table>
<tr><th colspan="3">Groundwater</th></tr>
<tr><td colspan="2">Proposed Action</td><td>SMALL: Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following:<br>Groundwater contamination and use (non-cooling system impacts)<br>Groundwater use conflicts (plants that withdraw less than 100 gpm)<br>Groundwater quality degradation resulting from water withdrawals<br>SMALL (radionuclides released to groundwater): The groundwater tritium concentrations are below the EPA drinking water standards. No gamma or difficult-to-detect radionuclides, other than naturally occurring radionuclides, were identified in well samples between 2016 and 2020.</td></tr>
<tr><td colspan="2">Termination of Operations and Decommissioning</td><td>SMALL: Decommissioning activities include some that may affect groundwater quality through the infiltration of water used for various purposes (e.g., cooling of cutting equipment, decontamination spray, and dust suppression). BMPs are expected to be employed as appropriate to collect and manage these waters. Groundwater chemistry may change as rainwater infiltrates through rubble. The increased pH could promote the subsurface transport of radionuclides and metals. However, this effect is expected to occur only over a short distance as a function of the buffering capacity of soil. Offsite transport of groundwater contaminants is not expected. (NRC 2013a)</td></tr>
<tr><td rowspan="2">Nuclear Alternatives</td><td>ALWR</td><td>SMALL: Construction and preconstruction impacts on groundwater use and quality would be negligible. A monitoring well system would be installed near the location of the RCW caissons that would be used to monitor the groundwater elevation and quality during operation of the radial collector wells. Environmental BMPs and a spill prevention plan would be used to minimize and prevent impacts. Any minor spills of diesel fuel, hydraulic fluid, lubricants, or other pollutants would be cleaned up quickly to prevent them from moving into the groundwater.</td></tr>
<tr><td>SMR</td><td>SMALL: During construction and operations, water demand can be met by groundwater supplies. Dewatering activities would be managed through the installation of diaphragm walls and grouting. BMPs would minimize impacts to groundwater quality as a result of stormwater runoff during construction and operation.</td></tr>
<tr><td colspan="2">NGCC Alternative</td><td>SMALL: During construction and operations, water demand can be met by groundwater supplies. Dewatering activities would be managed through the installation of diaphragm walls and grouting. Deep well injection would be used for wastewater disposal. BMPs would minimize impacts to groundwater quality as a result of stormwater runoff during construction and operation.</td></tr>
<tr><td colspan="2">Solar Alternative</td><td>SMALL: Water use for construction and operation would be minimal and supplied from municipal sources, permitted surface or groundwater sources, or trucked in. BMPs would minimize impacts to groundwater quality as a result of stormwater runoff during construction and operation.</td></tr>
</table>

**Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 8 of 15)**

<table>
<tr><th colspan="3">Terrestrial</th></tr>
<tr><td colspan="2">Proposed Action</td><td>SMALL: Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following:<br>Exposure of terrestrial organisms to radionuclides<br>Cooling system impacts on terrestrial resources (plants with once-through cooling systems or cooling ponds)<br>Bird collisions with plant structures and transmission lines<br>Transmission line right-of-way management impacts on terrestrial resources<br>Electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)<br>SMALL (effects on terrestrial resources—non-cooling system impacts): adequate management programs and regulatory controls in place to protect onsite important terrestrial ecosystems.</td></tr>
<tr><td colspan="2">Termination of Operations and Decommissioning</td><td>SMALL: The termination of nuclear power plant operations would reduce some impacts and eliminate others. Impacts from systems that continue operating to support other units (i.e., where the license term for each unit does not end at the same time) on the plant site may continue to affect terrestrial biota, but at a reduced level of impact. Areas disturbed or used to support decommissioning are within the operational areas of the site and are also within the protected area. Decommissioning activities conducted within the operational areas are not expected to have a detectable impact on important terrestrial resources. (NRC 2013a, Section 4.12.2.1)</td></tr>
<tr><td rowspan="2">Nuclear Alternatives</td><td>ALWR</td><td>MODERATE: Construction and preconstruction activities would noticeably affect wetlands, wildlife, and federally and state-listed plant and animal species at the PTN site, in the vicinity of the site, and in areas traversed by associated offsite facilities such as transmission lines, pipelines, and access roads. Operational activities have the potential of increased vehicle collision mortality to the Florida panther, vegetation-control effects on listed plants, and transmission-system impacts on wood storks and Everglade snail kites.</td></tr>
<tr><td>SMR</td><td>MODERATE: The SMR plant and widening of SR 710 would be require land clearing and permanent loss of upland and wetland habitat. The loss of habitat could affect protected terrestrial species.</td></tr>
<tr><td colspan="2">NGCC Alternative</td><td>SMALL to MODERATE: The NGCC plant would be require land clearing and permanent loss of upland and wetland habitat. Potential effects on surrounding habitats from air emissions from exhaust stacks and MDCTs. The loss of habitat could affect protected terrestrial species.</td></tr>
<tr><td colspan="2">Solar Alternative</td><td>MODERATE to LARGE: Sensitive and high-quality habitats would be avoided. Each facility would require 521 acres and cumulative acreage of approximately 49,000 acres, resulting in permanent loss of terrestrial habitat.</td></tr>
</table>

**Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 9 of 15)**

| Aquatic | |
|---|---|
| **Proposed Action** | **SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following:<br>Entrainment of phytoplankton and zooplankton (all plants)<br>Infrequently reported thermal impacts (all plants)<br>Effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication<br>Effects of nonradiological contaminants on aquatic organisms<br>Exposure of aquatic organisms to radionuclides<br>Effects of dredging on aquatic organisms<br>Effects on aquatic resources (non-cooling system impacts)<br>Impacts of transmission line right-of-way management on aquatic resources<br>Losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses<br>**MODERATE** (impingement and entrainment of aquatic organisms—plants with once-through cooling systems or cooling ponds): Operation of PSL's once-through cooling system has resulted in take exceeding take limits for threatened and endangered species. FPL is continuing to work with the NMFS on mitigation measures.<br>**SMALL** (thermal impacts on aquatic organisms—plants with once-through cooling systems or cooling ponds): The operation of PSL appears to have little long-term impact on the aquatic community of the Atlantic Ocean. PSL is operating in conformance with its current NPDES permit. Because there are no planned operational changes during the proposed SLR operating term that would increase the temperature of PSL's existing thermal discharge, impacts are anticipated to be SMALL and mitigation measures are not warranted. |
| **Termination of Operations and Decommissioning** | **SMALL:** The termination of nuclear power plant operations would reduce some impacts and eliminate others. Impacts from systems that continue operating to support other units (i.e., where the license term for each unit does not end at the same time) on the plant site may continue to affect aquatic biota, but at a reduced level of impact. Some aquatic organisms may have become established in the mixing zone because of the warmer environment, and these organisms likely would be adversely affected as the water temperature cooled and the original conditions were restored within the body of water. The NRC concluded that for facilities at which the decommissioning activities would be limited to existing operational areas, the potential impacts on aquatic resources would be SMALL. (NRC 2013a, Section 4.12.2.1) |

**Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 9 of 15, continued)**

| Aquatic | | |
|---|---|---|
| **Nuclear Alternatives** | **ALWR** | **SMALL to MODERATE:** Construction and preconstruction activities would have minimal impact on aquatic ecological resources and habitat with the exception of the American crocodile. The American crocodile may be disturbed by construction activities and is susceptible to injury or death by collisions with vehicles. During permitted radial collector well operation (60 d/year or less), there would be no noticeable change in salinity above or below normal background variation. The use of reclaimed water from Miami-Dade County to operate the cooling system would not result in noticeable impacts on onsite and offsite aquatic resources. |
| | **SMR** | **SMALL:** The project would not utilize surface water other than excess flow surface water and wastewater would be disposed of through deep well injection. Aquatic ecology impacts would be limited to impingement and entrainment of aquatic organisms from C-44 channel withdrawals during excess flow and those from stormwater runoff and the potential for spills that reach surface water. Stormwater runoff would be managed during construction and operations in accordance with FDEP regulations and SWPPP. Implementation of BMPs would minimize impacts on aquatic ecosystems during construction and operations. |
| **NGCC Alternative** | | **SMALL to MODERATE:** The project would not utilize surface water other than excess flow surface water and wastewater would be disposed of through deep well injection. Aquatic ecology impacts would be limited to impingement and entrainment of aquatic organisms from C-44 channel withdrawals during excess flow and those from stormwater runoff, air emissions from exhaust stacks and MDCTs, and the potential for spills that reach surface water. |
| **Solar Alternative** | | **SMALL:** Implementation of BMPs and adherence to stormwater permit conditions would minimize impacts on aquatic ecosystems during construction and operation. No cooling system is required. |

**Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 10 of 15)**

| Special Status Species | | |
|---|---|---|
| **Proposed Action** | | **ADVERSE EFFECT:** The continued operation of the site is likely to adversely affect the five species of documented sea turtles, the smalltooth sawfish, and the giant manta ray. A Section 7 consultation with NMFS is ongoing; the need for mitigation measures beyond FPL's current management programs and existing regulatory controls are pending NMFS's evaluation. |
| **Termination of Operations and Decommissioning** | | **Site Specific:** The termination of nuclear power plant operations would reduce some impacts and eliminate others. Impacts from systems that continue operating to support other units (i.e., where the license term for each unit does not end at the same time) on the plant site may continue to affect aquatic biota, but at a reduced level of impact. Some aquatic organisms may have become established in the mixing zone because of the warmer environment, and these organisms likely would be adversely affected as the water temperature cooled and the original conditions were restored within the body of water. The magnitude of impacts could vary widely based on site-specific conditions at the time of decommissioning and the presence or absence of special status species and habitats when the alternative is implemented. (NRC 2013a, Section 4.12.2.1) |
| **Nuclear Alternatives** | **ALWR** | **MAY AFFECT, NOT LIKELY TO ADVERSELY AFFECT:** Construction/preconstruction activities would noticeably affect wetlands, wildlife, and federally and state-listed species at the PTN site, in the vicinity of the site, and in areas traversed by associated offsite facilities such as transmission lines, pipelines, and access roads. Operational activities have the potential of increased vehicle collision mortality to the Florida panther, vegetation-control effects on listed plants, and transmission-system impacts on wood storks and Everglade snail kites. The use of reclaimed water from Miami-Dade County to operate the cooling system would not result in noticeable impacts on onsite and offsite aquatic resources. |
| | **SMR** | **MAY AFFECT, NOT LIKELY TO ADVERSELY AFFECT:** Clearing and permanent loss of upland and wetland habitat could affect protected terrestrial species. The Florida manatee and American alligator can occur near the Martin site. Planning would include wildlife surveys to identify protected species and habitat and design appropriate avoidance and minimization measures. |
| **NGCC Alternative** | | **MAY AFFECT, NOT LIKELY TO ADVERSELY AFFECT:** The NGCC plant would be require land clearing of permanent loss of upland and wetland habitat. The loss of habitat could affect protected terrestrial species. The Florida manatee and American alligator can occur near the Martin site. Planning would include wildlife surveys to identify protected species and habitat and design appropriate avoidance and minimization measures. |
| **Solar Alternative** | | **MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT:** The site selection process that would be used to avoid locations that would impact special status species. Surveys will also be conducted as appropriate to identify special status species and habitats. |

**Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 11 of 15)**

| Historic and Cultural Resources | | |
|---|---|---|
| **Proposed Action** | | **NO ADVERSE EFFECT:** No license renewal-related refurbishment or construction activities identified. FPL has no plans to conduct such soil-intrusive activities at any location outside the property boundary under a renewed license. Due to topography, vegetation and distance, no potential adverse effects to any NRHP-listed properties, including viewshed, aesthetic, and noise impacts, as a result of the continued operation of PSL are expected. |
| **Termination of Operations and Decommissioning** | | **NO ADVERSE EFFECT:** The termination of nuclear plant operations would not affect historic or cultural resources. The NRC conducted an analysis of the potential effects of decommissioning on historic and archaeological (cultural) resources and found that the potential onsite impacts at sites where the disturbance of lands would not go beyond the operational areas would be SMALL. (NRC 2013a, Section 4.12.2.1) |
| **Nuclear Alternatives** | **ALWR** | **NO ADVERSE EFFECT:** NRC's and FPL's consultation with the Florida SHPO concluded a finding of "no historic properties affected." FPL has committed to develop procedures for the treatment of unanticipated cultural resources discovered during construction activities. FPL has committed to develop procedures for operations that would be in place if ground-disturbing or maintenance activities discover historic or cultural resources. Given the potential for indirect visual impacts on built resources from the construction of transmission lines, the offsite impacts of the project on cultural resources is MODERATE. |
| | **SMR** | **NO ADVERSE EFFECT:** Previous records review for historic and cultural resources for the Martin site and archaeological survey within portions of the site did not identify any archaeological sites and there are no known historic properties located within surveyed portions of the site. Prior to construction activities, field surveys would be conducted as appropriate to allow for avoidance of identified cultural sites and design of minimization measures. |
| **NGCC Alternative** | | **NO ADVERSE EFFECT:** Previous records review for historic and cultural resources for the Martin site and archaeological survey within portions of the site did not identify any archaeological sites and there are no known historic properties located within surveyed portions of the site. Prior to construction activities for the NGCC plant, field surveys would be conducted as appropriate to allow for avoidance of identified cultural sites and design of minimization measures. |
| **Solar Alternative** | | **NO ADVERSE EFFECT:** The site selection process would have criteria to avoid locations whose development would impact cultural resources. |

**Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 12 of 15)**

| Socioeconomics | |
|---|---|
| **Proposed Action** | **SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following:<br>Employment and income, recreation and tourism<br>Tax revenues<br>Community services and education<br>Population and housing<br>Transportation |
| **Termination of Operations and Decommissioning** | When a nuclear power plant is closed and decommissioned, most of the important socioeconomic impacts will be associated with the plant closure rather than with the decommissioning process (NRC 2002, Section 4.3.12).<br>**SMALL to LARGE:** Terminating nuclear plant operations would have a noticeable adverse impact on socioeconomic conditions in the region around the nuclear power plant. There would be immediate socioeconomic impacts from the loss of jobs. The impacts from the loss or reduction of revenue due to the termination of plant operations on community and public education services could range from SMALL to LARGE. (NRC 2013a, Section 4.12.2.1) FPL is considered a principal property taxpayer in St. Lucie County and the property tax payment to the county was approximately 26 percent of the total county property tax revenue. The revenue loss would have a noticeable and potentially destabilizing impact on St. Lucie County. (Sections 2.5, 3.9.1, and 3.9.5). The PSL workforce is a very small contributor to the employed population in the area; therefore, the loss of jobs would affect a very small percentage of the population (Sections 2.5 and 3.9.1).<br>**SMALL**: Decommissioning itself has no impact on the tax base and no detectable impact on the demand for public services. The impacts of decommissioning on socioeconomics are neither detectable nor destabilizing; therefore, the impacts on socioeconomics are SMALL. (NRC 2002, Sections 4.3.12.3 and 4.3.12.4) |

## Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 12 of 15, continued)

| Socioeconomics | | |
|---|---|---|
| **Nuclear Alternatives** | **ALWR** | **SMALL beneficial:** Construction and preconstruction and operations economic and tax revenue impacts on the communities nearest to PTN are expected to be SMALL and beneficial in Miami-Dade County, Homestead, and Florida City. The in-migration of workers would result in increased, but limited, demand for housing, recreation, and infrastructure and community services.<br>**MODERATE (traffic):** Construction and preconstruction and operations traffic impacts would be noticeable but not destabilizing; FPL proposes a number of road improvements in the vicinity of the proposed site to accommodate the increased traffic expected during construction and operations. Among them, the new access road along SW 359th Street would open traffic to an area with limited accessibility to the public. |
| | **SMR** | **SMALL, beneficial:** The peak construction workforce is estimated at 3,983 workers and the operations workforce as 806 workers. The large local economy would be boosted by salaries and taxes but would not be noticeable with the exception of the Martin School District.<br>**MODERATE (traffic):** Development of a SMR plant at the Martin site would require widening of SR 710. Impacts could be mitigated by use of staggered shifts. |
| **NGCC Alternative** | | **SMALL, beneficial:** The jobs created to complete the construction of the NGCC plant (1,200) would be temporary in duration and any in-migration would be temporary. Operations workers are estimated at 150. Boosts to the local economy would not be noticeable with the exception of increased tax revenues to the Martin School District.<br>**MODERATE (construction traffic):** The increase in traffic during construction would be short-term and noticeable on SR 710. |
| **Solar Alternative** | | **SMALL, beneficial:** A construction workforce of up to approximately 200 workers would be needed for each facility for a few months. There would be small temporary stimulus to the local economy. Tax payments for industrial property would minimally increase tax revenues for local taxing authorities.<br>**SMALL (construction traffic):** The increase in traffic during construction would be short-term and not be expected to strain local roadways. |

**Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 13 of 15)**

| Human Health | |
|---|---|
| **Proposed Action** | **SMALL**: Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following:<br>Radiation exposures to the public<br>Radiation exposures to plant workers<br>Human health impact from chemicals<br>Microbiological hazards to plant workers<br>Physical occupational hazards<br>**SMALL** (microbiological hazards to the public [plants with cooling ponds or canals or cooling towers that discharge to a river]): Because the PSL discharge canal is restricted for public access, it does not represent a public health hazard. The discharge in the Atlantic Ocean is diffused and promotes rapid mixing with ocean water. The ocean discharge is 1,500 feet offshore and located away from public access beaches. Given the discharge from the canal is to the ocean rather than a river and the thermal discharge would not enhance the growth of thermophilic microorganisms, the discharge to the Atlantic Ocean does not represent a public health hazard.<br>**SMALL** (electric shock hazards): Transmission lines located entirely within PSL owner-controlled area and do not pose a shock hazard risk to the public. PSL and transmission system owner has safety measures in place to maintain minimal ground clearances and minimize shock hazards from overhead lines. |
| **Termination of Operations and Decommissioning** | **SMALL:** The human health impacts from physical, chemical, and microbiological hazards during the termination of plant operations and decommissioning would be SMALL for all plants. (NRC 2013a, Section 4.12.2.1) |

**Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 13 of 15, continued)**

| Human Health | | |
|---|---|---|
| **Nuclear Alternatives** | **ALWR** | **SMALL:** Construction – Emissions of dust and air pollutants would be limited by operational controls; noise impacts would comply with federal, state, and county standards. Worker health and safety would be ensured by compliance with NRC, OSHA, and state standards. Transportation impacts would be minimal.<br>Operations – Risks from etiological and chemical agents would be minimal. Noise impacts would be minimal, complying with all federal, state, and county regulations. Occupational safety and health impacts would be limited by compliance with OSHA standards. Acute effects of electromagnetic fields would be avoided by compliance with NESC standards.<br>Transportation impacts would be minimal.<br>Radiological doses to members of the public would be below NRC and EPA standards and there would be no observable health impacts. Occupational radiological doses to plant workers would be below NRC standards and a program to maintain doses ALARA would be implemented. |
| | **SMR** | **SMALL:** Compliance with OSHA worker protection rules would control impacts on workers at acceptable levels during construction and operation; human health impacts during operation would be similar to PSL. The radiological human health impact would be SMALL due to compliance with NRC regulations and adherence to ALARA principals. |
| **NGCC Alternative** | | **SMALL:** Compliance with OSHA worker protection rules would control impacts on workers at acceptable levels during NGCC plant construction and operations; air emissions would be subject to regulatory standards that are protective of human health |
| **Solar Alternative** | | **SMALL:** Compliance with OSHA worker protection rules would control impacts on workers at acceptable levels during construction and operations. |

a. Category 2 issue requiring site-specific evaluation.

**Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 14 of 15)**

| Environmental Justice | | |
|---|---|---|
| **Proposed Action** | | There are no known pathways by which disproportionately high and adverse impacts could be imposed on minority or low-income populations from the proposed action. |
| **Termination of Operations and Decommissioning** | | Termination of power plant operations and the resulting loss of jobs, income, and tax revenue could have a disproportionate effect on minority and low-income populations (NRC 2013a, Section 4.12.2).<br>**Site Specific:** The determination of whether the minority or low-income populations are disproportionately highly and adversely impacted by facility decommissioning activities needs to be made on a site-by-site basis because their presence and their socioeconomic circumstances will be site specific (NRC 2002, Section 4.3.13.3). |
| **Nuclear Alternatives** | **ALWR** | No environmental pathways or health and other preconditions of the minority and low income populations were found that would lead to disproportionately high and adverse impacts during construction or operations. |
| | **SMR** | Impacts during construction would be temporary and likely would result in no disproportionately high and adverse impacts to minority and low-income populations. There are no known pathways by which disproportionately high and adverse impacts could be imposed on environmental justice populations of interest. |
| **NGCC Alternative** | | Impacts during construction would be temporary and air emissions would compliance with air permit limits. There are no known pathways by which disproportionately high and adverse impacts could be imposed on environmental justice populations of interest. |
| **Solar Alternative** | | Some minor environmental impacts would result from the construction activities from fugitive dust, but this impact would be temporary and short in duration. No pathways by which disproportionately high and adverse impacts could be imposed on environmental justice populations of interest are expected. |

**Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 15 of 15)**

| Waste Management | | |
|---|---|---|
| **Proposed Action** | | **SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following:<br>Low-level waste storage and disposal<br>Onsite storage of spent nuclear fuel<br>Offsite radiological impacts of spent nuclear fuel and high-level waste disposal<br>Mixed waste storage and disposal<br>Nonradioactive waste storage and disposal |
| **Termination of Operations and Decommissioning** | | **SMALL:** After termination of nuclear plant operations, there would be a period before the beginning of decommissioning when the reactor would be placed in a cold shutdown condition and maintained. The quantities of waste generated would be smaller than the quantities generated during either operations or decommissioning. The impacts associated with the management of LLRW, hazardous waste, mixed waste, and nonradioactive and nonhazardous waste during operations and decommissioning would be SMALL. (NRC 2013a, Section 4.12.2.1) |
| **Nuclear Alternatives** | **ALWR** | **SMALL:** During construction, impacts on water, land, and air from the generation of nonradioactive waste would be minimal. Proposed practices for recycling, minimizing, managing, and disposing of wastes and the requirement to obtain regulatory approvals for waste disposal and discharges would help minimize impacts from waste generation during operations. |
| | **SMR** | **SMALL:** Construction-related waste would be properly characterized and disposed of at permitted offsite facilities; during operations, nonhazardous, hazardous, and radioactive wastes would be managed in compliance with federal and state regulations and disposed of in permitted facilities. |
| **NGCC Alternative** | | **SMALL:** Construction-related waste would be properly characterized and disposed of at permitted offsite facilities; during operations, nonhazardous and hazardous wastes would be managed in compliance with federal and state regulations and disposed of in permitted facilities. Operation of the NGCC plant would result in spent catalytic reduction catalysts used to control emissions. |
| **Solar Alternative** | | **SMALL:** Construction-related waste would be properly characterized and disposed of at permitted offsite facilities; during operations, nonhazardous and hazardous wastes would be managed in compliance with federal and state regulations and disposed of in permitted facilities. |

# 9.0 STATUS OF COMPLIANCE

The environmental report shall list all federal permits, licenses, approvals, and other entitlements which must be obtained in connection with the proposed action and shall describe the status of compliance with these requirements. The environmental report shall also include a discussion of the status of compliance with applicable environmental quality standards and requirements including, but not limited to, applicable zoning and land-use regulations, and thermal and other water pollution limitations or requirements which have been imposed by federal, state, regional, and local agencies having responsibilities for environmental protection. [10 CFR 51.45 (d)]

## 9.1 Authorizations

Table 9.1-1 provides a summary of authorizations held by PSL for current plan operations. Authorization in this context include any permits, licenses, approvals, or other entitlements that would continue to be in place, as appropriate, throughout the period of extended operation given their respective renewal schedules. Table 9.1-2 lists additional environmental authorizations and consultation related to the proposed subsequent renewal of the PSL site.

**Table 9.1-1 Environmental Authorizations for Current PSL Operations (Sheet 1 of 3)**

| Agency | Authority | Requirement | Number | Expiration Date | Authorized Activity |
|---|---|---|---|---|---|
| NRC | Atomic Energy Act<br>10 CFR 50 | Licensing of nuclear power plant. | DPR-67 | Renewed<br>October 2003<br>Expires 3/1/2036 | Operation of Unit 1. |
| NRC | Atomic Energy Act<br>10 CFR 50 | Licensing of nuclear power plant. | NPF-16 | Renewed<br>October 2003<br>Expires 4/6/2043 | Operation of Unit 2. |
| NRC | 10 CFR 72 | General license for storage of spent fuel at power reactors. | General permit | N/A | Dry storage of power reactor spent fuel and other associated radioactive materials in an ISFSI. |
| FDEP Siting Board | Florida Statutes<br>§ 403.501-518 | Power plant site certification. | Case No:<br>PA 74-02A2 | Final conditions of certification issued 9/17/2008 | Siting, construction, and operation of PSL Units 1 and 2 and associated facilities. |
| EPA/FDEP | Clean Water Act Section 401 [33 USC 1341] | Certification of state water quality standards. | Case No:<br>PA 74-02A2 | Final conditions of certification issued 9/17/2008 | Discharges during license renewal term. |
| USACE | Clean Water Act Section 404 [33 USC 1344] | Permit | SAJ-1993-01803 | Issued August 22, 2016; 10-year authorization. | Permit to perform maintenance dredging in the intake canal at PSL. |
| USACE/FDEP | Resource Conservation and Recovery Act<br>42 USC 6901 | Hazardous waste generator number. | FLD000807479 | N/A | Small quantity hazardous waste generator. |
| USDOT | 49 CFR 107 Subpart G | Registration. | 050120550008C | 6/30/2021 | Hazardous materials shipments. |
| TN Department of Environment and Conservation | Tennessee Code Annotated<br>68-202-206 | License to ship radioactive material. | T-FL003-L21 | 12/31/2021 | Shipment of radioactive material to processing facility in Tennessee. |

**Table 9.1-1 Environmental Authorizations for Current PSL Operations (Sheet 2 of 3)**

| Agency | Authority | Requirement | Number | Expiration Date | Authorized Activity |
|---|---|---|---|---|---|
| FDEP | Florida Statutes Chapter 403 | Industrial wastewater facility permit. | FL0002208 | 11/3/2021 | Wastewater treatment and effluent disposal. State implementation of NPDES. |
| FDEP | Florida Statutes Chapter 403 | Air construction permit. | 1110071-015-AC | 12/31/2021 | Construction and emissions from a new emergency stationary generator; removal of facility-wide NOx emissions limit; reclassification of PSL as a natural minor non-Title V source of pollution to allow for operation under a state-only air operation permit. |
| FDEP | Florida Statutes Chapter 403 | Air permit. | 1110071-016-AO | 11/3/2025 | Emissions from four emergency diesel generators; four diesel and propane emergency generators; miscellaneous diesel-driven equipment, and facility-wide fugitive emission from storage tanks, roadways, and paint/sandblasting. |
| FDEP | Florida Statutes Chapter 376 | Annual storage tank registration. | Facility ID: 8630677 | Annual renewal | Operation of above-ground storage tanks. |
| FDEP | Florida Statutes 161.053(4) | Construction permit. | SL-350 M1 | 4/18/2020 | Dune-construction related activities. |
| FDEP | Florida Statutes Chapter 161 and Part IV of Chapter 373 | Joint coastal permit. | 0314668-001-JC | 9/10/2028 | Permit to construct a submerged reef ball breakwater. |

**Table 9.1-1 Environmental Authorizations for Current PSL Operations (Sheet 3 of 3)**

| Agency | Authority | Requirement | Number | Expiration Date | Authorized Activity |
|---|---|---|---|---|---|
| USFWS | Migratory Bird Treaty Act [16 USC 703-712] | Special purpose utility permit | MB697722-0 | Annual renewal | Provides authorization for carcass salvage, nest relocation, and injured bird transport. This is an FPL system-wide permit that may be applied as necessary and appropriate at PSL Units 1 and 2. |
| NMFS | Biological Opinion | Effects of operation on federally listed threatened and endangered species. | Public Consultation Number: SER-2006-832 | Biological opinion is pending | Incidental take of specified turtle species and fish. |
| FFWCC | Florida Administrative Code Chapter 68B-8.006 | Special activity license. | 15-0018-SR | 4/28/2018 | Tag, release, and recapture of fish & invertebrates. |
| FFWCC | Florida Administrative Code Chapter 39 | Marine turtle permit. | MTP-20-125B | 12/31/2020 | Conduct turtle activities including net capture, tagging, nesting surveys, hand-capture, nest relocation, rescue and release of hatchlings, stranding and salvage activities. |
| SFWMD | Florida Administrative Code 65-25 | Stormwater discharge permit. | 56-00848-S | Perpetual | Stormwater discharge from overflow parking lot. |
| SFWMD | Florida Administrative Code 65-25 | Stormwater discharge permit. | 85-142 | Perpetual | Stormwater discharge from the simulator building. |

**Table 9.1-2 Environmental Consultations for the PSL License Renewal**

| Agency | Authority | Requirement | Remarks |
|---|---|---|---|
| NRC | Atomic Energy Act (42 USC 2011 et seq.) | License renewal | Applicant for federal license must submit ER in support of license renewal. |
| USFWS | Endangered Species Act Section 7 [16 USC 1636] | Consultation | Requires federal agency issuing a license to consult with the USFWS, and NMFS if applicable, regarding federally protected species. |
| NMFS | Endangered Species Act Section 7 [16 USC 1636]<br>Magnuson-Stevens Fishery Conservation and Management Act [16 USC 1801] | Consultation | Requires federal agency issuing a license to consult with the NMFS, if applicable, regarding federally protected species and EFH. |
| Florida Department of State Historic Preservation Office | National Historic Preservation Act Section 106 | Consultation | Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or tribal historic preservation office. |
| Seminole Tribe of Florida | National Historic Preservation Act Section 106 | Consultation | Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or tribal historic preservation office. |
| Miccosukee Tribe of Indians of Florida | National Historic Preservation Act Section 106 | Consultation | Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or tribal historic preservation office. |
| Muscogee (Creek) Nation | National Historic Preservation Act Section 106 | Consultation | Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or tribal historic preservation office. |
| Thlopthlocco Tribal Town | National Historic Preservation Act Section 106 | Consultation | Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or tribal historic preservation office. |

## 9.2 Status of Compliance

PSL has established control measures in place to ensure compliance with the authorizations listed in Table 9.1-1, including monitoring, reporting, and operating within the specified limits. PSL environmental compliance coordinators are responsible for monitoring and ensuring that the site complies with its environmental permits and applicable regulations. Monitoring and sampling results associated with the environmental programs submitted to appropriate agencies, as specified in the permits and/or governing regulations.

### 9.2.1 Site Certification

The Florida PPSA, ss. 403.501-.518, F.S, is the state's centralized process for licensing large power plants. One license, a certification, replaces many local and state permits. Local governments and state agencies within whose jurisdiction the power plant is to be built participate in the process. However, additional state and local permits may be required that do not fall under the umbrella of site certification. Certification addresses permitting, land use and zoning, and property interest. A certification grants approval for the location of the power plant and its associated facilities such as natural gas pipelines supplying the plant's fuel, rail lines for bringing coal to the site, and roadways and electrical transmission lines carrying power to the electrical grid, among others. (FDEP 2021f).

PSL Units 1 and 2 are licensed under the Florida PPSA, Chapter 403, Part II, F.S. Those units operate in accordance with the conditions of certification in their license, PA 74-02A2 as modified in 2008 to approve operating under the current uprated conditions. (FDEP 2020d) The Florida PPSA process provides a certification that encompasses many license and permits needed for affected Florida state, regional, and local agencies. It also includes any regulatory activity applicable under these agencies' regulations for PSL. The final conditions of the certification issued are binding and subject to the requirements listed in the Florida PPSA.

## 9.3 Notices of Violations

Based on review of records over the 5-year period 2016–2020 of various environmental programs and permits that PSL is subject to and complies with, there have been no federal (i.e., agencies other than the NRC), state, or local regulatory notices of violations (NOVs) issued to the facility.

## 9.4 Remediation Activities

Based on a review of records, no remediation activities for nonradioactive or radioactive environmental concerns have been conducted since 2015.

## 9.5 Federal, State, and Local Regulatory Standards: Discussion of Compliance

This section contains information regarding environmental programs identified in the 2013 GEIS that may or may not be applicable to the site, and current status of compliance with each program.

### 9.5.1 Atomic Energy Act

#### 9.5.1.1 Radioactive Waste

As discussed in Section 2.2.6, PSL has radioactive waste stream handling and shipping procedures. As a generator of both LLRW and spent fuel, PSL is subject to and complies with provisions and requirements of the Low-Level Radioactive Waste Policy Amendment Act of 1985 and the Nuclear Waste Policy Act of 1982, as subsequently amended.

PSL also complies with the permit issued by the Tennessee Department of Environment and Conservation (Table 9.1-1) for shipping radioactive material to a licensed disposal/processing facility within the state of Tennessee.

### 9.5.2 Clean Air Act

#### 9.5.2.1 Air Permit

PSL has a permit to operate emergency diesel generators, diesel generator engines and miscellaneous diesel equipment.

Operation of these air emission sources is maintained within the emissions, opacity, fuel sulfur content, and fuel usage (as applicable) limits established in the station air permit issued by the FDEP.

#### 9.5.2.2 Chemical Accident Prevention Provisions [40 CFR Part 68]

PSL is not subjected to the risk management plan requirements described in 40 CFR Part 68 because the amount of regulated chemicals present onsite do not exceed the threshold quantities specified in 40 CFR 68.130.

#### 9.5.2.3 Stratospheric Ozone [40 CFR Part 82]

Under Title VI of the CAA, the EPA is responsible for several programs that protect the stratospheric ozone layer. Regulations promulgated by the EPA to protect the ozone layer are contained in 40 CFR Part 82. Refrigeration appliances and motor vehicle air conditions are regulated under Section 608 and 609 of the CAA, respectively. A number of service practices, refrigerant reclamation, technician certification, and other requirements are covered by these programs. PSL is in compliance with Section 608 of the CAA as amended in 1990 and the implementing regulations codified in these regulations. The program to manage stationary refrigeration appliances at PSL is described in FPL procedures. Because motor vehicle air conditions are not serviced onsite, Section 609 of the CAA is not applicable.

### 9.5.3 Clean Water Act

#### 9.5.3.1 Section 404 Permitting

PSL has a Section 404 permit in place (Table 9.1-1) and complies with the regulatory requirements imposed by the USACE under Section 404 of the CWA as it relates to performing dredging activities in federal jurisdictional waters. As discussed in Section 3.6.1, PSL periodically assesses the need to conduct dredging.

#### 9.5.3.2 Water Quality (401) Certification

Federal CWA Section 401 requires applicants for a federal license (that conduct an activity that might result in a discharge into navigable waters) to provide the licensing agency with a certification from the state that the discharge will comply with applicable CWA requirements [33 USC 1341].

The operating agreement between the FDEP and participating agencies identifies the final order issued as part of the PPSA as the 401 Certification for the authorized power plant (FDEP 2020d; FDEP 2021f; FDEP 2021g). As the PPSA certification is a non-expiring permit for the life of the facility, it remains effective and constitutes a continuing certification of compliance with state water quality standards. Therefore, PSL has fulfilled the regulatory requirement to provide certification by the state.

#### 9.5.3.3 NPDES Permit

PSL permit No. FL0002208 (Table 9.1-1), issued by the FDEP, authorizes the discharge of once-through cooling water, process water, and stormwater into state waters. The IWFP/NPDES permit authorizes discharge from four outfalls (one external and three internal) and requires monitoring of water quality and effluent limits. Plant effluent is discharged to the Atlantic Ocean, mangrove impoundments, and the intake canal. As discussed in Section 3.6.1.2.5, FPL sent a non-compliance notification to the FDEP for usage of water treatment chemicals that had not been permitted prior to use on May 17, 2016. FPL fulfilled regulatory reporting requirements and followed necessary procedures to restore IWFP/NPDES compliance. Also, in November and December of 2019, FPL requested revisions to the IWFP/NPDES permit to allow for permanent approval and use of chlorine dioxide as a biocide and to reduce the sampling frequency at internal Outfall I-005. The FDEP approved these revisions and issued a revised IWFP/NPDES permit on May 21, 2020.

#### 9.5.3.4 Stormwater Permit

As discussed in Section 3.6.1.2.2, stormwater discharges associated with PSL industrial activities are regulated and controlled through the NPDES permit No. FL0002208 issued by the FDEP. PSL also implements and maintains a SWPPP for the facility that identifies potential sources of pollution that would reasonably be expected to affect the quality of stormwater and identifies BMPs that will be used to prevent or reduce the pollutants in stormwater discharge. PSL is in compliance with the terms and conditions of the NPDES permit as it relates to the stormwater program.

#### 9.5.3.5 Sanitary Wastewaters

As presented in Section 3.6.1.2.3, PSL no longer treats site sanitary wastewater. Since September 1997, sanitary wastewater has been discharged to St. Lucie County's South Hutchinson Island water reclamation facility for treatment. There is no wastewater treatment plant in use at PSL.

#### 9.5.3.6 Spill Prevention, Control, and Countermeasures

The EPA's Oil Pollution Prevention Rule became effective January 10, 1974, and was published under the authority of Section 311(j)(1)(C) of the Federal Water Pollution Control Act. The regulation has been published in 40 CFR Part 112, and facilities subject to the rule must prepare and implement an SPCC plan to prevent any discharge of oil into or upon navigable waters of the United States or adjoining shorelines. PSL is subject to this rule and has a written SPCC plan that identifies and describes the procedures, materials, equipment, and facilities that are utilized at the station to minimize the frequency and severity of oil spills to meet the requirements of this rule.

#### 9.5.3.7 Reportable Spills [40 CFR Part 110]

PSL is subject to the reporting provisions of 40 CFR Part 110 as it relates to the discharge of oil in such quantities as may be harmful pursuant to Section 311(b)(4) of the Federal Water Pollution Control Act. Any discharge of the oil in such quantities that may be harmful to the public health or welfare or the environment must be reported to the EPA's national response center. Based on a review of site records from 2016–2020, there have been no releases at PSL that have triggered this notification requirement.

#### 9.5.3.8 Reportable Spills [FAC 62-780]

PSL is also subject to the reporting provision under Florida Administrative Code (FAC) 62-780, and under the site conditions of certification. This reporting provision requires that any spills of materials having potential to significantly pollute surface or groundwaters and which are not confined to a building or similar containment structure be reported to the FDEP Office of Emergency Response by telephone immediately after discovery of such spill, followed by a detailed written report. (FDEP 2020d) Based on review of records over the previous 5 years (2016–2020), there has been one release at PSL that triggered the notification requirement. The spill was attributed to a lift pump station at the north lift station which experienced failure, allowing approximately 400 gallons of untreated domestic wastewater to overflow the sump and collect on the surrounding grass, with some of the water draining onto adjacent concrete and through a drainage culvert into the intake canal on October 22, 2019. Wastewater that had pooled on the ground was removed, but water that reached the canal was unrecoverable. PSL replaced the lift pump indicators and audio and visual level indication was entered into the work week process for repairs. An evaluation of the remaining lift pump stations at the site was also conducted and no other issues were noted. The FDEP waived the requirement of a formal report, and notification of the spill to the NRC was not required.

#### 9.5.3.9 Facility Response Plan

PSL is not subject to the facility response plan risk requirement described in 40 CFR 112.20 because the facility does not transfer oil over water to or from vessels and does not store oil in quantities greater than 1 million gallons.

### 9.5.4 Safe Drinking Water Act

As discussed in Section 3.6.3.2, potable water for PSL is obtained from the Fort Pierce Utilities Authority and PSL does not have an active well subject to the Safe Drinking Water Act limits.

### 9.5.5 Endangered Species Act

Potential impacts on federally and state-listed species were considered in FPL's review and analysis in Section 4.6.6, and it was concluded that continued operation is likely to affect certain listed species at the PSL site. FPL has administrative controls in place to maintain compliance with all regulatory requirements associated with protected species. Continued adherence to these controls, and compliance with applicable laws and regulations, should adequately mitigate potential negative impacts to listed species at PSL as a result of SLR.

Section 7 of the ESA requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of species that are listed, or proposed for listing, as endangered or threatened. Depending on the action involved, the ESA requires consultation with the USFWS and with the NMFS if marine or anadromous species could be affected. PSL operates under a BO established by the NMFS, which is currently under consultation. The resultant BO will determine if mitigation measures beyond FPL's current management programs and existing regulatory controls are warranted. Although PSL has also invited comment from the USFWS and NMFS (Attachment C) during the development of this ER, a more structured consultation process with these agencies may be initiated by the NRC per Section 7 of the ESA.

### 9.5.6 Migratory Bird Treaty Act

The MBTA makes it unlawful to pursue, hunt, take, capture, kill, or sell birds listed, and grants protection to any bird parts, including feathers, eggs, and nests. As discussed in Section 3.7.8.5, FPL maintains a migratory bird special purpose utility permit (Table 9.1-1) that authorizes tracking and reporting of migratory bird mortality, nest removal and relocation, and transport of injured birds to rehabilitation facilities. An annual report to the USFWS is required to maintain compliance with federal regulations. PSL adheres to the regulations and requirements of the MBTA and permit.

### 9.5.7 Bald and Golden Eagle Protection Act

The BGEPA prohibits the take, transport, sale, barter, trade, import and export, and possession of eagles, making it illegal for anyone to collect eagles and eagle parts, nests, or eggs without a USFWS permit. As discussed in Section 3.7.8.4, bald eagles are not known to nest on the PSL site; however, activities on the PSL site are evaluated to ensure compliance under the BGEPA and MBTA. When necessary, consultation with responsible agencies is conducted. There are currently no BGEPA permitting requirements associated with PSL operations.

### 9.5.8 Magnuson-Stevens Fishery Conservation and Management Act

As discussed in Section 3.7.8.6, according to the 2018 EFH Final Amendment, 21 species with potential EFH exist within 6 miles of the site and are listed in Table 3.7-6. FPL has invited comment from the NMFS. Attachment C includes a copy of the FPL correspondence with the NMFS regarding potential effects that PSL SLR might have on EFH and HAPCs.

### 9.5.9 Marine Mammal Protection Act

The MMPA prohibits, with certain exemptions, the "take" of marine mammals in the U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the United States. There are currently no MMPA permitting requirements associated with PSL operations.

### 9.5.10 Coastal Zone Management Act

The federal Coastal Zone Management Act (CZMA) [16 USC 1451 et seq.] imposes requirements on applicants for a federal license to conduct an activity that could affect a state's coastal zone. The act requires the applicant to certify to the licensing agency that the proposed activity would be consistent with the state's federally approved coastal zone management program [16 USC 1456(c)(3)(A)]. NOAA has promulgated implementing regulations indicating that the requirements are applicable to renewal of federal licenses for activities not previously reviewed by the state [15 CFR 930.51(b)(1)]. The regulation requires the license applicant to provide its certification to the federal licensing agency and a copy to the applicable state agency [15 CFR 930.57(a)].

The NRC's Office of Nuclear Reactor Regulation has issued guidance to its staff regarding compliance with the act. This guidance acknowledges that Florida has an approved coastal zone management program (NRC 2013e). The entire state of Florida is designated as a coastal zone; therefore, PSL is located within the Florida coastal zone.

The PPSA at FS §403.511(7) provides that "Pursuant to §380.23, electrical power plants are subject to the federal coastal consistency review program. Issuance of [PPSA] certification shall constitute the state's certification of coastal zone consistency." As previously discussed, the PPSA certification is a non-expiring permit for the life of the facility. It therefore remains effective and constitutes the State's continuing determination that PSL operation is consistent with the State's coastal zone management program.

### 9.5.11 National Historic Preservation Act

Potential impacts on historic properties are discussed in Section 4.7.4.2, with one potentially eligible cultural resource identified. As discussed in Section 3.8.6, there is currently no CRMP or UDP in place at PSL.

Section 106 of the NHPA (16 USC 470 et seq.) requires federal agencies having the authority to license any undertaking, prior to issuing the license, to take into account the effect of undertaking on historic properties and to afford the Advisory Council on Historic Preservation and opportunity to comment on the undertaking. Council regulations provide for establishing an agreement with any SHPO to substitute state review for council review (35 CFR 800.7). Although not required of an applicant by federal law or NRC regulation, FPL has invited comment from the Florida SHPO. Attachment D includes a copy FPL correspondence with the Florida SHPO regarding potential effects that PSL SLR might have on historic or cultural resources. In accordance with Section 101(d)(2) of the NHPA, FPL has chosen to initiate consultation with the SHPO-identified tribal historic preservation offices (THPOs), designated representatives of tribes with no THPO, and with Indian tribes that may attach religious and cultural significance to historic properties within Florida.

### 9.5.12 Resource Conservation and Recovery Act

#### 9.5.12.1 Nonradioactive Wastes

As a generator of hazardous wastes, PSL is subject to and complies with RCRA and specific FDEP regulations contained in the site conditions of certification. PSL is classified as a small quantity generator of hazardous waste. As a generator of hazardous wastes, PSL also maintains a hazardous waste generator identification number (Table 9.1-1). For most hazardous waste records, the regulations require that records be retained for at least 3 years from the date the hazardous waste, for which the record pertains, is last shipped offsite. PSL has not received any violations for hazardous wastes management in the past 5 years based on a review of its compliance history.

#### 9.5.12.2 Reportable Spills [40 CFR Part 262]

PSL is subject to the reporting provision of 40 CFR 262.34(d)(5)(iv)(C) as it relates to a fire, explosion, or other releases of hazardous waste which could threaten human health outside the facility boundary or when the facility has knowledge that a spill has reached surface water. Any such events must be reported to the EPA's national response center. Based on a review of records over the previous 5 years (2016–2020), there have been no releases at PSL that triggered this notification requirement.

#### 9.5.12.3 Mixed Wastes

Radioactive materials are regulated by the NRC under the Atomic Energy Act of 1954, and hazardous wastes are regulated by the EPA under the RCRA of 1976. Management of radioactive waste at PSL is discussed in Section 2.2.6. FPL's management of its waste streams is in compliance with applicable regulatory standards and has not resulted in any NOVs for the 2016–2020 timeframe. FPL will continue to store and dispose of hazardous and nonhazardous wastes in accordance with EPA and state regulations and dispose of the wastes in appropriately permitted treatment and disposal facilities during the proposed SLR operating term.

#### 9.5.12.4 Above Ground Storage Tanks [FAC 62-762]

PSL has 12 aboveground storage tanks (ASTs) onsite, four of which have a 550-gallon capacity and the remaining eight with capacities ranging from 2,000 to 18,000 gallons. The ASTs contain new/lube oil, waste oil, gasoline, ultra-low sulfur, and other hazardous substances, and are registered with the FDEP.

### 9.5.13 Pollution Prevention Act

In accordance with the RCRA Section 3002(b) and 40 CFR 262.27, a small or large quantity generator must certify that a waste minimization program is in place to reduce the volume and toxicity of the waste generated to the degree determined to be economically practical. PSL is meeting this requirement as procedural measures are in place to minimize hazardous waste generated to the maximum extent practical.

### 9.5.14 Federal Insecticide, Fungicide, and Rodenticide Act

Commercially approved herbicides may be used to maintain the ROW associated with transmission lines from the facility electric switchyard to existing transmission lines, and to manage the growth of invasive plant species. Maintenance must be performed in accordance with the conditions of certification and any state and federal regulations concerning the use of herbicides. FPL must notify the FDEP of the type of herbicides to be used at least 60 days prior to their first use (FDEP 2020d).

### 9.5.15 Toxic Substances Control Act

The Toxic Substances Control Act of 1976 regulates PCBs [40 CFR Part 761] and asbestos [40 CFR Part 763], both of which may be present at PSL. FPL has a procedure in place that provides guidance for asbestos removal to ensure compliance with state and federal regulations. PSL adheres to the procedure and is in compliance with the PCB and asbestos regulations applicable to the facility.

### 9.5.16 Hazardous Materials Transportation Act

Because PSL ships offsite the hazardous materials regulated by the U.S. Department of Transportation, the facility is subject to and complies with the applicable requirements of the

Hazardous Materials Transportation Act described in 49 CFR, including the requirement to possess a current hazardous materials certificate of registration (Table 9.1-1).

### 9.5.17 Emergency Planning and Community Right-to-Know Act

#### 9.5.17.1 Section 312 Reporting [40 CFR Part 370]

PSL is subject to and complies with Section 312 of the Emergency Planning and Community Right-to-Know Act, which requires the submission of an emergency and hazardous chemical inventory report (Tier II) to the local emergency planning commission, the state emergency response commission, and the local fire department. This report, which typically includes, but is not limited to, chemicals such as ammonium hydroxide, boric acid, $CO_2$, diesel fuel, electrohydraulic fluid, ethylene glycol, gasoline, hydrazine, hydrogen, lube oils, Nalco products, nitrogen, sodium hydroxide, and sulfuric acid, is submitted to these agencies annually. PSL is in compliance with this regulation.

### 9.5.18 Comprehensive Environmental Response, Compensation, and Liability Act

PSL is subject to the hazardous substance release and reporting provisions of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as subsequently amended. Any release of reportable quantities of listed hazardous substances to the environment requires a notification to the EPA's national response center, the FDEP, and subsequent written follow-up within 15 days of the release. Based on a review of records over the previous 5 years (2016–2020), no releases at PSL have triggered this notification requirement.

### 9.5.19 Farmland Protection Policy Act

The Farmland Protection Policy Act (FPPA) only applies to federal programs. The term "federal program" under this act does not included federal permitting or licensing for activities on private or non-federal lands. Therefore, because license renewal is considered a federal licensing activity and PSL is located on non-federal lands, FPPA is not applicable.

### 9.5.20 Federal Aviation Act

Coordination with the Federal Aviation Administration (FAA) is required when it becomes necessary to ensure that the highest structures associated with a project do not impair the safety of aviation. Submission of a letter of notification (with accompanying maps and project description) to the FAA would result in a written response from the FAA certifying that no hazard exits or recommending project changes and/or the installation of warning devices such as lighting.

At PSL, the site elevation is dominated by approximately 200-foot-high reactor containment buildings (FPL 2001). No SLR-related construction activities have been identified; therefore, no new notifications to the FAA are required.

### 9.5.21 Occupational Safety and Health Act

OSHA governs the occupational safety and health of the construction workers and operations staff. PSL and its contractors comply with OSHA's requirements, as these are incorporated in the site's occupational health and safety practices.

### 9.5.22 County Zoning Requirements

PSL is located in unincorporated St. Lucie County, Florida. St. Lucie County has adopted a comprehensive plan to meet the requirements of the Growth Policy; County and Municipal Planning; Land Development Regulation, Chapter 163, Part II (F.S.). The comprehensive plan was last amended in December 2018.

PSL has future land use categories of T/U and R/C according to the comprehensive plan's future land use map. The comprehensive plan's land use categories allow for transportation, utilities, residential, preservation, and/or recreational areas. The operation of PSL is an allowed use under the T/U land designation.

The St. Lucie County land development code has been adopted to implement policies and objectives outlined in the St. Lucie County comprehensive plan and to regulate land development within unincorporated portions of St. Lucie County. As discussed in Section 3.2.1, PSL is zoned both U and R/C. The plant area of the PSL site is zoned U which allows for electric generation plants and associated infrastructure as a permitted use in the code. PSL is in compliance with all zoning requirements, and the SLR project does not represent a change or adjustment to the existing use status.

## 9.6 <u>Environmental Reviews</u>

PSL has procedural controls in place to ensure all environmentally sensitive areas at PSL, if present, are adequately protected during site operation and project planning. These controls, which encompass nonradiological environmental resource areas such as land us, air quality, surface water and groundwater, terrestrial and aquatic ecology, historic and cultural resources, waste management, and pollution prevention consist of the following:

- Appropriate local, state, and/or federal permits are obtained or modified as necessary.
- BMP are implemented to protect wetlands, natural heritage areas, and sensitive ecosystems.
- Appropriate agencies are consulted on matters involving federally and state-listed threatened, endangered, and protected species, and the BMPs are implemented to minimize impacts to these species.

- Appropriate agencies are consulted on matters involving cultural resources and to ensure BMPs are implemented to minimize impact to this resource.

In summary, FPL's administrative controls ensure that appropriate local, state, and/or federal permits are obtained or modified as necessary, that cultural resources and threatened and endangered species are protected if present, and that other regulatory issues are adequately addressed as necessary.

## 9.7 Alternatives

The discussion of alternatives in the ER shall include a discussion of whether alternatives will comply with such applicable environmental quality standard and requirements [10 CFR 51.45(d)]. The ALWR, SMR, NGCC, new nuclear, and solar plant alternatives discussed in Section 7.2.1 would be constructed and operated to comply with all applicable environmental quality standards and requirements. While alternative generation would be developed and operated compliant with standards and requirements, additional environmental impacts associated with siting, construction, and operation would be realized. Continued compliant operation of PSL would not result in these additional impacts.

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## 10.1 Figure References

| No. | Title | References |
|---|---|---|
| 2.2-1 | PSL Typical Water Balance | |
| 2.2-2 | PSL Circulating Water System—Plan View | FDEP 2020 |
| 2.2-3 | PSL Intake Well | |
| 2.2-4 | In-Scope Transmission Lines | USDA 2020a |
| 3.1-1 | PSL Site Layout | USDA 2020a |
| 3.1-2 | PSL Site Area and Topography | USDA 2020a |
| 3.1-3 | 6-Mile Radius of PSL | USCB 2020; USDOT 2021; USGS 2021a |
| 3.1-4 | 50-Mile Radius of PSL | USCB 2020; USDOT 2021; USGS 2021a |
| 3.1-5 | Federal, State, and Local Lands, 6-Mile Radius | SLC 2020; USCB 2020; USDA 2020a; USDOT 2021; USGS 2021a |
| 3.1-6 | Federal, State, and Local Lands, 50-Mile Radius | SLC 2020; USCB 2020; USDA 2020a; USDOT 2021; USGS 2021a |
| 3.2-1 | Land Use/Land Cover, PSL Site | MRLC 2020; USGS 2021a |
| 3.2-2 | Land Use/Land Cover, 6-Mile Radius of PSL | MRLC 2020; USGS 2021a |
| 3.3-1 through 3.3-5 | PSL Wind Roses 2015–2019 | |
| 3.5-1 | Physiographic Provinces Associated with the PSL Site | USCB 2020; USGS 2020a; USGS 2021b |
| 3.5-2 | Surficial Geology Map, PSL Property | ESRI 2021; USGS 2021b |
| 3.5-3a through 3.5-3d | Hydrological Cross-Section Locations on PSL Site<br>Cross Section A_A'<br>Cross Section B_B'<br>Cross Section C_C' | |
| 3.5-4 | Distribution of Soil Units, PSL Property | USDA 2020a; USDA 2020b |
| 3.5-5 | Historic Seismic Events, 1879-2020 | ESRI 2021; USCB 2020; USGS 2020b |
| 3.6-1 | Vicinity Hydrologic Features | USCB 2020; USGS 2021a |
| 3.6-2 | FEMA Floodplain Zones at PSL | FEMA 2020; FEMA 2021; USDA 2020 |
| 3.6-3 | NPDES Outfalls | USDA 2020a; |
| 3.6-4 | Average Condenser Intake Temperature | |

| No. | Title | References |
|---|---|---|
| 3.6-5 | Average Condenser Discharge Temperature | |
| 3.6-6 | Onsite Wells | USDA 2020a |
| 3.6-7 | November 2016 Potentiometric Map | USDA 2020a |
| 3.6-8 | Offsite Registered Water Wells within 5 Miles of PSL Boundary | ESRI 2021; FDEP 2021; USCB 2020a |
| 3.7-1 | NWI Wetlands, 6-Mile Radius | ESRI 2021; USCB 2020; USFWS 2021 |
| 3.7-2 | NWI Wetlands, Site | USDA 2020a; USFWS 2021 |
| 3.7-3 | Critical Habitat | ESRI 2021; USCB 2020; USFWS 2020 |
| 3.7-4 | Essential Fish Habitat | ESRI 2021; USCB 2020; NOAA 2020 |
| 3.8-1 | Government Land Office 1845 Hutchinson Island Map | BLM 2021 |
| 3.8-2 | FPL Property, 1950 | USGS 2020c |
| 3.8-3 | FPL Property, 1971 | USGS 2020c |
| 3.8-4 | NRHP-Listed Resources within 6 Miles of PSL | USCB 2020 |
| 3.8-5 through 3.8-8 | Historical Photos of Plant Construction | |
| 3.11-1 through 3.11-12 | EJ Figures Minority Populations | USCB 2020; USCB 2021 |
| 3.11-13 through 3.11-16 | EJ Figures Low-Income Populations | USCB 2020; USCB 2021 |

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# Attachment A: NRC NEPA Issues for License Renewal

# NRC NEPA Issues for License Renewal of Nuclear Power Plants

*St. Lucie Nuclear Plant Units 1 and 2 Environmental Report*

## NRC NEPA Issues for License Renewal of Nuclear Power Plants

Florida Power & Light Company (FPL) has prepared this environmental report (ER) in accordance with the requirements of U.S. Nuclear Regulatory Commission (NRC) regulation 10 CFR 51.53. The NRC included in the regulation the list of 78 National Environmental Policy Act (NEPA) issues for license renewal of nuclear power plants that were identified in the 2013 GEIS (Appendix B to Subpart A of 10 CFR Part 51, Table B-1).

The following table lists the 78 issues from 10 CFR Part 51, Appendix B, Table B-1, and identifies the section in this ER in which FPL addresses each issue.

## Table A-1 PSL ER Cross-Reference of License Renewal NEPA Issues

| No. | Issue[a] | Category | ER Section | GEIS Cross Reference (Section/Page)[b] |
|---|---|---|---|---|
| | **Land Use** | | | |
| 1 | Onsite land use | 1 | 4.1 | 4.2.1.1/4-6 |
| 2 | Offsite land use | 1 | 4.1 | 4.2.1.1/4-7 |
| 3 | Offsite land use in transmission line rights-of-way | 1 | 4.0.1 | 4.2.1.1/4-6 |
| | **Visual Resources** | | | |
| 4 | Aesthetic impacts | 1 | 4.1 | 4.2.1.2/4-9 |
| | **Air Quality** | | | |
| 5 | Air quality (all plants) | 1 | 4.2 | 4.3.1.1/4-14 |
| 6 | Air quality effects of transmission lines | 1 | 4.2 | 4.3.1.1/4-14 |
| | **Noise** | | | |
| 7 | Noise impacts | 1 | 4.3 | 4.3.1.2/4-19 |
| | **Geologic Impacts** | | | |
| 8 | Geology and soils | 1 | 4.4 | 4.4/4-29 |
| | **Surface Water Resources** | | | |
| 9 | Surface water use and quality (non-cooling system impacts) | 1 | 4.5 | 4.5.1.1/4-30 |
| 10 | Altered current patterns at intake and discharge structures | 1 | 4.5 | 4.5.1.1/4-36 |
| 11 | Altered salinity gradients | 1 | 4.0.1 | 4.5.1.1/4-36 |
| 12 | Altered thermal stratification of lakes | 1 | 4.5 | 4.5.1.1/4-37 |
| 13 | Scouring caused by discharged cooling water | 1 | 4.5 | 4.5.1.1/4-38 |
| 14 | Discharge of metals in cooling system effluent | 1 | 4.5 | 4.5.1.1/4-38 |
| 15 | Discharge of biocides, sanitary wastes, and minor chemical spills | 1 | 4.5 | 4.5.1.1/4-39 |
| 16 | Surface water use conflicts (plants with once-through cooling systems) | 1 | 4.5 | 4.5.1.1/4-40 |
| 17 | Surface water use conflicts (plants with cooling ponds, or cooling towers using makeup water from a river) | 2 | 4.5.1 | 4.5.1.1/4-41 |
| 18 | Effects of dredging on surface water quality | 1 | 4.5 | 4.5.1.1/4-42 |
| 19 | Temperature effects on sediment transport capacity | 1 | 4.5 | 4.5.1.1/4-43 |
| | **Groundwater Resources** | | | |
| 20 | Groundwater contamination and use (non-cooling system impacts) | 1 | 4.5 | 4.5.1.2/4-45 |
| 21 | Groundwater use conflicts (plants that withdraw <100 gpm) | 1 | 4.5 | 4.5.1.2/4-47 |

| No. | Issue(a) | Category | ER Section | GEIS Cross Reference (Section/Page)(b) |
|---|---|---|---|---|
| 22 | Groundwater use conflicts (plants that withdraw >100 gpm) | 2 | 4.5.3 | 4.5.1.2/4-48 |
| 23 | Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river) | 2 | 4.5.2 | 4.5.1.2/4-48 |
| 24 | Groundwater quality degradation resulting from water withdrawals | 1 | 4.5 | 4.5.1.2/4-49 |
| 25 | Groundwater quality degradation (plants with cooling ponds in salt marshes) | 1 | 4.0.1 | 4.5.1.2/4-50 |
| 26 | Groundwater quality degradation (plants with cooling ponds at inland sites) | 2 | 4.5.4 | 4.5.1.2/4-51 |
| 27 | Radionuclides released to groundwater | 2 | 4.5.5 | 4.5.1.2/4-51 |
| | **Terrestrial Resources** | | | |
| 28 | Effects on terrestrial resources (non-cooling system impacts) | 2 | 4.6.5 | 4.6.1.1/4-59 |
| 29 | Exposure of terrestrial organism to radionuclides | 1 | 4.6 | 4.6.1.1/4-61 |
| 30 | Cooling system impacts on terrestrial resources (plants with once-through cooling systems or cooling ponds) | 1 | 4.6 | 4.6.1.1/4-64 |
| 31 | Cooling tower impacts on vegetation (plants with cooling towers) | 1 | 4.0.1 | 4.6.1.1/4-69 |
| 32 | Bird collisions with plant structures and transmission lines | 1 | 4.6 | 4.6.1.1/4-70 |
| 33 | Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river) | 2 | 4.6.4 | 4.6.1.1/4-75 |
| 34 | Transmission line ROW management impacts on terrestrial resources | 1 | 4.6 | 4.6.1.1/4-75 |
| 35 | Electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock) | 1 | 4.6 | 4.6.1.1/4-80 |
| | **Aquatic Resources** | | | |
| 36 | Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds) | 2 | 4.6.1 | 4.6.1.2/4-87 |
| 37 | Impingement and entrainment of aquatic organisms (plants with cooling towers) | 1 | 4.0.1 | 4.6.1.2/4-92 |
| 38 | Entrainment of phytoplankton and zooplankton (all plants) | 1 | 4.6 | 4.6.1.2/4-93 |
| 39 | Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds) | 2 | 4.6.2 | 4.6.1.2/4-94 |

| No. | Issue[a] | Category | ER Section | GEIS Cross Reference (Section/Page)[b] |
|---|---|---|---|---|
| 40 | Thermal impacts on aquatic organisms (plants with cooling towers) | 1 | 4.0.1 | 4.6.1.2/4-96 |
| 41 | Infrequently reported thermal impacts (all plants) | 1 | 4.6 | 4.6.1.2/4-97 |
| 42 | Effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication | 1 | 4.6 | 4.6.1.2/4-100 |
| 43 | Effects of non-radiological contaminants on aquatic organisms | 1 | 4.6 | 4.6.1.2/4-103 |
| 44 | Exposure of aquatic organisms to radionuclides | 1 | 4.6 | 4.6.1.2/4-105 |
| 45 | Effect of dredging on aquatic organisms | 1 | 4.6 | 4.6.1.2/4-107 |
| 46 | Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river) | 2 | 4.6.3 | 4.6.1.2/4-109 |
| 47 | Effects on aquatic resources (non-cooling system impacts) | 1 | 4.6 | 4.6.1.2/4-110 |
| 48 | Impacts of transmission line ROW management on aquatic resources | 1 | 4.6 | 4.6.1.2/4-112 |
| 49 | Losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses | 1 | 4.6 | 4.6.1.2/4-110 |
| | **Special Status Species and Habitats** | | | |
| 50 | Threatened, endangered, and protected species and essential fish habitat | 2 | 4.6.6 | 4.6.1.3/4-115 |
| | **Historic and Cultural Resources** | | | |
| 51 | Historic and cultural resources | 2 | 4.7 | 4.7.1/4-122 |
| | **Socioeconomics** | | | |
| 52 | Employment and income, recreation and tourism | 1 | 4.8 | 4.8.1.1/4-127 |
| 53 | Tax revenues | 1 | 4.8 | 4.8.1.1/4-128 |
| 54 | Community services and education | 1 | 4.8 | 4.8.1.1/4-129 |
| 55 | Population and housing | 1 | 4.8 | 4.8.1.1/4-130 |
| 56 | Transportation | 1 | 4.8 | 4.8.1.1/4-131 |
| | **Human Health** | | | |
| 57 | Radiation exposures to the public | 1 | 4.9 | 4.9.1.1.1/4-140 |
| 58 | Radiation exposures to plant workers | 1 | 4.9 | 4.9.1.1.1/4-136 |
| 59 | Human health impacts from chemicals | 1 | 4.9 | 4.9.1.1.2/4-147 |
| 60 | Microbiological hazards to the public (plants that use cooling ponds, lake, or canals or that discharge to a river)[c] | 2 | 4.9.1 | 4.9.1.1.3/4-149 |
| 61 | Microbiological hazards to plant workers | 1 | 4.9 | 4.9.1.1.3/4-149 |
| 62 | Chronic effects of electromagnetic fields | UC | 4.0.3 | 4.9.1.1.4/4-150 |
| 63 | Physical occupational hazards | 1 | 4.9 | 4.9.1.1.5/4-156 |
| 64 | Electric shock hazards | 2 | 4.9.2 | 4.9.1.1.5/4-156 |

| No. | Issue[a] | Category | ER Section | GEIS Cross Reference (Section/Page)[b] |
|---|---|---|---|---|
| | **Postulated Accidents** | | | |
| 65 | Design-basis accidents | 1 | 4.15.1 | 4.9.1.2/4-158 |
| 66 | Severe accidents | 2 | 4.15.2 | 4.9.1.2/4-158 |
| | **Environmental Justice** | | | |
| 67 | Minority and low-income populations | 2 | 4.10.1 | 4.10.1/4-167 |
| | **Waste Management** | | | |
| 68 | Low-level waste storage and disposal | 1 | 4.11 | 4.11.1.1/4-171 |
| 69 | Onsite storage of spent nuclear fuel | 1 | 4.11 | 4.11.1.2/4-172 |
| 70 | Offsite radiological impacts of spent nuclear fuel and high-level waste disposal | 1 | 4.11 | 4.11.1.3/4-175 |
| 71 | Mixed waste storage and disposal | 1 | 4.11 | 4.11.1.4/4-178 |
| 72 | Non-radioactive waste storage and disposal | 1 | 4.11 | 4.11.1.5/4-179 |
| | **Cumulative Impacts** | | | |
| 73 | Cumulative impacts | 2 | 4.12 | 4.13/4-243 |
| | **Uranium Fuel Cycle** | | | |
| 74 | Offsite radiological impacts–individual impacts from other than the disposal of spent fuel and high-level waste | 1[d] | 4.13 | 4.12.1.1/4-193 |
| 75 | Offsite radiological impacts–collective impacts from other than the disposal of spent fuel and high-level waste | 1 | 4.13 | 4.12.1.1/4-194 |
| 76 | Non-radiological Impacts of the uranium fuel cycle | 1 | 4.13 | 4.12.1.1/4-194 |
| 77 | Transportation | 1 | 4.13 | 4.12.1.1/4-196 |
| | **Termination of Nuclear Power Plant Operations and Decommissioning** | | | |
| 78 | Termination of plant operations and decommissioning | 1 | 4.14 | 4.12.2.1/4-201 |

a) 10 CFR 51, Subpart A, Appendix A, Table B-1 (issue numbers added to facilitate discussion).

b) Generic Environmental Impact Statement for License Renewal of Nuclear Plants (NUREG-1437, Rev 1).

c) Wording from [10 CFR 51.53(c)(3)(ii)(G)].

d) SECY-14-0072 (July 21, 2014).

UC = uncategorized (categorization and impact finding definitions do not apply to the issue).

# Attachment B: PSL NPDES Permit

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOTICE OF PERMIT REVISION

The Department of Environmental Protection gives notice of its issuance of a National Pollutant Discharge Elimination System (NPDES) permit revision (DEP File Number FL0002208-021-IWB) to Florida Power & Light Company for St. Lucie Power Plant, under Chapter 403, Florida Statutes.

The permit and application file are available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at the Department's Wastewater Management Program, 2600 Blair Stone Road, M.S. 3545, Tallahassee, Florida 32399-2400, at phone number (850)245-8589.

## NOTICE OF RIGHTS

This action is final and effective on the date filed with the Clerk of the Department unless a petition for an administrative hearing is timely filed under Sections 120.569 and 120.57, F.S., before the deadline for filing a petition. On the filing of a timely and sufficient petition, this action will not be final and effective until further order of the Department. Because the administrative hearing process is designed to formulate final agency action, the hearing process may result in a modification of the agency action or even denial of the application.

Petition for Administrative Hearing

A person whose substantial interests are affected by the Department's action may petition for an administrative proceeding (hearing) under Sections 120.569 and 120.57, F.S. Pursuant to Rules 28-106.201 and 28-106.301, F.A.C., a petition for an administrative hearing must contain the following information:

(a) The name and address of each agency affected and each agency's file or identification number, if known;
(b) The name, address, any e-mail address, any facsimile number, and telephone number of the petitioner, if the petitioner is not represented by an attorney or a qualified representative; the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests will be affected by the agency determination;
(c) A statement of when and how the petitioner received notice of the agency decision;
(d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate;
(e) A concise statement of the ultimate facts alleged, including the specific facts that the petitioner contends warrant reversal or modification of the agency's proposed action;
(f) A statement of the specific rules or statutes that the petitioner contends require reversal or modification of the agency's proposed action, including an explanation of how the alleged facts relate to the specific rules or statutes; and

(g) A statement of the relief sought by the petitioner, stating precisely the action that the petitioner wishes the agency to take with respect to the agency's proposed action.

The petition must be filed (received by the Clerk) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000, or via electronic correspondence at Agency_Clerk@dep.state.fl.us. Also, a copy of the petition shall be mailed to the applicant at the address indicated above at the time of filing.

Time Period for Filing a Petition

Petitions filed by any persons other than the applicant, and other than those entitled to written notice under Section 120.60(3), F.S., must be filed within 14 days of publication of the notice or within 14 days of receipt of the written notice, whichever occurs first. The failure to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under Sections 120.569 and 120.57, F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention (in a proceeding initiated by another party) will be only at the discretion of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205, F.A.C.

Extension of Time

Under Rule 62-110.106(4), F.A.C., a person whose substantial interests are affected by the Department's action may also request an extension of time to file a petition for an administrative hearing. The Department may, for good cause shown, grant the request for an extension of time.Requests for extension of time must be filed with the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000, or via electronic correspondence at Agency_Clerk@dep.state.fl.us, before the deadline for filing a petition for an administrative hearing. A timely request for extension of time shall toll the running of the time period for filing a petition until the request is acted upon.

Mediation

Mediation is not available in this proceeding.

Judicial Review

Once this decision becomes final, any party to this action has the right to seek judicial review pursuant to Section 120.68, F.S., by filing a Notice of Appeal pursuant to Florida Rules of Appellate Procedure 9.110 and 9.190 with the Clerk of the Department in the Office of General Counsel (Station #35, 3900 Commonwealth Boulevard, Tallahassee, Florida 32399-3000) and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate district court of appeal. The notice must be filed within 30 days from the date this action is filed with the Clerk of the Department.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

# STATEMENT OF BASIS FOR PERMIT REVISION

Permit Number: FL0002208
DEP File No.: FL0002208-021-IWB
Permit Writer: Tien-Shuenn Wu, P.E.

Application Date: November 27, 2019
Publication Date: February 21, 2020 (Notice of Draft)

## 1. SYNOPSIS OF APPLICATION

A. Name and Address of Applicant

Florida Power & Light Company
6501 S. Ocean Drive
Jensen Beach, Florida
34957

For:

St. Lucie Power Plant Units 1 and 2
6501 S. Ocean Drive (South State Road A1A)
St. Lucie County
Jensen Beach, Florida 34957

B. Description of Proposed Activity:

The Department received a minor permit revision request on November 27, 2019, from Florida Power & Light (FPL) requesting the addition of Chlorine Dioxide ($ClO_2$) as a permanently approved biocide. As part of the Chlorine Optimization Study required by Permit Condition VI.5, the plant conducted a pilot trial using the Nalco Purate System to examine the benefit of using Chlorine Dioxide to prevent biofouling in lieu of using Sodium Hypochlorite (NaClO). Both Adenosine Triphosphate (ATP) and residual chlorine analyses during the study showed improved biocide effectiveness on a microbiological level. Condenser inspections performed confirmed that enhanced disinfection and macro biological fouling prevention was achieved with this alternative biocide.

The Department also received an email revision request on December 4, 2019 requesting a reduction in sampling frequency for Flow, Total Suspended Solids (TSS), Hydrazine, Carbohydrazide, and Oil and Grease at Internal Outfall I-005 from weekly to monthly. The reductions were based on applying and incorporating the minimum criteria for surface water internally to I-005 in permit condition I.B.5 as described below.

C. Changes to Existing NPDES Permit:

(1) Page 3, Permit Condition I.A.1. Chlorine Dioxide monitoring was added based on approval for continued use.

(2) Page 8, Permit Conditions I.A.18-19. These conditions contain monitoring, sampling, and reporting requirements for chlorine dioxide.

(3) Page 9, Permit Condition I.B.3. The sampling frequencies for Flow, Total Suspended Solids, Hydrazine, Carbohydrazide, and Oil & Grease for Internal Outfall I-005 were reduced from

weekly to monthly.

(4) Page 10, Permit Condition I.B.5. The condition was revised to incorporate minimum criteria applicable to surface waters in accordance with Rule 63-302.500(1)(a), F.A.C., internally to I-005.

(5) Pages 14-15, Permit Condition I.C.9. The condition was revised authorizing the use of Chlorine Dioxide with seasonal dosing rates. Sodium Hypochlorite usage was revised to include seasonal dosing rates.

D. Other Comments

Dr. Timothy A Parsons, Director, from the Division of Historical Resources & State Historic Preservation Office had comments on March 19, 2020:

- Based on the information provided, it is their understanding that this permit, if issued, does not authorize any new construction or ground disturbing activities.

- It is the opinion of their office that the proposed project will likely have no effect on historic properties listed, or eligible for listing, on the National Register of Historic Places, or that are otherwise significant to Florida's history or prehistory.

This constitutes Revision C (Rev. C) to the permit. All changes to the permit are noted in Rev. C by italics and underline or strike-through.

# STATE OF FLORIDA
# INDUSTRIAL WASTEWATER FACILITY PERMIT

| | | | |
|---|---|---|---|
| **PERMITTEE:** | | **PERMIT NUMBER:** | FL0002208 (Major) *Rev.C* |
| Florida Power & Light (FPL) | | **FILE NUMBER:** | FL0002208-017-IW1S |
| | | **ISSUANCE DATE:** | **November 4, 2016** |
| | | **REVISION DATE:** | **May 21, 2020** |
| **RESPONSIBLE OFFICIAL:** | | **EXPIRATION DATE:** | **November 3, 2021** |

Richard L. Anderson
Vice President
6501 S. Ocean Drive
Jensen Beach, Florida 34957

**FACILITY:**

St. Lucie Power Plant Units 1 and 2
Hutchinson Island
St. Lucie County, Florida
Latitude: See Note Below        Longitude: See Note Below

Note: Latitude and longitude are not shown at the permittee's request, for purposes of Homeland Security pursuant to federal regulations found at 18 CFR 388.113(c)(i) and (ii) and by Presidential Directive dated December 17, 2003.

This permit is issued under the provisions of Chapter 403, Florida Statutes (F.S.), and applicable rules of the Florida Administrative Code (F.A.C.) and constitutes authorization to discharge to waters of the state under the National Pollutant Discharge Elimination System. This permit does not constitute authorization to discharge wastewater other than as expressly stated in this permit. The above-named permittee is hereby authorized to operate the facilities in accordance with the documents attached hereto and specifically described as follows:

**FACILITY DESCRIPTION:**

The plant is located in St. Lucie County on Hutchinson Island, Jensen Beach, Florida. The existing facility consists of two nuclear powered steam electric generating units (Unit 1 and Units 2) with a total generating capacity of 1908 megawatts. The plant has a once-through cooling water (OTCW) system and auxiliary equipment cooling water (AECW) system that uses water from the Atlantic Ocean, a Class III marine water body, to remove heat from the main condensers and discharged to the plant's discharge canal.

Cooling water gravity flows from the Atlantic Ocean through three offshore intake structures into the intake canal. The water is then pumped through the main condensers for each unit. Heated cooling water is released to the discharge canal and back to the Atlantic Ocean through existing offshore Y and multi-port diffusers.

Units 1 and 2 are also regulated under the Florida Electrical Power Plant Siting Act (License No. PA74-02).

The radioactive component of the discharge is regulated by the U.S. Nuclear Regulatory Commission under the Atomic Energy Act, and not by the Department or the U.S. Environmental Protection Agency under the Clean Water Act.

**WASTEWATER TREATMENT:**

The wastewater generated at the facility consists of once-through cooling water, steam generator blowdown, liquid radiation waste, intake screen wash wastewater, and stormwater associated with industrial activity. Units 1 and 2 cooling water and auxiliary equipment cooling water (AECW) are treated by chlorination with biofouling control, and by using sodium molybdate, sodium nitrite and tolytriazole. Equipment area storm water is routed through an oil/water separator prior to discharge to the stormwater basins and then to the Intake Canal through the Southeast Basin. Low volume waste (LVW) (consisting of water treatment system wastewater, steam generator/boiler blowdown, and equipment area floor drainage), non-radioactive wastes/liquid radiation waste, and stormwater associated with industrial activity are treated by chemical/physical processes including neutralization, settling, ion exchange and micro filtration. Non-industrial stormwater and intake screen wash water are discharged without treatment.

# I. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

## A. Surface Water Discharges

1. During the period beginning on the issuance date and lasting through the expiration date of this permit, the permittee is authorized to discharge **once-through non-contact cooling water and auxiliary equipment cooling water** from **Outfall D-001** to the Atlantic Ocean. Such discharge shall be limited and monitored by the permittee as specified below and reported in accordance with Permit Condition I.C.3.:

| | | | Effluent Limitations | | Monitoring Requirements | | | |
|---|---|---|---|---|---|---|---|---|
| Parameter | Units | Max/ Min | Limit | Statistical Basis | Frequency of Analysis | Sample Type | Monitoring Site Number | Notes |
| Flow | MGD | Max | Report | Daily Maximum | Hourly | Pump Logs | FLW-1 | |
| Chlorination Duration | min | Max | 120 | Daily Maximum | Daily; 24 hours | Logs | EFF-1 | See I.A.8 and VI.6 |
| Oxidants, Total Residual | mg/L | Max<br>Max | 0.10<br>0.10 | Daily Maximum<br>Monthly Average | Continuous | Recorder | EFF-2 | See I.A.6, I.A.7, and VI.5 |
| Temperature, Water (During Normal Operation) | Deg F | Max | 115 | Daily Maximum | Hourly | Recorder | EFF-2 | See I.A.4 and I.A.5 |
| Temperature, Water (During Maintenance Activities) | Deg F | Max | 117 | Daily Maximum | Hourly | Recorder | EFF-2 | See I.A.4 and I.A.5 |
| Temp. Diff. between Intake and Discharge (During Normal Operation) | Deg F | Max | 30 | Daily Maximum | Hourly | Calculated | INT-1<br>EFF-2 | See I.A.4 and I.A.5 |
| Temp. Diff. between Intake and Discharge (During Maintenance Activities) | Deg F | Max | 32 | Daily Maximum | Hourly | Calculated | INT-1<br>EFF-2 | See I.A.4 and I.A.5 |
| Nitrogen, Ammonia, Total (as N) | mg/L | Max | Report | Single Sample | Quarterly | Grab | EFF-2<br>INT-1 | |
| Nitrogen, Kjeldahl, Total (as N) | mg/L | Max | Report | Single Sample | Quarterly | Grab | EFF-2<br>INT-1 | |
| Nitrite plus Nitrate, Total (as N) | mg/L | Max | Report | Single Sample | Quarterly | Grab | EFF-2<br>INT-1 | |
| Nitrogen, Total | mg/L | Max | Report | Single Sample | Quarterly | Grab | EFF-2<br>INT-1 | |
| Phosphorus, Total (as P) | mg/L | Max | Report | Single Sample | Quarterly | Grab | EFF-2<br>INT-1 | |
| Phosphate, Ortho (as PO4) | mg/L | Max | Report | Single Sample | Quarterly | Grab | EFF-2<br>INT-1 | |
| Chronic Whole Effluent Toxicity, 7-Day IC25 (Mysidopsis bahia) | percent | Min | 100 | Single Sample | Semi- annually | 24-hr TPC | EFF-2 | See I.A.13 |
| Chronic Whole Effluent Toxicity, 7-Day IC25 (Menidia beryllina) | percent | Min | 100 | Single Sample | Semi- annually | 24-hr TPC | EFF-2 | See I.A.13 |
| *<u>Chlorine Dioxide</u>* | *<u>mg/L</u>* | *<u>Max</u>* | *<u>Report</u>* | *<u>Daily Maximum</u>* | *<u>Monthly</u>* | *<u>Grab</u>* | *<u>See I.A.18</u>* | *<u>See I.A.18, and I.A.19</u>* |

2. Effluent samples shall be taken at the monitoring site locations listed in Permit Condition I.A.1. and as described below:

| Monitoring Site Number | Description of Monitoring Site |
|---|---|
| FLW-1 | Pump log or recorder. |

by a repeat valid test initiated within 21 days after the last day of the invalid test, the invalid test will not be counted against the requirement for four consecutive quarterly valid routine tests for the purpose of terminating the plan.

(4) If chronic toxicity test results indicate greater than 50% mortality within 96 hours in an effluent concentration equal to or less than the effluent concentration specified as the acute toxicity limit in 15.(a)(2), the Department may revise this permit to require acute definitive whole effluent toxicity testing.

(5) The additional follow-up testing and the plan do not preclude the Department taking enforcement action for acute or chronic whole effluent toxicity failures.

*[62-4.241, 62-620.620(3)]*

16. The withdrawal of water for the testing and functioning of the emergency cooling systems for the St. Lucie Plant from that portion of the Indian River known as Big Mud Creek shall be in accordance with the following:

a. Testing of the alternate emergency cooling systems not to exceed 4,000,000 gallons per calendar year.

b. Flow of water in the alternate emergency cooling system, in the event that the main source of emergency cooling water from the Atlantic Ocean is not available, shall not exceed 60,000 gallons per minute, and may continue until the main source of emergency cooling water has been restored.

c. The permittee shall notify the Southeast District Office of the Department prior to each test of the emergency cooling canal system and shall also notify the Department of any use of the emergency cooling canal system lasting more than twelve hours.

d. Starting with the issuance of this permit, all pertinent flow and length of time information associated with withdrawal of water from Big Mud Creek shall be kept on site in accordance with permit Condition V.2 and made available to Department inspectors upon request.

17. The permittee shall submit annually to the Department the "Annual Radiological Environmental Operating Report", along with the summarized monitoring results for gross alpha particle activity and total radium 226+radium 228 from the report.

*<u>18. Once per month for the next six months, the permittee shall collect grab samples from one condenser train cleaning sample port(s). The samples shall be collected every 15 minutes starting when treatment begins on one condenser train and extending for 30 minutes after treatment ends for that condenser train. The condenser train being treated, time treatment begins and ends, and the times of collection for all samples shall be recorded and submitted with the chlorine dioxide ($ClO_2$) results for the condenser being treated. All grab samples shall be tested immediately for chlorine dioxide ($ClO_2$) by Hach Method 10126. Sample hold time shall not exceed 10 minutes. Instrument calibration, calibration verification, and chronological calibration verification data shall be included with the sampling data submitted to the Department. The permittee shall submit sampling results to the Department's Tallahassee Wastewater Management Program within 30 days of sample collection. Each month, samples shall be collected from a different condenser train to demonstrate that chlorine dioxide data is being collected from each condenser train at least once during the six months sampling period.</u>*

*<u>19. Prior to permit renewal and using the results from 18 above, conservatively estimate (based on dilution) the chlorine dioxide concentration at EFF-2, and conservatively estimate (based on dilution) the distance beyond EFF-2 required to achieve $ClO_2$ at a level of $< 0.01$ mg/L.</u>*

## B. Internal Outfalls

1. During the period beginning on the issuance date and lasting through the expiration date of this permit, the permittee is authorized to discharge **process wastewater and monitoring well sample purge water** from **Internal Outfall I-003** to the onsite discharge canal. Such discharge shall be limited and monitored by the permittee as specified below and reported in accordance with Permit Condition I.C.3.:

| | Effluent Limitations | Monitoring Requirements |
|---|---|---|

| Parameter | Units | Max/ Min | Limit | Statistical Basis | Frequency of Analysis | Sample Type | Monitoring Site Number | Notes |
|---|---|---|---|---|---|---|---|---|
| Flow | MGD | Max<br>Max | Report<br>Report | Daily Maximum<br>Monthly Average | Per batch of process | Calculated | OUI-1 | |
| Oil and Grease | mg/L | Max<br>Max | 15.0<br>20.0 | Monthly Average<br>Daily Maximum | Annually | Grab | OUI-1 | |
| Solids, Total Suspended | mg/L | Max<br>Max | 30.0<br>100.0 | Monthly Average<br>Daily Maximum | Per batch of process | Grab | OUI-1 | |

2. Effluent samples shall be taken at the monitoring site locations listed in Permit Condition I.B.1. and as described below:

| **Monitoring Site Number** | **Description of Monitoring Site** |
|---|---|
| OUI-1 | Discharge from the radiation waste system prior to mixing with any other waste stream. |

3. During the period beginning on the issuance date and lasting through the expiration date of this permit, the permittee is authorized to discharge **steam generator blowdown,** ***including a minor side stream through the blowdown sample panel*****,** from **Internal Outfall I-005** to the onsite discharge canal. Such discharge shall be limited and monitored by the permittee as specified below and reported in accordance with Permit Condition I.C.3.:

| | | | **Effluent Limitations** | | **Monitoring Requirements** | | | |
|---|---|---|---|---|---|---|---|---|
| Parameter | Units | Max/ Min | Limit | Statistical Basis | Frequency of Analysis | Sample Type | Monitoring Site Number | Notes |
| Flow | MGD | Max<br>Max | Report<br>Report | Daily Maximum<br>Monthly Average | ~~Weekly~~ *Monthly*, when discharging | Calculated | OUI-2 | See I.B.5 |
| | | Max | Report | Daily Maximum | Monthly | Calculated[1] | CAL-1 | See I.B.6 |
| Oil and Grease | mg/L | Max<br>Max | 15.0<br>20.0 | Monthly Average<br>Daily Maximum | ~~Weekly~~ *Monthly*, when discharging | Grab | OUI-2 | See I.B.5 |
| | | Max<br>Max | 15.0<br>20.0 | Monthly Average<br>Daily Maximum | Quarterly | Grab | OUI-7 | See I.B.6 |
| Solids, Total Suspended | mg/L | Max<br>Max | 30.0<br>100.0 | Monthly Average<br>Daily Maximum | ~~Weekly~~ *Monthly*, when discharging | Grab | OUI-2 | See I.B.5 |
| | | Max<br>Max | 30.0<br>100.0 | Daily Maximum<br>Monthly Average | Quarterly | Grab | OUI-7 | See I.B.6 |
| Hydrazine | mg/L | Max | 0.30 | Daily Maximum | ~~Weekly~~ *Monthly*, when discharging | Grab | EFF-2 | See I.B.5, I.B.7, and I.B.8 |
| Carbohydrazide | mg/L | Max | Report | Daily Maximum | ~~Weekly~~ *Monthly*, when discharging | Grab | EFF-2 | See I.B.5, I.B.7, and I.B.8 |

4. Effluent samples shall be taken at the monitoring site locations listed in Permit Condition I.B.3. and as described below:

| **Monitoring Site Number** | **Description of Monitoring Site** |
|---|---|

[1] Flow from the lab sample panel shall consist of a sum of the flow meter readings from the 1-inch pipes and the calculated flow from the 2-inch pipe. The sum of all three flows shall be reported on the Discharge Monitoring Report.

| | |
|---|---|
| OUI-2 | Discharge from I-005 prior to entering the discharge canal. |
| OUI-7 | At the laboratory sample panel prior to entering the blowdown tank. |
| EFF-2 | Within the discharge canal upstream of the discharge piping to the Atlantic Ocean. |
| CAL-1 | Calculation of the flow rate. |

5. Monitoring Location OUI-2 for Internal Outfall I-005 shall be monitored once per discharge event or once per ~~week~~ *month* when discharging steam generator blowdown, whichever is more frequent, unless there is no discharge for that week. Total volume of batch and period of discharge shall be reported.

   *The discharge shall not contain components that, alone or in combination with other substances or in combination with other components of the discharge:*

   *a. Settle to form putrescent deposits or otherwise create a nuisance; or*

   *b. Float as debris, scum, oil, or other matter in such amounts as to form nuisances; or*

   *c. Produce color, odor, taste, turbidity, or other conditions in such degree as to create a nuisance; or*

   *d. Are acutely toxic; or*

   *e. Are present in concentrations which are carcinogenic, mutagenic, or teratogenic to human beings or to significant, locally occurring, wildlife or aquatic species, unless specific standards are established for such components in subsection 62-302.500(2) or Rule 62-302.530, F.A.C.; or*

   *f. Pose a serious danger to the public health, safety, or welfare.*

   *[62-302.500(1)(a)]*

6. Hydrazine and Carbohydrazide shall be monitored once per batch by a grab sample during wet lay-up discharges that result from the start-up of a unit following a refueling outage.

7. A grab sample shall be taken at the discharge of the steam generator to the discharge canal and the following calculations shall be used to determine the concentration from the discharge canal to the Atlantic Ocean [point of discharge (POD)].

$$\text{Hydrazine at POD (mg/L)} = \frac{\text{Steam Generator Flow (MGD) x Blowdown Hydrazine Concentration (mg/L)}}{\text{Once-Through Cooling Water Flow (MGD)}}$$

$$\text{Carbohydrazide at POD (mg/L)} = \frac{\text{Steam Generator Flow (MGD) x Blowdown Carbohydrazide Concentration (mg/L)}}{\text{Once-Through Cooling Water Flow (MGD)}}$$

8. During the period beginning on the issuance date and lasting through the expiration date of this permit, the permittee is authorized to discharge **stormwater and water treatment plant reverse osmosis reject** from **Internal Outfall I-008** to the intake canal. Such discharge shall be limited and monitored by the permittee as specified below and reported in accordance with Permit Condition I.C.3.:

| | | | **Effluent Limitations** | | **Monitoring Requirements** | | | |
|---|---|---|---|---|---|---|---|---|
| Parameter | Units | Max/ Min | Limit | Statistical Basis | Frequency of Analysis | Sample Type | Monitoring Site Number | Notes |
| Flow | MGD | Max<br>Max | Report<br>Report | Daily Maximum<br>Monthly Average | Weekly, when discharging | Calculated | OUI-5 | |
| Solids, Total Suspended | mg/L | Max<br>Max | 30.0<br>100.0 | Monthly Average<br>Daily Maximum | Weekly, when discharging | Grab | OUI-5 | |

A revision to this permit is not necessary for use of products equivalent to those authorized in this permit provided the equivalent products consist of the same active ingredients and the product is applied at the same location with the same or lower concentrations of the active ingredients at the outfall. The permittee is responsible for maintaining documentation on-site which demonstrates equivalency of any new water treatment products from another vendor or manufacturer with a different product name from those listed above.

8. There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid. The permittee shall dispose of all known PCB equipment, articles, and wastes either in accordance with:

   a. Department-issued permits governing soil thermal treatment (Chapter 62-713, F.A.C.) or Department-approved landfills provided the PCB concentrations meet the Florida landfill's permitted limit when concentrations are less than 50 ppm; or

   b. 40 CFR 761 when concentrations are greater than or equal to 50 ppm.

   *[40 CFR Part 423.12(b)(2)]*

9. The permittee is authorized to utilize the following water treatment chemicals and biocides, or their equivalents, in the cooling water systems and other wastewater streams:

| Chemical Name | System Used | Dosage Rate (ppm) |
|---|---|---|
| Ammonium Hydroxide | Feedwater, Condensate, Steam Generators | 0.005 |
| Boric Acid (Boron) | Reactor Coolant (RCS) and Support Systems | |
| Carbohydrazide | Steam Generators | 50 |
| Dimethylamine | Feedwater, Condensate, Steam Generators | 2-10 |
| Ethanolamine (ETA) | Feedwater, Condensate, Steam Generators | 50 |
| Glutaraldehyde | Closed Cooling Systems | |
| Hydrazine | Feedwater, Condensate, Steam Generators-Small quantities to RCS during cold startups | |
| Hydrogen Peroxide | RCS | |
| Isothiazolin | Closed Cooling Systems | |
| Klaraid | Liquid Rad Waste System | |
| Lithium Hydroxide | RCS | |
| Poly Acrylic Acid | Feedwater | 2-5 |
| Polyglycol | Closed Cooling Systems | |
| Potassium Hydroxide | Closed Cooling Systems | |
| Sodium Bisulfite | Feedwater | 0-3 |
| Sodium Hydroxide | Closed Cooling Systems | |
| ~~Sodium Hypochlorite~~ | ~~Circulating Water and Intake Cooling (Auxiliary Equipment Cooling Water)~~ | |
| Sodium Molybdate | Closed Cooling Systems | |
| Sodium Nitrite | Closed Cooling Systems | |
| Tolytriazole | Closed Cooling Systems | |
| Vitec 5100 | Reverse Osmosis System | 3-5 |
| Vitec 3000 | Reverse Osmosis System | 0-3 |
| Zinc Acetate | RCS | |
| *Sodium Hypochlorite (NaClO)* | *Condenser Cooling Water* | *3.6* |
| | *Intake Cooling Water* | *3.8* |

| | | |
|---|---|---|
| *<u>Chlorine Dioxide ($ClO_2$) - Winter</u>* | *<u>Condenser Cooling Water</u>* | *<u>1.12</u>* |
| | *<u>Intake Cooling Water</u>* | *<u>0.8</u>* |
| *<u>Chlorine Dioxide ($ClO_2$) - Summer</u>* | *<u>Condenser Cooling Water</u>* | *<u>1.00</u>* |
| | *<u>Intake Cooling Water</u>* | *<u>0.6</u>* |

10. The permittee is authorized to use preservative-free wood flour for plugging pinhole leaks in the once through cooling water system condenser.

11. The permittee can use only one of the antiscalant chemicals (Vitec 5100 and Vitec 3000) at a given time.

12. A revision to this permit is not necessary for the following activities:

    a. Structural changes that do not change the quality, nature, or quantity of the discharge of wastes or that do not cause water pollution; and

    b. Construction, replacement or repair of components at the facility which does not change the permitted treatment works or the terms and conditions of this permit.

    Records of these activities shall be kept by the permittee (activity description, start date and length of activity). The documentation shall be kept on-site in accordance with permit condition V.2, and made available to Department staff upon request. *[62-620.200(26)(a) & (b)]*

## II. SLUDGE MANAGEMENT REQUIREMENTS

1. The permittee shall be responsible for proper treatment, management, use, and disposal of its sludge. *[62- 620.320(6)]*

2. Storage, transportation, and disposal of sludge/solids characterized as hazardous waste shall be in accordance with requirements of Chapter 62-730, F.A.C. *[62-730]*

3. Vegetation and materials removed from intake screens s must be properly stored onsite until they are disposed in accordance with requirements in Chapter 62-701, F.A.C., and other applicable State and Federal requirements. Storage, transportation, and disposal of sludge/solids characterized as hazardous waste shall be in accordance with requirements of Chapter 62-730, F.A.C. *[62-730]*

## III. GROUND WATER REQUIREMENTS

Section III is not applicable to this facility.

## IV. ADDITIONAL LAND APPLICATION REQUIREMENTS

Section IV is not applicable to this facility.

## V. OPERATION AND MAINTENANCE REQUIREMENTS

1. During the period of operation authorized by this permit, the wastewater facilities shall be operated under the supervision of a person who is qualified by formal training and/or practical experience in the field of water pollution control. *[62-620.320(6)]*

2. The permittee shall maintain the following records and make them available for inspection on the site of the permitted facility.

    a. Records of all compliance monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, including, if applicable, a copy of the laboratory certification showing the certification number of the laboratory, for at least three years from the date the sample or measurement was taken;

## DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: FPL St. Lucie Power Plant

MONITORING GROUP NUMBER: D-001

PERMIT NUMBER: FL0002208-021-IWB

MONITORING PERIOD From: ____________________ To: ______________

| Parameter | | Quantity or Loading | | Units | Quality or Concentration | | | Units | No. Ex. | Frequency of Analysis | Sample Type |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7-DAY CHRONIC STATRE Menidia beryllina (Routine) | Sample Measurement | | | | | | | | | | |
| PARM Code TRP6B S Mon. Site No. EFF-2 | Permit Requirement | | | | 100 (Min.) | | | percent | | Semi-Annually; twice per year | 24-hr TPC |
| 7-DAY CHRONIC STATRE Menidia beryllina (Additional) | Sample Measurement | | | | | | | | | | |
| PARM Code TRP6B T Mon. Site No. EFF-2 | Permit Requirement | | | | 100 (Min.) | | | percent | | As needed | As required by the permit |
| 7-DAY CHRONIC STATRE Menidia beryllina (Additional) | Sample Measurement | | | | | | | | | | |
| PARM Code TRP6B U Mon. Site No. EFF-2 | Permit Requirement | | | | 100 (Min.) | | | percent | | As needed | As required by the permit |
| *Chlorine Dioxide* | *Sample Measurement* | | | | | | | | | | |
| *PARM Code 50070 1 Mon. Site No. EFF-2* | *Permit Requirement* | | | | | | *Report (Day.Max.)* | *mg/L* | | *Monthly* | *Grab* |
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ISSUANCE/REISSUANCE DATE:
DMR EFFECTIVE DATE: 1st day of the 2nd month following effective date of permit - Permit expiration

## DEPARTMENT OF ENVIRONMENTAL PROTECTION DISCHARGE MONITORING REPORT - PART A

**When Completed submit this report to:** http://www.fldepportal.com/go/

| | | | | | |
|---|---|---|---|---|---|
| PERMITTEE NAME: | FPL | PERMIT NUMBER: | FL0002208-021-IWB | | |
| MAILING ADDRESS: | 6501 South Ocean Drive<br>Jensen Beach, Florida 34957 | | | | |
| | | LIMIT: | Final | REPORT FREQUENCY: | Monthly |
| | | CLASS SIZE: | MA | PROGRAM: | Industrial |
| FACILITY: | FPL St. Lucie Power Plant | MONITORING GROUP NUMBER: | I-005 | | |
| LOCATION: | 6501 S. State Road A1a<br>Jensen Beach, FL 34957 | MONITORING GROUP DESCRIPTION: | Steam generator blowdown to the discharge canal to the Atlantic Ocean. | | |
| | | RE-SUBMITTED DMR: ☐ | | | |
| | | NO DISCHARGE FROM SITE: ☐ | | | |
| COUNTY: | St. Lucie | MONITORING PERIOD From: | ____________ | To: | ____________ |
| OFFICE: | Southeast District | | | | |

| Parameter | | Quantity or Loading | | Units | Quality or Concentration | | | Units | No. Ex. | Frequency of Analysis | Sample Type |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow | Sample Measurement | | | | | | | | | | |
| PARM Code 50050 P<br>Mon. Site No. OUI-2 | Permit Requirement | Report (Day.Max.) | Report (Mo.Avg.) | MGD | | | | | | *Monthly, when discharging* | Calculated |
| Oil and Grease | Sample Measurement | | | | | | | | | | |
| PARM Code 00556 P<br>Mon. Site No. OUI-2 | Permit Requirement | | | | | 15.0 (Mo.Avg.) | 20.0 (Day.Max.) | mg/L | | *Monthly, when discharging* | Grab |
| Solids, Total Suspended | Sample Measurement | | | | | | | | | | |
| PARM Code 00530 P<br>Mon. Site No. OUI-2 | Permit Requirement | | | | | 30.0 (Mo.Avg.) | 100.0 (Day.Max.) | mg/L | | *Monthly, when discharging* | Grab |
| Hydrazine | Sample Measurement | | | | | | | | | | |
| PARM Code 81313 1<br>Mon. Site No. EFF-2 | Permit Requirement | | | | | | 0.30 (Day.Max.) | mg/L | | *Monthly, when discharging* | Grab |
| Carbohydrazide | Sample Measurement | | | | | | | | | | |
| PARM Code 61916 1<br>Mon. Site No. EFF-2 | Permit Requirement | | | | | | Report (Day.Max.) | mg/L | | *Monthly, when discharging* | Grab |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

| NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT | SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT | TELEPHONE NO | DATE (mm/dd/yyyy) |
|---|---|---|---|
| | | | |

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here):

ISSUANCE/REISSUANCE DATE:
DMR EFFECTIVE DATE: 1st day of the 2nd month following effective date of permit - Permit expiration

# Attachment C: Threatened and Endangered Species Consultation Letters

FPL

April 14, 2021

David Bernhart
Assistant Regional Administrator
National Oceanic and Atmospheric Administration Fisheries
Southeast Regional Office
263 13th Avenue South
St. Peterburg, FL 33701

**RE: Florida Power & Light Company – St. Lucie Nuclear Power Plant (PSL) Units 1 and 2 Subsequent License Renewal**

Dear Mr. Bernhart:

Florida Power & Light Company (FPL) is preparing an application to renew the operating licenses for St. Lucie Units 1 and 2 (PSL) for an additional 20 years (see Table 1). As part of the license renewal process, the U.S. Nuclear Regulatory Commission (NRC) may request an informal or formal consultation with your agency. It is our intent by this letter to introduce you to the project, to make available any data you need to ensure an efficient and effective consultation process, and to request the following:

- Confirmation from you on the identified list of listed species, and
- Input on listed species under your jurisdiction and important habitats within the surrounding area of the plant.

**Table 1. PSL Licensing Dates**

| PSL Unit | Current License Expiration Date | Extended License Expiration Date |
|---|---|---|
| Unit 1 | March 1, 2036 | March 1, 2056 |
| Unit 2 | April 6, 2043 | April 6, 2063 |

As part of the renewal process, the NRC requires that the license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. The ER addresses the potential impact on species listed or proposed for listing as threatened or endangered in accordance with the Endangered Species Act (ESA), and important plant and animal habitats as defined by the ESA and essential fish habitat as identified under the Magnuson-Stevens Fishery Conservation and Management Act.

To facilitate our assessment and a smooth consultation by the NRC, we are seeking input from you regarding the effects that license renewal activities may have on listed species (or candidates proposed for listing) and important plant and animal habitats within the plant's environs and any questions or additional information necessary for the consultation process. Figures depicting the plant site and essential fish habitat within a 6-mile radius (the vicinity) of the plant are attached, and a brief discussion of the plant and its operations during the extended period of operation is provided below.

PSL is located on Hutchinson Island in St. Lucie County, FL, approximately 7 miles west-southwest of Port St. Lucie, FL. A portion of the Jensen Beach to Jupiter Inlet Aquatic Preserve is immediately west of the site in the Indian River Lagoon. In accordance with NRC regulations, transmission lines within the scope of the license renewal are those located within the PSL site boundary.

Marine species with historical occurrence and/or potentially occurring near the PSL site, or within St. Lucie and Martin counties (counties within in a 6-mile radius of the site) that are currently listed (or proposed for listing) as threatened or endangered are included in the attached Table 2. Potential impacts on federally listed species were considered in FPL's review and analysis during the development of the ER, and it was concluded that continued operation of PSL has the potential to adversely affect certain listed species. Table 2 also identifies these certain species that have the potential to be adversely affected by continued operation. FPL has administrative controls in place to maintain compliance with all regulatory requirements associated with protected species. Continued adherence to these controls, and compliance with applicable laws and regulation are anticipated to mitigate potential negative impacts to listed species at PSL.

During the license renewal term, FPL proposes to continue operating Units 1 and 2 as currently operated and based on aging management studies does not expect that refurbishment will be needed for the license renewal.

As stated earlier, this letter seeks your input on our proposed continued operation of PSL on listed species under your jurisdiction and important habitats within the surrounding area of the plant. We appreciate your notifying us of your comments and any information you believe FPL should consider as part of the license renewal process. Your response is kindly requested within 45 days of receiving this letter. FPL plans to include this letter in the ER.

Should you or your staff have any questions or comments, please contact me at (561) 691-2801 or Jodie.Eldridge@nexteraenergy.com.

Sincerely,

Jodie Gless Eldridge

Jodie Gless Eldridge
Environmental Services Manager

Attachments:

Table 2. Listed Threatened, Endangered, or Candidate Marine Species, St. Lucie and Martin Counties, FL

Figure 1. PSL Site

Figure 2. Essential Fish Habitats within 6-Miles (the vicinity) of PSL

## Table 2. Listed Threatened, Endangered, or Candidate Marine Species, St. Lucie and Martin Counties, FL

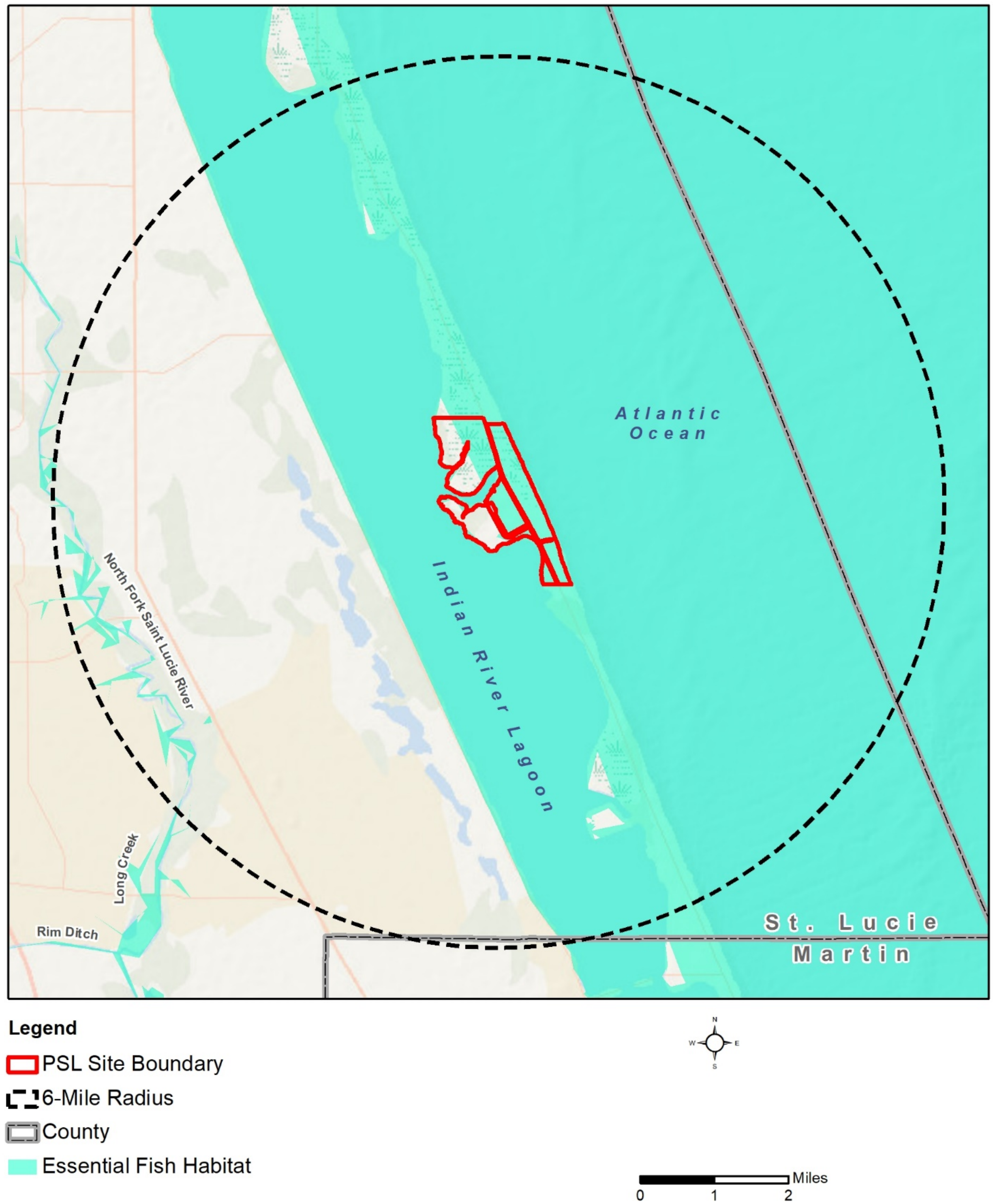
| Common Name | Scientific Name | Federal Status |
|---|---|---|
| ***Fish*** | | |
| Atlantic sturgeon | *Acipenser oxyrinchus oxyrinchus* | E |
| Giant manta ray[1] | *Manta birostris* | T |
| Mangrove rivulus | *Rivulus marmoratus* | SSC |
| Nassau grouper | *Epinephelus striatus* | T |
| Scalloped hammerhead[1] | *Sphyrna lewini* | E |
| Smalltooth sawfish[1] | *Pristis pectinata* | E |
| Oceanic whitetip shark | *Carcharhinus longimanus* | T |
| ***Reptiles*** | | |
| Green sea turtle[1, 2] | *Chelonia mydas* | E |
| Hawksbill sea turtle[1, 2] | *Eretmochelys imbricata* | E |
| Kemp's ridley sea turtle[1, 2] | *Lepidochelys kempii* | E |
| Leatherback sea turtle[1, 2] | *Dermochelys coriacea* | E |
| Loggerhead sea turtle[1, 2] | *Caretta caretta* | T |
| ***Mammals*** | | |
| Blue Whale | *Balaenoptera musculus* | E |
| Finback whale | *Balaenoptera physalus* | E |
| Humpback whale | *Megaptera novaeangliae* | E |
| North Atlantic right whale | *Eubalaena glacialis* | E |
| Sei whale | *Balaenoptera borealis* | E |
| Sperm whale | *Physeter macrocephalus* | E |
| West Indian manatee (Florida manatee) [1] | *Trichechus manatus (Trichechus manatus latirostris)* | T |
| ***Plants*** | | |
| Johnson's seagrass | *Halophila johnsonii* | E |
| ***Corals*** | | |
| Lobed star coral | *Orbicella annularis* | T |
| Mountainous star coral | *Orbicella faveolata* | T |
| Pillar coral | *Dendrogyra cylindricus* | T |
| Rough cactus coral | *Mycetophyllia ferox* | T |
| Staghorn coral | *Acropora cervicornis* | T |

T = threatened; E = endangered; C = candidate; T(S/A) = threatened based on similarity of appearance; SSC = species of conservation concern

[1]Potentially adversely affected
[2]Dual jurisdiction, National Marine Fisheries Service and USFWS

**Figure 1. PSL Site**

**Figure 2. Essential Fish Habitats within 6-Miles (the vicinity) of PSL**



April 14, 2021

Roxanna Hinzman
Field Supervisor
U.S. Fish and Wildlife Service
South Florida Ecological Field Services Office
1339 20th Street
Vero Beach, FL 32960

**RE: Florida Power & Light Company – St. Lucie Nuclear Power Plant (PSL) Units 1 and 2 Subsequent License Renewal**

Dear Ms. Hinzman:

Florida Power & Light Company (FPL) is preparing an application to renew the operating licenses for St. Lucie Units 1 and 2 (PSL) for an additional 20 years (see Table 1). As part of the license renewal process, the U.S. Nuclear Regulatory Commission (NRC) may request an informal or formal consultation with your agency. It is our intent by this letter to introduce you to the project, to make available any data you need to ensure an efficient and effective consultation process, and to request the following:

- Confirmation from you on the identified list of listed species, and
- Input on listed species under your jurisdiction and important habitats within the surrounding area of the plant.

**Table 1. PSL Licensing Dates**

| PSL Unit | Current License Expiration Date | Extended License Expiration Date |
|---|---|---|
| Unit 1 | March 1, 2036 | March 1, 2056 |
| Unit 2 | April 6, 2043 | April 6, 2063 |

As part of the renewal process, the NRC requires that the license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. The ER addresses the potential impact on species listed or proposed for listing as threatened or endangered in accordance with the Endangered Species Act (ESA), and important plant and animal habitats as defined by the ESA and essential fish habitat as identified under the Magnuson-Stevens Fishery Conservation and Management Act.

To facilitate our assessment and a smooth consultation by the NRC, we are seeking input from you regarding the effects that license renewal activities may have on listed species (or candidates proposed for listing) and important plant and animal habitats within the plant's environs and any questions or additional information necessary for the consultation process. Figures depicting the plant site and critical habitats within 6-mile radius (the vicinity) of the plant are attached, and a brief discussion of the plant and its operations during the extended period of operation is provided below.

PSL is located on Hutchinson Island in St. Lucie County, Florida, approximately 7 miles west-southwest of Port St. Lucie, FL. A portion of the Jensen Beach to Jupiter Inlet Aquatic Preserve is immediately west of the site in the Indian River Lagoon. In accordance with NRC regulations, transmission lines within the scope of the license renewal are those located within the PSL site boundary.

Species with historical occurrence and/or potentially occurring near the PSL site, or within St. Lucie and Martin counties (counties within in a 6-mile radius of the site) that are currently federally listed (or proposed for listing) as threatened or endangered are included in the attached Table 2. Potential impacts on federally listed species were considered in FPL's review and analysis during the development of the ER, and it was concluded that continued operation of PSL has the potential to adversely affect certain listed species. Table 2 also identifies these certain species that have the potential to be adversely affected by continued operation. FPL has administrative controls in place to maintain compliance with all regulatory requirements associated with protected species. Continued adherence to these controls, and compliance with applicable laws and regulation are anticipated to mitigate potential negative impacts to listed species at PSL.

During the license renewal term, FPL proposes to continue operating Units 1 and 2 as currently operated and based on aging management studies does not expect that refurbishment will be needed for the license renewal.

As stated earlier, this letter seeks your input on our proposed continued operation of PSL on listed species under your jurisdiction and important habitats within the surrounding area of the plant. We appreciate your notifying us of your comments and any information you believe FPL should consider as part of the license renewal process. Your response is kindly requested within 45 days of receiving this letter. FPL plans to include this letter in the ER.

Should you or your staff have any questions or comments, please contact me at (561) 691-2801 or Jodie.Eldridge@nexteraenergy.com.

Sincerely,

Jodie Gless Eldridge

Jodie Gless Eldridge
Environmental Services Manager

Attachments:

Table 2. Listed Threatened, Endangered, or Candidate Species, St. Lucie and Martin Counties, FL

Figure 1. PSL Site

Figure 2. Critical Habitats within 6-Miles (the vicinity) of PSL

**Table 2. Listed Threatened, Endangered, or Candidate Species, St. Lucie and Martin Counties, FL**

| Common Name | Scientific Name | Federal Status |
|---|---|---|
| ***Reptiles*** | | |
| American alligator | *Alligator mississippiensis* | T (S/A) |
| American crocodile | *Crocodylus acutus* | T |
| Atlantic salt marsh snake | *Nerodia clarkii taeniata* | T |
| Eastern indigo snake | *Drymarchon corais couperi* | T |
| Gopher tortoise | *Gopherus polyphemus* | C |
| Green sea turtle[1, 3] | *Chelonia mydas* | E |
| Hawksbill sea turtle[1, 3] | *Eretmochelys imbricata* | E |
| Kemp's ridley sea turtle[1, 3] | *Lepidochelys kempii* | E |
| Leatherback sea turtle[1, 3] | *Dermochelys coriacea* | E |
| Loggerhead sea turtle[1, 3] | *Caretta caretta* | T |
| ***Birds*** | | |
| Audubon's crested caracara | *Caracara cheriway* | T |
| Everglade snail kite | *Rostrhamus sociabilis plumbeus* | E |
| Florida grasshopper sparrow | *Ammodramus savannarum floridanus* | E |
| Florida scrub-jay | *Aphelocoma coerulescens* | T |
| Ivory-billed woodpecker | *Campephilus principalis* | E |
| Kirtland's wood warbler | *Dendroica kirtlandii* | E |
| Least tern | *Sternula antillarum* | E |
| Piping plover | *Charadrius melodus* | T |
| Red-cockaded woodpecker | *Picoides borealis* | E |
| Roseate tern | *Sterna dougallii dougallii* | T |
| Rufa red knot | *Calidris canutus rufa* | T |
| Whooping crane | *Grus americana* | XN |
| Wood stork | *Mycteria americana* | T |
| ***Mammals*** | | |
| Anastasia Island beach mouse | *Peromyscus polionotus phasma* | E |
| Florida panther | *Puma (=Felis) concolor coryi* | E |
| Florida salt marsh vole | *Microtus pennsylvanicus dukecampbelli* | E |
| Gray bat | *Myotis grisescens* | E |
| Puma | *Puma concolor spp* | T (S/A) |
| Rice rat | *Oryzomys palustris natator* | E |
| Southeastern beach mouse | *Peromyscus polionotus niveiventris* | T |
| West Indian manatee[1] (Florida manatee) | *Trichechus manatus (Trichechus manatus latirostris)* | T |

**Table 2. Federally Listed Threatened or Endangered or Candidate Species, St. Lucie County and Martin Counties, FL (Continued)**

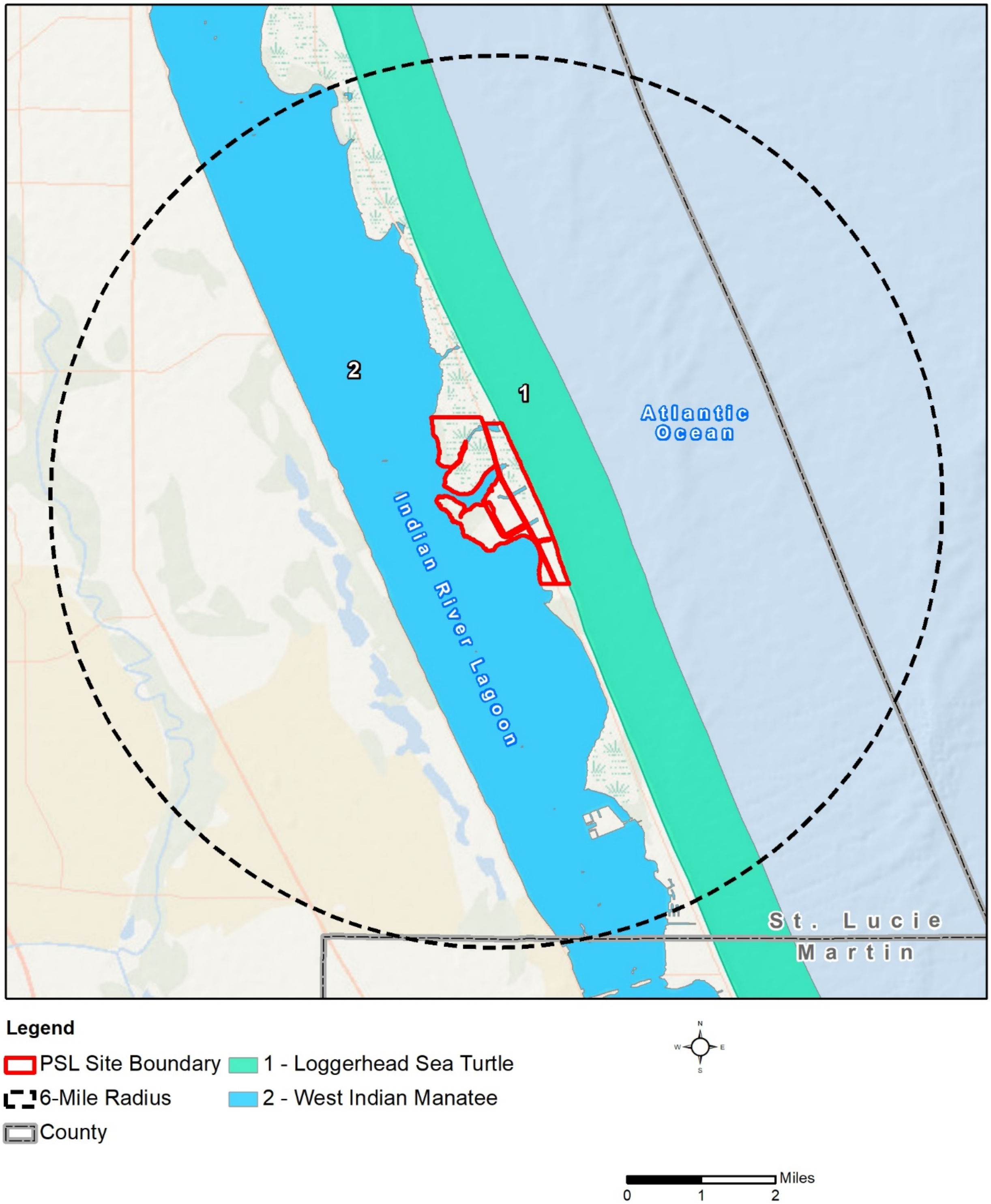
| Common Name | Scientific Name | Federal Status |
|---|---|---|
| ***Insects*** | | |
| Cassius blue butterfly | *Leptotes cassius theonus* | T (S/A) |
| Ceraunus blue butterfly | *Hemiargus ceraunus antibubastus* | T (S/A) |
| Florida leafwing | *Anaea troglodyte floridalis* | E |
| Miami blue butterfly | *Cyclargus thomasi bethunebakeri* | E |
| ***Plants*** | | |
| Florida bully | *Sideroxylon reclinatum subsp. austrofloridense* | T |
| Florida perforate cladonia | *Cladonia perforata* | E |
| Four-petal pawpaw | *Asimina tetramera* | E |
| Fragrant prickly-apple | *Cereus eriophorus var. fragrans* | E |
| Johnson's seagrass[2] | *Halophila johnsonii* | T |
| Lakela's mint | *Dicerandra immaculata* | E |
| Tiny polygala | *Polygala smallii* | E |

T = threatened; E = endangered; C = candidate; T(S/A) = threatened based on similarity of appearance; SSC = species of conservation concern; XN = experimental population

[1]Potentially adversely affected
[2]National Marine Fisheries Service jurisdiction
[3]Dual jurisdiction, National Marine Fisheries Service and USFWS

**Figure 1. PSL Site**

**Figure 2. Critical Habitats within 6-Miles (the vicinity) of PSL**



# Attachment D: Cultural Resource Consultation Letters

April 14, 2021

Timothy A. Parsons, Ph.D.
Division Director and State Historic Preservation Officer
Florida Department of State
Division of Historical Resources
500 S. Bronough Street
Tallahassee, FL 32399-0250

**RE: Florida Power & Light Company – St. Lucie Nuclear Power Plant (PSL) Units 1 and 2 Subsequent License Renewal**

Dear Dr. Parsons:

Florida Power & Light Company (FPL) is preparing an application to renew the operating licenses for St. Lucie Nuclear Power Plant Units 1 and 2 (PSL) for an additional 20 years (see Table 1). As part of the renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report (ER) that assesses the potential impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. The ER addresses the potential to impact historic and cultural resources including tribal cultural resources on or near the PSL site. Also, as part of the renewal process, the NRC may request a consultation in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (Public Law 89-665; 54 U.S.C. 300101 et seq.), and the federal Advisory Council on Historic Preservation regulations (36 CFR 800) with the Florida Division of Historical Resources (FDHR) regarding the license renewal.

It is our intent by this letter to introduce you to the project, to make available any data you need to ensure an efficient and effective consultation process, and request the following:

- Confirmation from your office on the list of identified cultural resources, including tribal cultural resources (summarized below); and
- Confirmation from your office on the assessment that PSL structures, pending no anticipated changes to use or design, will not require additional evaluations as part of the license renewal process.

Figures depicting the plant site and the vicinity within a 6-mile radius of the plant are attached, and a brief discussion of the plant and its operations during the extended period of operation is provided below.

**Table 1. PSL Licensing Dates**

| PSL Unit | Current License Expiration Date | Extended License Expiration Date |
|---|---|---|
| Unit 1 | March 1, 2036 | March 1, 2056 |
| Unit 2 | April 6, 2043 | April 6, 2063 |

PSL is located on Hutchinson Island in St. Lucie County, Florida, approximately 7 miles west-southwest of Port St. Lucie, FL. In accordance with NRC regulations, transmission lines within the scope of the license renewal are those located within the PSL site boundary.

According to the Florida Master Site File (FMSF), there are five cultural resources recorded within the 1,132-acre PSL property. One of the cultural resources on property (8SL44) has been determined potentially eligible for the National Register of Historic Places (NRHP). There was insufficient information to determine eligibility for two of the cultural resources (8SL11 and 8SL13) and the remaining two cultural resources (8SL33 and 8SL55) have not been evaluated for their NRHP eligibility.

There have been 13 cultural resource surveys conducted within close proximity to the PSL site, five of which were conducted within portions of the 1,132-acre property. A cultural resources survey (FMSF Survey 600) was conducted in 1969 by Allan Saltus, Jr. for the Board of Archives and History (now FDHR) on the original construction footprint portion of the site. Saltus also reported on sites 8SL13 and 8SL44 (Blind Creek I and Blind Creek II) on the northern end of the property, but outside of the original construction footprint. A cultural resource survey (FMSF Survey 22921) was conducted for a cell tower on the PSL property in 2014. The survey did not result in the recording of any cultural resources. Two surveys (FMSF Surveys 14038 and 15623) were conducted for the St Lucie County Mosquito Control District prior to installing insect control features in a portion of the northern extent of the property. These investigations further evaluated 8SL13 and 8SL44 and made avoidance recommendations for these resources. A 2014 investigation conducted for the PSL's primary transmission line (FMSF Survey 20868) recommended the portion of site 8SL1722 (Indian River Dr – Site #6) within the transmission line corridor on the west shore of the Indian River Lagoon as not NRHP eligible, but the remainder of the site outside of the corridor remain unevaluated for its NRHP eligibility.

The cultural resources within a 6-mile radius of PSL identified from a 2020 search of the FMSF GIS and tabular data sets are presented in Tables 2 and 3. There is one NRHP-listed structure, the Captain Hammond House (8SL77), and 10 cultural resources potentially eligible for the NRHP within 6-miles of PSL.

During the license renewal term, FPL proposes to continue operating the units as currently operated and based on aging management studies does not expect that refurbishment, construction, ground disturbing activities or physical changes to the generating facility will be needed for the license renewal. Any ground-disturbing activities would be maintenance related and governed by site procedures.

FPL does not anticipate operation of PSL to adversely affect any historic properties.

As stated above, this letter requests your input on the potential for our proposed continued operation of PSL to affect historic properties, including tribal cultural resources, within the surrounding area of the plant. We appreciate your notifying us of your comments and any information you believe should be considered by the NRC. Your response is kindly requested within 45 days of receiving this letter.

Should you or your staff have any questions or comments, please contact Rich Estabrook at 561-691-3054 or richard.estabrook@fpl.com.

Sincerely,

Richard W. Estabrook, Ph.D. RPA
Environmental Services Senior Project Manager - Archaeologist
Florida Power & Light Company / NextEra Energy Resources, LLC

Attachments:

Table 2. Archaeological Sites Inventory Entries within a 6-Mile Radius of PSL
Table 3. Architecture and History Inventory Entries within a 6-Mile Radius of PSL
Figure 1. PSL Site
Figure 2. PSL 6-mile Vicinity

**Table 2. Archaeological Sites Inventory Entries within a 6-Mile Radius of PSL**

| Site ID# | Quadrangle | Type | NRHP Status/SHPO Evaluation |
|---|---|---|---|
| SL00004 | Fort Pierce | Prehistoric camp site and 19th century farm | Potentially eligible for NRHP |
| SL00008 | Eden | Prehistoric midden with pottery | Not evaluated by SHPO |
| SL00009 | Eden | Prehistoric midden with burials and 19th century scatter | Not evaluated by SHPO |
| SL00011 | Eden | Prehistoric burial mound(s) | Not evaluated by SHPO |
| SL00013 | Eden | Prehistoric midden mound with burials | Insufficient information |
| SL00015 | Fort Pierce | Shell midden with no artifacts observed | Ineligible for NRHP |
| SL00017 | Fort Pierce | Multicomponent prehistoric site and $16^{th}$-$18^{th}$ century shipwreck | Not evaluated by SHPO |
| SL00022 | Eden | Historic shipwreck | Not evaluated by SHPO |
| SL00026 | Eden | Historic shipwreck | Not evaluated by SHPO |
| SL00028 | Eden | 18th century shipwreck | Not evaluated by SHPO |
| SL00033 | Eden | 19th to 20th century shipwreck | Not evaluated by SHPO |
| SL00037 | Eden | Prehistoric midden | Not evaluated by SHPO |
| SL00043 | Fort Pierce | Prehistoric midden | Not evaluated by SHPO |
| SL00044 | Eden | Prehistoric midden with burials | Potentially eligible for NRHP |
| SL00055 | Eden | Prehistoric campsite and historic shipwreck | Not evaluated by SHPO |
| SL00074 | Ankona | Prehistoric midden(s) | Not evaluated by SHPO |
| SL00075 | Ankona | Prehistoric camp site and 19th Century scatter | Not evaluated by SHPO |
| SL00291 | Ankona | Prehistoric habitation and 19th to 20th century scatter | Not evaluated by SHPO |
| SL00292 | Ankona | Prehistoric habitation and 19th to 20th century scatter | Not evaluated by SHPO |
| SL01121 | Ankona | Prehistoric burial mound(s) | Not evaluated by SHPO |

**Table 2. Archaeological Sites Inventory Entries within a 6-Mile Radius of PSL (Continued)**

| Site ID# | Quadrangle | Type | NRHP Status/SHPO Evaluation |
|---|---|---|---|
| SL01136 | Ankona | Prehistoric campsite and late 19th to 20 century homestead | Ineligible for the NRHP |
| SL01146 | Eden | Prehistoric midden | Ineligible for the NRHP |
| SL01173 | Eden | Prehistoric midden and homestead (unidentified timeframe) | Ineligible for the NRHP |
| SL01174 | Ankona | 20th century homestead | Ineligible for the NRHP |
| SL01175 | Ankona | 20th century trash dump and scatter | Ineligible for the NRHP |
| SL01176 | Eden | Prehistoric campsite | Ineligible for the NRHP |
| SL01177 | Eden | Prehistoric campsite | Ineligible for the NRHP |
| SL01178 | Eden | Prehistoric midden(s) | Ineligible for the NRHP |
| SL01184 | Eden | An isolated Archaic artifact | Ineligible for the NRHP |
| SL01269 | Palms Cemetery | Ankona | Protected by state burial laws, not evaluated by SHPO |
| SL01634 | Eden Cemetery | Eden | Protected by state burial laws, not evaluated by SHPO |
| SL01640 | Eden | Late 19th century homestead | Ineligible for the NRHP |
| SL01720 | Fort Pierce | Prehistoric campsite | Potentially eligible for the NRHP |
| SL01721 | Fort Pierce | Prehistoric midden(s) | Potentially eligible for the NRHP |
| Site ID# | Quadrangle | Type | NRHP status/SHPO evaluation |
| SL01722 | Ankona | Prehistoric midden(s) | Insufficient information |
| SL01723 | Ankona | Prehistoric midden(s) and 20th century refuse/dump | Potentially eligible for the NRHP |
| SL01724 | Ankona | Prehistoric midden(s) and 19th to 20th century homestead and refuse/dump | Potentially eligible for the NRHP |
| SL01725 | Ankona | Prehistoric midden(s) and 20th century refuse/dump | Potentially eligible for the NRHP |
| SL01726 | Ankona | 19th to 20th century homestead and refuse/dump | Not evaluated by SHPO |
| SL01810 | Ankona | Prehistoric burials | Potentially eligible for NRHP |

**Table 2. Archaeological Sites Inventory Entries within a 6-Mile Radius of PSL (Continued)**

| Site ID# | Quadrangle | Type | NRHP Status/SHPO Evaluation |
|---|---|---|---|
| SL01811 | Ankona | Prehistoric midden(s) | Potentially eligible for NRHP |
| SL01812 | Ankona | Prehistoric habitation with midden(s) and 20th century refuse/dump | Potentially eligible for NRHP |
| SL01813 | Ankona | Prehistoric habitation with midden(s) and 20th century refuse/dump | Potentially eligible for NRHP |
| SL03016 | Eden | 19th to 20th century homestead refuse/dump | Not evaluated by SHPO |
| SL03017 | Ankona | Prehistoric burial mound(s) | Insufficient information |
| SL03018 | Ankona | Prehistoric habitation with midden(s) | Insufficient information |
| SL03019 | Ankona | Prehistoric habitation with midden(s) | Insufficient information |
| SL03020 | Ankona | Prehistoric habitation with midden(s) | Insufficient information |
| SL03021 | Ankona | Prehistoric habitation with midden(s) | Insufficient information |
| SL03258 | Ankona | 20th century refuse/dump | Not evaluated by SHPO |

**Table 3. Architecture and History Inventory Entries within a 6-Mile Radius of PSL**

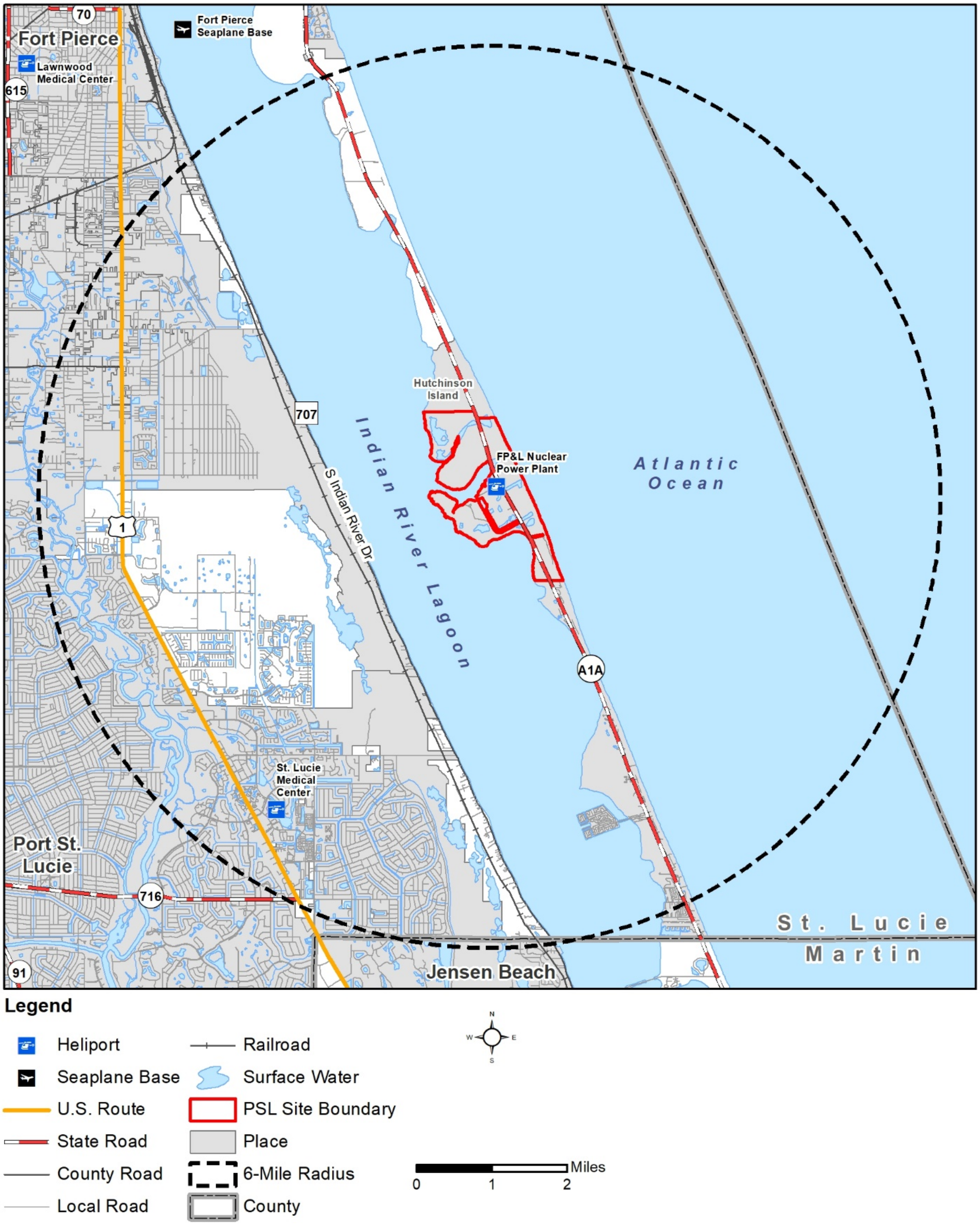
| Site ID# | Site Name | Quadrangle | Style | NRHP Status/SHPO Evaluation |
|---|---|---|---|---|
| SL00077 | Captain Hammond House | Ankona | Frame Vernacular ca. 1901 | Listed on NRHP 1990 |
| SL00078 | Fairmont Manor | Ankona | Greek Revival ca. 1825-1860; year built 1896 | Eligible for NRHP |
| SL00124 | Nels Hanson House | Ankona | Frame Vernacular; year built 1914 | Not evaluated by SHPO |
| SL00126 | 905 W Second Street | Ankona | Georgian Revival ca. 1880-present; year built 1927 | Not evaluated by SHPO |
| SL00132 | Gustave Ringdahl House | Ankona | Frame Vernacular; year built 1898 | Eligible for NRHP |
| SL00134 | Nels C. Jorgenson House | Ankona | Craftsman; year built 1925 | Eligible for NRHP |
| SL00138 | Mary Kerr House | Ankona | Masonry Vernacular; year built 1920 | Not evaluated by SHPO |
| SL00139 | Ray Kerr House | Ankona | Frame Vernacular; year built 1929 | Not evaluated by SHPO |
| SL00151 | Covenant Tabernacle Church | Ankona | Frame Vernacular; year built 1914 | Eligible for NRHP |
| SL00155 | White City Mercantile Building | Ankona | Frame Vernacular; year built 1900 | Eligible for NRHP |
| SL00179 | 4111 Oleander Avenue | Ankona | Frame Vernacular; year built 1915 | Not evaluated by SHPO |
| SL00188 | Christensen House | Ankona | Frame Vernacular; year built 1895 | Eligible for NRHP |

**Table 3. Architecture and History Inventory Entries within a 6-Mile Radius of PSL (Continued)**

| Site ID# | Site Name | Quadrangle | Style | NRHP Status/SHPO Evaluation |
|---|---|---|---|---|
| SL00193 | Pete Robinson House | Ankona | Frame Vernacular; year built1905 | Not evaluated by SHPO |
| SL00211 | Captain John Miller House | Eden | Frame Vernacular; year built 1895 | Eligible for NRHP |
| SL00223 | R. V. Ankeny House | Ankona | Neo-Classical Revival ca. 1880-1940; year built 1904 | Eligible for NRHP |
| SL00224 | Russell House | Ankona | Frame Vernacular; year built 1900 | Eligible for NRHP |
| SL00227 | 7901 South Indian River Drive | Ankona | Craftsman; year built 1910 | Eligible for NRHP |
| SL00231 | 5703 S Indian River Drive | Ankona | Prairie ca. 1900-1920; year built 1915 | Eligible for NRHP |
| SL00235 | William Robinson House | Ankona | Frame Vernacular; year built 1901 | Eligible for NRHP |
| SL00236 | Riverhill | Ankona | Frame Vernacular; year built 1903 | Eligible for NRHP |
| SL00237 | Britt House | Ankona | Frame Vernacular; year built 1908 | Eligible for NRHP |
| SL00238 | N. E. Card House | Ankona | Masonry Vernacular; year built 1914 | Eligible for NRHP |
| SL01745 | Eden Grove | Ankona | Style not specified; year built 1883 | Not evaluated by SHPO |
| SL03035 | William H. Tancre Pineapple Plantation | Ankona | Other; year built 1885 | Not evaluated by SHPO |

# Figure 1. PSL Site

**Figure 2. PSL 6-Mile Vicinity**



April 14, 2021

Kevin Donaldson
Director, Real Estate
Miccosukee Tribe of Indians
PO Box 440021
Tamiami Station

**RE: Florida Power & Light Company – Point St. Lucie Nuclear Power Plant (PSL) Units 1 and 2 Subsequent License Renewal**

Dear Mr. Donaldson:

Florida Power & Light Company (FPL) is preparing an application to renewing the operating licenses for Point St. Lucie Nuclear Power Plant Units 1 and 2 (PSL) for an additional 20 years (see Table 1). This process is known as a "subsequent license" and as part of that process the NRC requires the license renewal application include an environmental report (ER) that assesses the potential impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. The ER addresses the potential to impact historic and cultural resources including tribal cultural resources on or near the PSL site. Also, as part of the renewal process, the NRC may request a consultation with your tribe in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (Public Law 89-665; 54 U.S.C. 300101 et seq.), and implemented by the Advisory Council on Historic Preservation regulations (36 CFR 800).

**Table 1. PSL Licensing Dates**

| PSL Unit | Initial License Expiration Date | Current License Expiration Date | Extended License Expiration Date |
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Consistent with FPL's policy to reach out to tribes in the area of its projects, I wanted to provide you with information about the project, make available any data you need to ensure an efficient and effective consultation process, and request input from you regarding tribal cultural resources within the plant's surrounding area.

Figures depicting the plant site and the vicinity within a 6-mile radius of the plant are enclosed, and a brief discussion of the plant and its operations during the extended period of operation is provided below.

PSL is located on Hutchinson Island in St. Lucie County, Florida, approximately 7 miles west-southwest of Port St. Lucie, FL. In accordance with NRC regulations, transmission lines within the scope of the license renewal are those located within the PSL site boundary. PSL was constructed from 1970 to 1983 with Unit 1 achieving initial operation in June of 1976 and Unit 2 following in August 1983. In 2003, PSL received approval for its first license renewal resulting in the current license expiration date seen in Table 1.

During the subsequent license renewal term, FPL proposes to continue operating the units as currently operated and based on aging management studies **does not expect that refurbishment, construction, ground disturbing activities or physical changes to the generating facility will be needed for the license renewal.** Any ground-disturbing activities would be maintenance related and governed by site procedures. FPL does not anticipate operation of PSL to adversely affect the environment or any cultural or historic resources.

There have been a total of 14 cultural resource surveys within a 6-mile radius of PSL, three of which were within the 1,132-acre PSL property. A full cultural resources survey was conducted in 1969 by the Board of Archives and History on a portion of the site, resulting in one recorded prehistoric archaeological site and one prehistoric site that was described but not recorded. A second cultural resource survey was conducted for a cell tower on the PSL property in 2014. The survey did not result in the recording of any cultural resources. A third cultural resources survey was conducted by the Archaeological and Historical Conservancy, Inc. (AHCI) in 2008 at the request of FPL. According to the Florida Master Site File (FMSF), there are five cultural resources within the PSL property. One of the cultural resources on property has been determined to be potentially eligible for the National Register of Historic Places (NRHP). A listing of cultural resources within a 6-mile radius of PSL identified from a 2020 search of the FMSF GIS and tabular data sets is presented in the attached Table 2.

I hope this information has been helpful to you. Please let me know if you have any comments, questions, or have information you believe FPL should consider as part of the license renewal process. Your response is kindly requested within 45 days of receiving this letter. FPL plans to include this letter in the ER. I can be reached at 561-310-8843 or via email at Desiree.Estabrook@nee.com.

Sincerely,

Desiree Estabrook, AICP, CNU-A
Project Manager, Tribal Relations, Florida Power & Light

Attachments:

Table 2. Archaeological Sites Inventory Entries within a 6-Mile Radius of PSL

Figure 1. PSL Site

Figure 2. PSL 6-mile Vicinity

**Table 2. Archaeological Sites Inventory Entries within a 6-Mile Radius of PSL**

| Site ID# | Quadrangle | Type | NRHP Status/SHPO Evaluation |
|---|---|---|---|
| SL00004 | Fort Pierce | Prehistoric camp site and 19th century farm | Potentially eligible for NRHP |
| SL00008 | Eden | Prehistoric midden with pottery | Not evaluated by SHPO |
| SL00009 | Eden | Prehistoric midden with burials and 19th century scatter | Not evaluated by SHPO |
| SL00011 | Eden | Prehistoric burial mound(s) | Not evaluated by SHPO |
| SL00013 | Eden | Prehistoric midden mound with burials | Insufficient information |
| SL00015 | Fort Pierce | Shell midden with no artifacts observed | Ineligible for NRHP |
| SL00017 | Fort Pierce | Multicomponent prehistoric site and $16^{th}$-$18^{th}$ century shipwreck | Not evaluated by SHPO |
| SL00022 | Eden | Historic shipwreck | Not evaluated by SHPO |
| SL00026 | Eden | Historic shipwreck | Not evaluated by SHPO |
| SL00028 | Eden | 18th century shipwreck | Not evaluated by SHPO |
| SL00033 | Eden | 19th to 20th century shipwreck | Not evaluated by SHPO |
| SL00037 | Eden | Prehistoric midden | Not evaluated by SHPO |
| SL00043 | Fort Pierce | Prehistoric midden | Not evaluated by SHPO |
| SL00044 | Eden | Prehistoric midden with burials | Potentially eligible for NRHP |
| SL00055 | Eden | Prehistoric campsite and historic shipwreck | Not evaluated by SHPO |
| SL00074 | Ankona | Prehistoric midden(s) | Not evaluated by SHPO |
| SL00075 | Ankona | Prehistoric camp site and 19th Century scatter | Not evaluated by SHPO |
| Site ID# | Quadrangle | Type | NRHP status/SHPO evaluation |
| SL00291 | Ankona | Prehistoric habitation and 19th to 20th century scatter | Not evaluated by SHPO |
| SL00292 | Ankona | Prehistoric habitation and 19th to 20th century scatter | Not evaluated by SHPO |
| SL01121 | Ankona | Prehistoric burial mound(s) | Not evaluated by SHPO |

**Table 2. Archaeological Sites Inventory Entries within a 6-Mile Radius of PSL (Continued)**

| Site ID# | Quadrangle | Type | NRHP Status/SHPO Evaluation |
|---|---|---|---|
| SL01136 | Ankona | Prehistoric campsite and late 19th to 20 century homestead | Ineligible for the NRHP |
| SL01146 | Eden | Prehistoric midden | Ineligible for the NRHP |
| SL01173 | Eden | Prehistoric midden and homestead (unidentified timeframe) | Ineligible for the NRHP |
| SL01174 | Ankona | 20th century homestead | Ineligible for the NRHP |
| SL01175 | Ankona | 20th century trash dump and scatter | Ineligible for the NRHP |
| SL01176 | Eden | Prehistoric campsite | Ineligible for the NRHP |
| SL01177 | Eden | Prehistoric campsite | Ineligible for the NRHP |
| SL01178 | Eden | Prehistoric midden(s) | Ineligible for the NRHP |
| SL01184 | Eden | An isolated Archaic artifact | Ineligible for the NRHP |
| SL01269 | Palms Cemetery | Ankona | Protected by state burial laws, not evaluated by SHPO |
| SL01634 | Eden Cemetery | Eden | Protected by state burial laws, not evaluated by SHPO |
| SL01640 | Eden | Late 19th century homestead | Ineligible for the NRHP |
| SL01720 | Fort Pierce | Prehistoric campsite | Potentially eligible for the NRHP |
| SL01721 | Fort Pierce | Prehistoric midden(s) | Potentially eligible for the NRHP |
| SL01722 | Ankona | Prehistoric midden(s) | Insufficient information |
| SL01723 | Ankona | Prehistoric midden(s) and 20th century refuse/dump | Potentially eligible for the NRHP |
| SL01724 | Ankona | Prehistoric midden(s) and 19th to 20th century homestead and refuse/dump | Potentially eligible for the NRHP |
| SL01725 | Ankona | Prehistoric midden(s) and 20th century refuse/dump | Potentially eligible for the NRHP |
| SL01726 | Ankona | 19th to 20th century homestead and refuse/dump | Not evaluated by SHPO |
| SL01810 | Ankona | Prehistoric burials | Potentially eligible for NRHP |

**Table 3. Archaeological Sites Inventory Entries within a 6-Mile Radius of PSL (Continued)**

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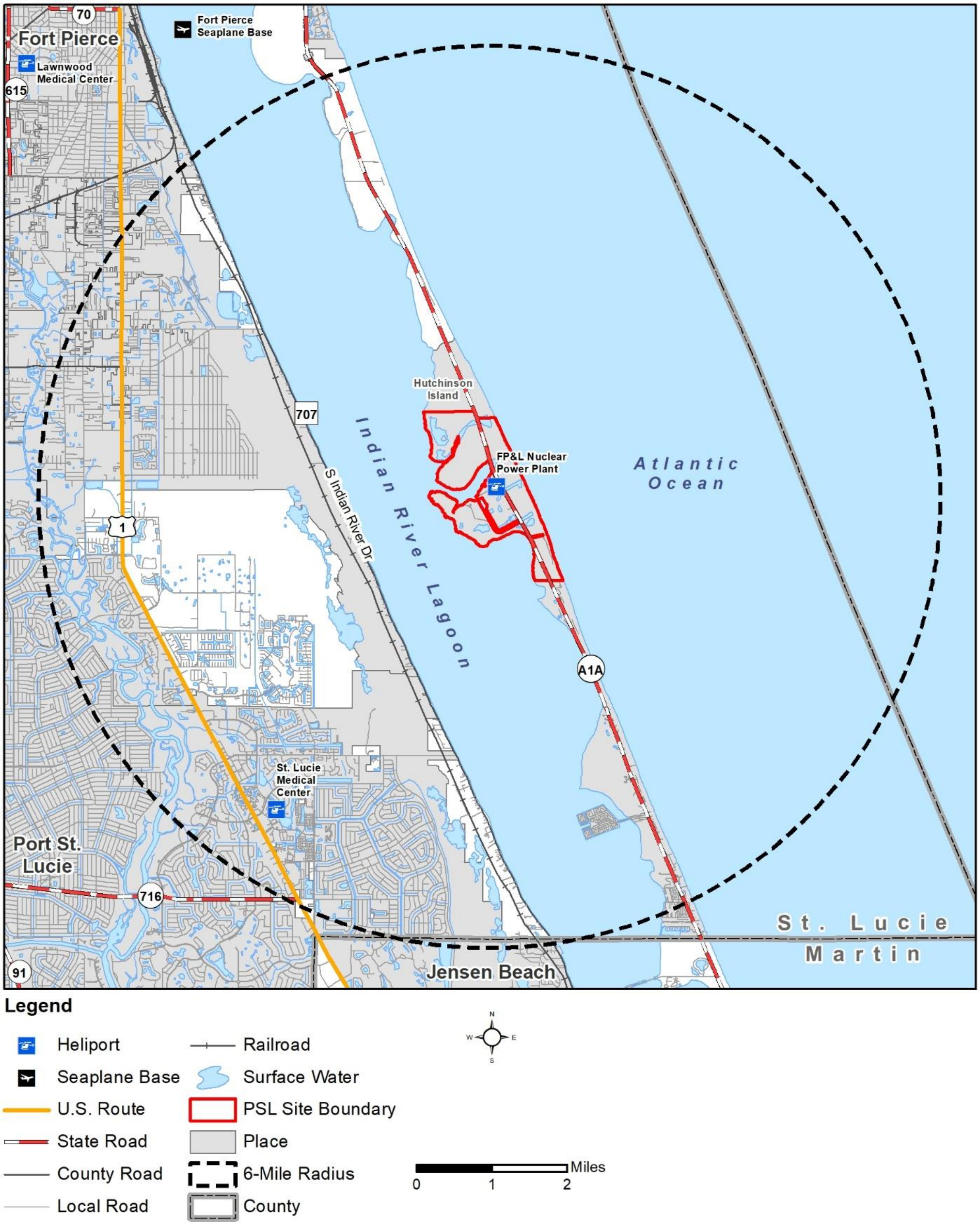
| SL01812 | Ankona | Prehistoric habitation with midden(s) and 20th century refuse/dump | Potentially eligible for NRHP |
| SL01813 | Ankona | Prehistoric habitation with midden(s) and 20th century refuse/dump | Potentially eligible for NRHP |
| SL03016 | Eden | 19th to 20th century homestead refuse/dump | Not evaluated by SHPO |
| SL03017 | Ankona | Prehistoric burial mound(s) | Insufficient information |
| SL03018 | Ankona | Prehistoric habitation with midden(s) | Insufficient information |
| SL03019 | Ankona | Prehistoric habitation with midden(s) | Insufficient information |
| SL03020 | Ankona | Prehistoric habitation with midden(s) | Insufficient information |
| SL03021 | Ankona | Prehistoric habitation with midden(s) | Insufficient information |
| SL03258 | Ankona | 20th century refuse/dump | Not evaluated by SHPO |

**Figure 1. PSL Site**

**Figure 2. PSL 6-Mile Vicinity**



April 14, 2021

Dr. Paul Backhouse
Sr. Director Historic and Environmental Resources Office (HERO)
Seminole Tribe of Florida
Ah-Ta-Thi-Ki Museum
30290 Josie Billie Hwy, PMB 1004
Clewiston, FL 33440

**RE: Florida Power & Light Company – Point St. Lucie Nuclear Power Plant (PSL) Units 1 and 2 Subsequent License Renewal**

Dear Dr. Backhouse:

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**Figure 1. PSL Site**

**Figure 2. PSL 6-Mile Vicinity**

April 14, 2021

Galen Cloud
Tribal Historic Preservation Officer
Thlopthlocco Tribal Town
POB 188
Okemah, OK 74859

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During the subsequent license renewal term, FPL proposes to continue operating the units as currently operated and based on aging management studies **does not expect that refurbishment, construction, ground disturbing activities or physical changes to the generating facility will be needed for the license renewal.** Any ground-disturbing activities would be maintenance related and governed by site procedures. FPL does not anticipate operation of PSL to adversely affect the environment or any cultural or historic resources.

There have been a total of 14 cultural resource surveys within a 6-mile radius of PSL, three of which were within the 1,132-acre PSL property. A full cultural resources survey was conducted in 1969 by the Board of Archives and History on a portion of the site, resulting in one recorded prehistoric archaeological site and one prehistoric site that was described but not recorded. A second cultural resource survey was conducted for a cell tower on the PSL property in 2014. The survey did not result in the recording of any cultural resources. A third cultural resources survey was conducted by the Archaeological and Historical Conservancy, Inc. (AHCI) in 2008 at the request of FPL. According to the Florida Master Site File (FMSF), there are five cultural resources within the PSL property. One of the cultural resources on property has been determined to be potentially eligible for the National Register of Historic Places (NRHP). A listing of cultural resources within a 6-mile radius of PSL identified from a 2020 search of the FMSF GIS and tabular data sets is presented in the attached Table 2.

I hope this information has been helpful to you. Please let me know if you have any comments, questions, or have information you believe FPL should consider as part of the license renewal process. Your response is kindly requested within 45 days of receiving this letter. FPL plans to include this letter in the ER. I can be reached at 561-310-8843 or via email at Desiree.Estabrook@nee.com .

Sincerely,

Desiree Estabrook, AICP, CNU-A
Project Manager, Tribal Relations, Florida Power & Light

Attachments:

Table 2. Archaeological Sites Inventory Entries within a 6-Mile Radius of PSL

Figure 1. PSL Site

Figure 2. PSL 6-mile Vicinity

**Table 2. Archaeological Sites Inventory Entries within a 6-Mile Radius of PSL**

| Site ID# | Quadrangle | Type | NRHP Status/SHPO Evaluation |
|---|---|---|---|
| SL00004 | Fort Pierce | Prehistoric camp site and 19th century farm | Potentially eligible for NRHP |
| SL00008 | Eden | Prehistoric midden with pottery | Not evaluated by SHPO |
| SL00009 | Eden | Prehistoric midden with burials and 19th century scatter | Not evaluated by SHPO |
| SL00011 | Eden | Prehistoric burial mound(s) | Not evaluated by SHPO |
| SL00013 | Eden | Prehistoric midden mound with burials | Insufficient information |
| SL00015 | Fort Pierce | Shell midden with no artifacts observed | Ineligible for NRHP |
| SL00017 | Fort Pierce | Multicomponent prehistoric site and $16^{th}$-$18^{th}$ century shipwreck | Not evaluated by SHPO |
| SL00022 | Eden | Historic shipwreck | Not evaluated by SHPO |
| SL00026 | Eden | Historic shipwreck | Not evaluated by SHPO |
| SL00028 | Eden | 18th century shipwreck | Not evaluated by SHPO |
| SL00033 | Eden | 19th to 20th century shipwreck | Not evaluated by SHPO |
| SL00037 | Eden | Prehistoric midden | Not evaluated by SHPO |
| SL00043 | Fort Pierce | Prehistoric midden | Not evaluated by SHPO |
| SL00044 | Eden | Prehistoric midden with burials | Potentially eligible for NRHP |
| SL00055 | Eden | Prehistoric campsite and historic shipwreck | Not evaluated by SHPO |
| SL00074 | Ankona | Prehistoric midden(s) | Not evaluated by SHPO |
| SL00075 | Ankona | Prehistoric camp site and 19th Century scatter | Not evaluated by SHPO |
| Site ID# | Quadrangle | Type | NRHP status/SHPO evaluation |
| SL00291 | Ankona | Prehistoric habitation and 19th to 20th century scatter | Not evaluated by SHPO |
| SL00292 | Ankona | Prehistoric habitation and 19th to 20th century scatter | Not evaluated by SHPO |
| SL01121 | Ankona | Prehistoric burial mound(s) | Not evaluated by SHPO |

**Table 2. Archaeological Sites Inventory Entries within a 6-Mile Radius of PSL (Continued)**

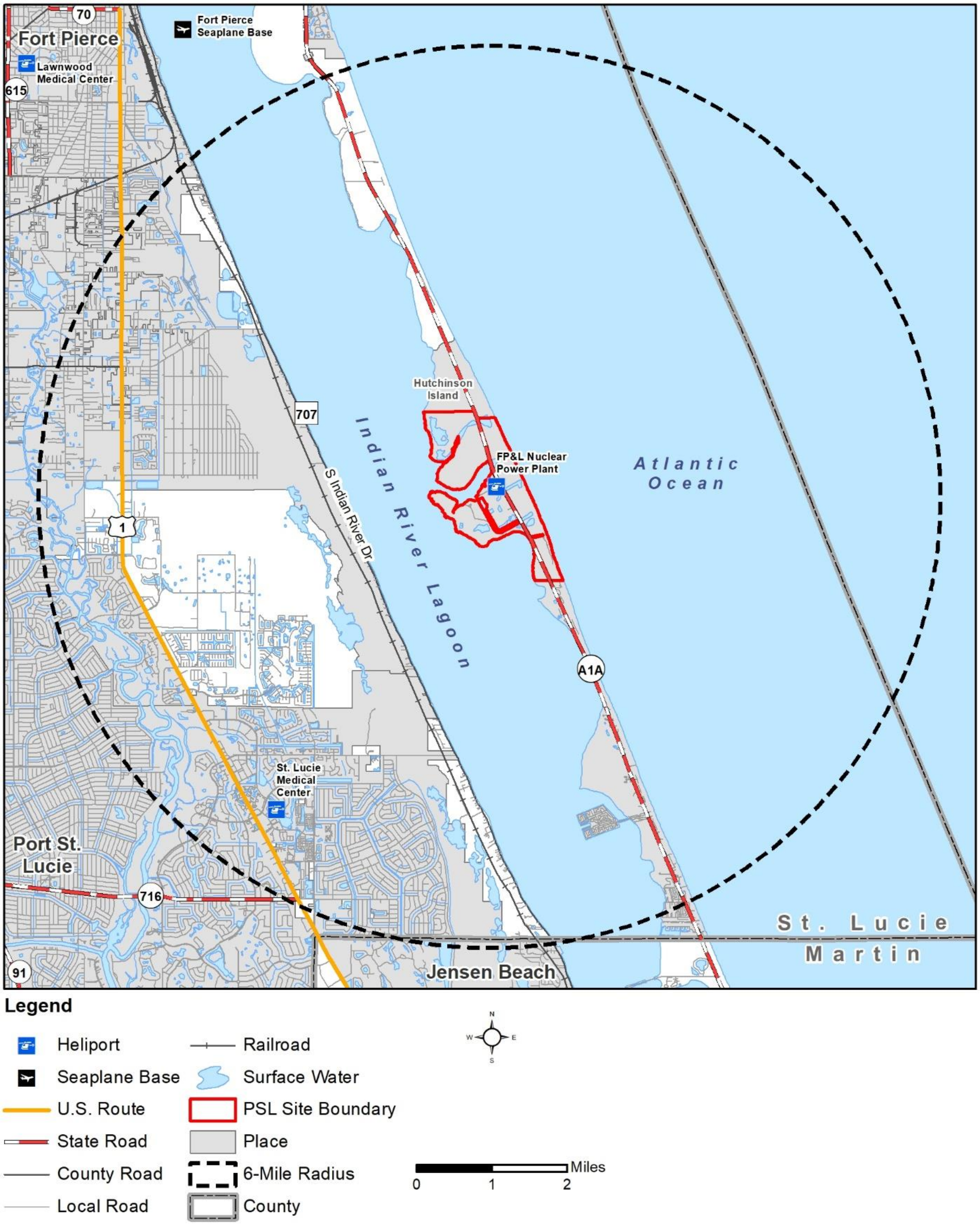
| Site ID# | Quadrangle | Type | NRHP Status/SHPO Evaluation |
|---|---|---|---|
| SL01136 | Ankona | Prehistoric campsite and late 19th to 20 century homestead | Ineligible for the NRHP |
| SL01146 | Eden | Prehistoric midden | Ineligible for the NRHP |
| SL01173 | Eden | Prehistoric midden and homestead (unidentified timeframe) | Ineligible for the NRHP |
| SL01174 | Ankona | 20th century homestead | Ineligible for the NRHP |
| SL01175 | Ankona | 20th century trash dump and scatter | Ineligible for the NRHP |
| SL01176 | Eden | Prehistoric campsite | Ineligible for the NRHP |
| SL01177 | Eden | Prehistoric campsite | Ineligible for the NRHP |
| SL01178 | Eden | Prehistoric midden(s) | Ineligible for the NRHP |
| SL01184 | Eden | An isolated Archaic artifact | Ineligible for the NRHP |
| SL01269 | Palms Cemetery | Ankona | Protected by state burial laws, not evaluated by SHPO |
| SL01634 | Eden Cemetery | Eden | Protected by state burial laws, not evaluated by SHPO |
| SL01640 | Eden | Late 19th century homestead | Ineligible for the NRHP |
| SL01720 | Fort Pierce | Prehistoric campsite | Potentially eligible for the NRHP |
| SL01721 | Fort Pierce | Prehistoric midden(s) | Potentially eligible for the NRHP |
| SL01722 | Ankona | Prehistoric midden(s) | Insufficient information |
| SL01723 | Ankona | Prehistoric midden(s) and 20th century refuse/dump | Potentially eligible for the NRHP |
| SL01724 | Ankona | Prehistoric midden(s) and 19th to 20th century homestead and refuse/dump | Potentially eligible for the NRHP |
| SL01725 | Ankona | Prehistoric midden(s) and 20th century refuse/dump | Potentially eligible for the NRHP |
| SL01726 | Ankona | 19th to 20th century homestead and refuse/dump | Not evaluated by SHPO |
| SL01810 | Ankona | Prehistoric burials | Potentially eligible for NRHP |

**Table 3. Archaeological Sites Inventory Entries within a 6-Mile Radius of PSL (Continued)**

| Site ID# | Quadrangle | Type | NRHP Status/SHPO Evaluation |
|---|---|---|---|
| SL01811 | Ankona | Prehistoric midden(s) | Potentially eligible for NRHP |
| SL01812 | Ankona | Prehistoric habitation with midden(s) and 20th century refuse/dump | Potentially eligible for NRHP |
| SL01813 | Ankona | Prehistoric habitation with midden(s) and 20th century refuse/dump | Potentially eligible for NRHP |
| SL03016 | Eden | 19th to 20th century homestead refuse/dump | Not evaluated by SHPO |
| SL03017 | Ankona | Prehistoric burial mound(s) | Insufficient information |
| SL03018 | Ankona | Prehistoric habitation with midden(s) | Insufficient information |
| SL03019 | Ankona | Prehistoric habitation with midden(s) | Insufficient information |
| SL03020 | Ankona | Prehistoric habitation with midden(s) | Insufficient information |
| SL03021 | Ankona | Prehistoric habitation with midden(s) | Insufficient information |
| SL03258 | Ankona | 20th century refuse/dump | Not evaluated by SHPO |

**Figure 1. PSL Site**

**Figure 2. PSL 6-Mile Vicinity**



# Attachment E: Other Consultation Letters

April 14, 2021

Shamarial Roberson, PhD.
Deputy Secretary for Health
Florida Department of Health
4052 Bald Cypress Way
Tallahassee, FL 32399

**RE: Florida Power & Light Company – St. Lucie Nuclear Power Plant (PSL) Units 1 and 2 Subsequent License Renewal**

Dear Dr. Roberson:

Florida Power & Light Company (FPL) is seeking a license renewal (see Table 1) from the U.S. Nuclear Regulatory Commission (NRC) for the St. Lucie Nuclear Power Plant Units 1 and 2 (PSL), which have a heated wastewater discharge to the Atlantic Ocean. As part of the license renewal process, the NRC may request a consultation with your agency.

**Table 1. PSL Licensing Dates**

| PSL Unit | Current License Expiration Date | Extended License Expiration Date |
|---|---|---|
| Unit 1 | March 1, 2036 | March 1, 2056 |
| Unit 2 | April 6, 2043 | April 6, 2063 |

The NRC requires a license renewal applicant to assess public health impacts resulting from thermophilic organisms. It is our intent by this letter to introduce you to the project, to make available any data you need to ensure an efficient and effective consultation process, and request input from the Florida Department of Health (FDOH) regarding:

- Any questions or additional information needs FDOH may have regarding our thermophilic organism impact assessment summarized below.

- Confirmation that continued operation of PSL will create no potential public health hazards from pathogenic microorganisms due to PSL discharge-related warming of the Atlantic Ocean.

Information concerning this request, specific microorganisms of concern identified by NRC, and PSL's thermal discharge are presented below. A figure depicting the station site and the vicinity within a 6-mile radius is attached.

As part of the renewal process, the NRC requires that the license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. One of the environmental impact topics is the potential public health hazard associated with thermophilic microorganisms. The presence and numbers of these organisms can be increased in the receiving waterbody by the addition of heat from a nuclear power plant's cooling water discharge. FPL's ER concludes that PSL's heated wastewater discharge to the Atlantic Ocean would not enhance the growth of thermophilic microorganisms.

**Microorganisms of Concern**

- Free-living amoebae of the genera *Naegleria* (*N. fowleri*) and *Acanthamoeba*
- *Legionella* spp.
- Enteric pathogens *Salmonella* spp., *Shigella* spp., and *Pseudomonas aeruginosa*
- Thermophilic fungi

**Information to Support Consultation on Thermophilic Microorganisms**

Of greatest concern is the known human pathogen of genera *Naegleria, N. fowleri. Naegleria* spp. is ubiquitous in nature and thrives in freshwater bodies at temperatures ranging from 95-106°F or higher. *N. fowleri*, the organism that caused primary amebic meningoencephalitis, does not live in seawater.

Exposure to *Legionella* spp. from power plant operations is generally an occupational health concern rather than a public health concern. Occupational exposure is associated with tasks where a worker could dislodge biofilms, where *Legionella* are often concentrated, such as during the cleaning of condenser tubes and cooling towers. PSL does not have cooling towers and condenser tube cleaning is mechanized, minimizing occupational exposure.

Other human pathogens mentioned above have infection routes of contact with infected persons or contaminated water, food, soil, or other contaminated material. The exposure route of concern would be contact with contaminated water (i.e., containing a population of microorganisms sufficient for human infection). The pathogens can grow at a range of temperatures. There were no reported cases of infection from waterborne *Salmonella* spp. in the United States in 2019. There were no infection cases from waterborne pathogens in untreated recreational water in Florida in 2013-2014.

PSL's wastewater discharge permit issued by the Florida Department of Environmental Protection limits the waste heat that PSL can reject to the Atlantic Ocean and requires reporting of intake and discharge temperatures. The wastewater is discharged 1,500 feet offshore via two submerged pipes. The design of the discharge creates a high degree of mixing with the surrounding ocean water.

The nearest public beach areas to PSL are Walton Rocks Beach and Dog Park and Ocean Bay Riverside Park within and south of the PSL property, and Blind Creek Beachside and Blind Creek Riverside South north of the property. The discharge is located away from public access beaches and navigation buoys in the ocean flank the discharge area, restricting public access.

As stated earlier, this letter seeks your input on potential public health impacts associated with the microorganisms of concern as they relate to the proposed continued operation of PSL. Your response is kindly requested within 45 days or receiving this letter. FPL plans to include this letter in the ER.

Should you or your staff have any questions or comments, please contact Richard Orthen at (561) 236-1481 / richard.orthen@fpl.com.

Sincerely,

William D. Maher
Licensing Director - Nuclear Licensing Projects

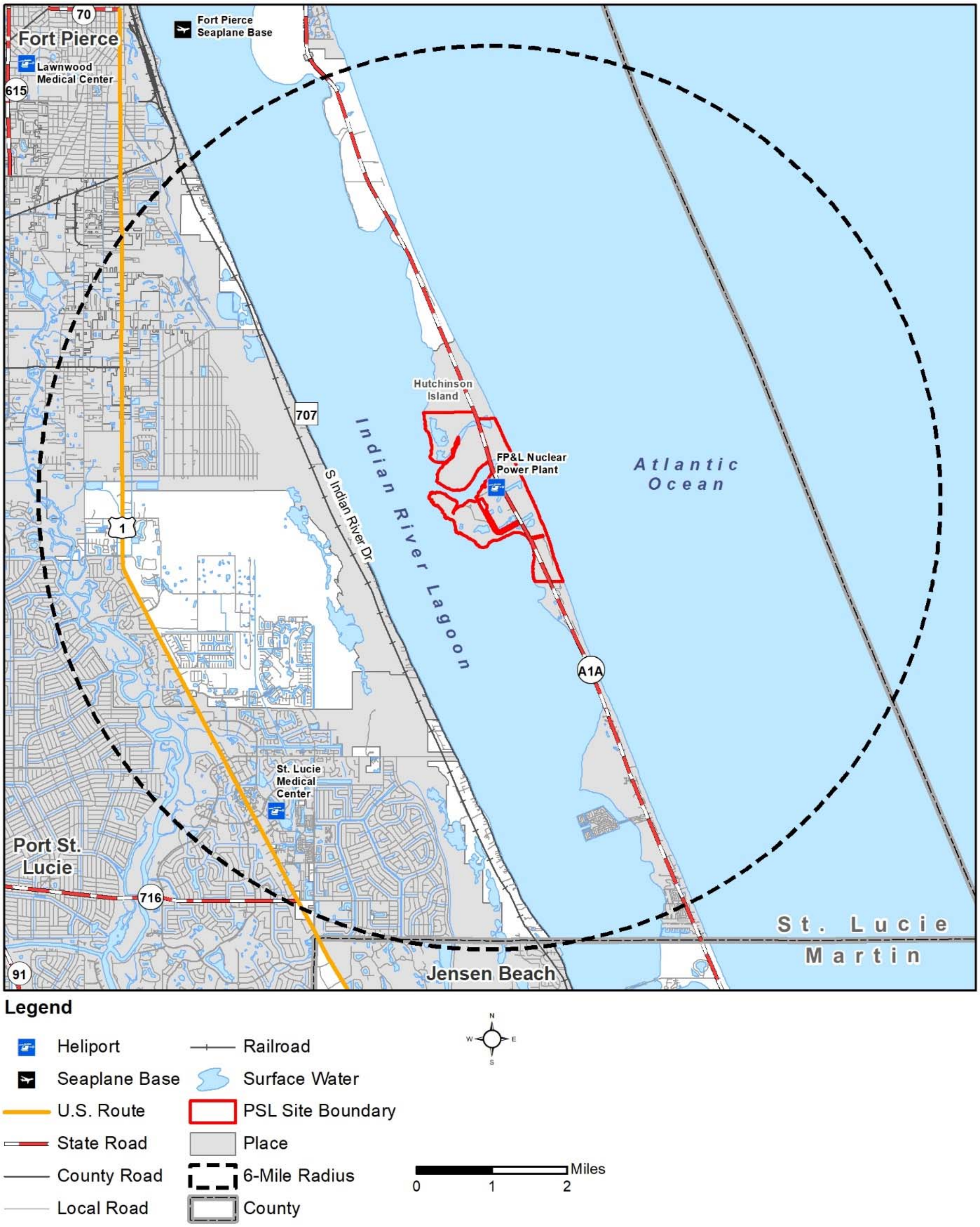
Attachments:

Figure 1. PSL Site

Figure 2. PSL 6-mile Vicinity

**Figure 1. PSL Site**

**Figure 2. PSL 6-Mile Vicinity**



# Attachment F: Coastal Zone Management Act Certification

Florida Department of
Environmental Protection
Bob Martinez Center
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Charlie Crist
Governor

Jeff Kottkamp
Lt. Governor

Michael W. Sole
Secretary

March 9, 2012

Dr. Stuart L. Santos, P.W.S.
Regulatory Division, Jacksonville District
U.S. Army Corps of Engineers
Post Office Box 4970
Jacksonville, FL  32232-0019

RE: St. Lucie Power Plant Units 1 & 2 PA 74-02
Water Quality Certification

Dear Dr. Santos;

This letter serves as notice that the St. Lucie Power Plant (Units 1 & 2) was certified through written final order signed by the Secretary of the Department of Environmental Protection, pursuant to 403.509, Florida Statutes, on September 17, 2008.  The Conditions of Certification are available at: http://www.dep.state.fl.us/siting/files/certification/pa74_02_2008_Up.pdf

Pursuant to the Operating Agreement between the Florida Department of Environmental Protection (Department), United States Army Corps of Engineers (USACOE) and water management districts, this written final order granting certification under the Florida Electric Power Plant Siting Act, section 403.501-.539, Florida Statutes, also constitutes certification of compliance with state water quality standards pursuant to section 401 of the Clean Water Act, 33 U.S.C. 1341 and a finding of consistency with the Florida Coastal Management Program, as required by Section 307 of the Coastal Zone Management Act.

If additional information or assistance is required, please contact me at (850) 245-2175 or at cindy.mulkey@dep.state.fl.us

Sincerely,

Cindy Mulkey

Cindy Mulkey
Administrator, Siting Coordination Office

cc: Mr. Peter Cocotos, FPL Peter.Cocotos@fpl.com
Mr. Doug Fry, DEP – doug.fry@dep.state.fl.us
Ms. Jennifer Smith, DEP-SED jennifer.k.smith@dep.state.fl.us
Ms. Dianne Hughes, DEP – SED dianne.k.hughes@dep.state.fl.us
Melinda Parrot, SFWMD, mparrott@sfwmd.gov