121 ha (300 ac.) near the center of the LNP site. Land cover in the plant site area comprises clearcut fields, planted pine, cypress swamps, and depressional marshes that occur mostly as isolated basins in stands of planted pine.

Soils in the study area have been extensively disturbed through clearing, logging road construction, and bedding. The predominant soils on the site are Smyrna fine sands and Placid and Samsula soils, depressional. Figure 2.4-4 presents a description of the area soils composition. Smyrna fine sands are described as poorly drained and level soils in flatwoods, with a seasonal high water table at 6 to 46 cm (18 in.) for 1 to 4 months. Placid and Samsula soils, depressional, are described as very poorly drained and nearly level soils in depressions in flatwoods. They are ponded, with the seasonal high water table typically above the surface for more than 6 months and within a depth of 30.5 cm (12 in.) during the rest of the year. The predominant soils map unit on the site is common across the region, covering approximately 28 percent of the Levy County acreage. (Reference 2.4-001)

#### 2.4.1.1.1 Existing Cover Types

The LNP site comprises a range of cleared and forested cover types, as evident in an aerial photograph of the property (Figure 2.4-5). Existing vegetative cover types on the LNP site that are described below are based on the FLUCCS, as interpreted and mapped by the SWFWMD and field-verified during ecological surveys performed by CH2M HILL ecologists between September 2006 and January 2008 (Figure 2.4-6). (References 2.4-003 and 2.4-004)

Major vegetative cover types on the LNP site are listed in Table 2.4-1 and are described below in order of decreasing prevalence (Reference 2.4-004). Species lists are based on observations made in the field between September 2006 and January 2008.

Natural communities located on the LNP site have been logged and are in various stages of regeneration. Remnant natural systems, such as logged cypress swamps in which cypress no longer comprises the dominant vegetative canopy cover, are described below under the classification that reflects current vegetative composition.

##### 2.4.1.1.1.1 Tree Plantations (Code 440)

Encompassing approximately 720 ha (1780 ac.), or 57 percent of the site acreage, tree plantations comprise the predominant cover class on the LNP site. Most of the site is planted with slash pine, and to a lesser extent, loblolly pine (*Pinus taeda*). The silvicultural operations represent stages of short-rotation (less than [<] 30 years) pine production from newly planted seedlings to early-maturity pine stands for the pulpwood market. After harvest the land is graded, bedded, and replanted with pine seedlings. Bedding is the technique of forming continuous mounds of soil alternating with furrows. It is a common site preparation practice, especially under moist soil conditions. The practice enhances local drainage and seedling survival. (Reference 2.4-005)

Individual planted pine stands are monospecific and even-aged. The understory and groundcover strata are generally sparse, with common species including gallberry (*Ilex glabra*), saw palmetto (*Serenoa repens*), sand blackberry (*Rubus cuneifolis*), wax myrtle (*Myrica cerifera*), wiregrass (*Aristida stricta*), broomsedge (*Andropogon virginicus*), bristlegrass (*Setaria geniculata*), blue maidencane (*Amphicarpum muhlenbergium*), musky mint (*Hyptis alata*), muscadine grape (*Vitis rotundifolia*) and greenbrier (*Smilax spp.*). In wetter areas, understory and groundcover species may include buttonbush (*Cephalanthus occidentalis)*, Virginia chain fern (*Woodwardia virginica*), maidencane (*Panicum hemitomon*), and soft rush (*Juncus effusus*).

2.4.1.1.1.2 Cypress (Code 621)

Cypress swamp is the predominant wetland cover class on the LNP site, encompassing 290 ha (717 ac.) or 23 percent of the site acreage. These wetlands are characterized by a canopy cover of predominantly pond cypress (*Taxodium ascendens*). Cypress swamps on the LNP site are poorly drained with water at or above ground surface during much of the year. A few of the cypress swamps support small, semi-permanent pools of open water in deeper areas and clearings. Some of the cypress communities on the LNP site are isolated, circular depressions, while others are linked as shallow slough systems or drainage-ways during wet weather periods, such as early spring.

Woody species, including slash pine, redbay (*Persea palustris*), swamp tupelo (*Nyssa sylvatica* var *biflora*), red maple (*Acer rubrum*), buttonbush, fetterbush (*Lyonia lucida*), Virginia willow *(Itea virginica*), and doghobble *(Leucothoe racemosa*) are associated with the pond cypress. Groundcover is generally sparse due to high water, but includes lizard's tail (*Saururus cernuus*), maidencane, and a variety of fern species that frequently grow in elevated tussocks, such as royal fern (*Osmunda regalis*), cinnamon fern (*Osmunda cinnamomea*), and Virginia chain fern.

Under natural conditions, flooding and fire restrict the encroachment of less tolerant hardwoods into cypress swamps (Reference 2.4-006). Without fire, cypress swamps are succeeded by hardwoods such as redbay, sweetbay (*Magnolia virginiana*), red maple, and swamp tupelo, eventually evolving from cypress swamp to a hardwood-dominated system (Reference 2.4-007).

2.4.1.1.1.3 Wetland Forested Mixed (Code 630)

Approximately 73 ha (181 ac.) or 6 percent of the total LNP site acreage are classified as Wetland Forested Mixed. This classification is defined as forested wetlands in which hardwoods and conifers are co-dominant in the crown canopy composition. On the LNP site these systems are frequently found as inclusions in, or on the periphery of, cypress swamps. Common species are similar to those found in cypress swamps, but with a higher prevalence of hardwood trees such as redbay, sweetbay, tupelo, red maple, and dahoon holly (*Ilex cassine*). Left

undisturbed, these mixed forests eventually will become dominated by hardwoods (Reference 2.4-008).

2.4.1.1.1.4 Stream and Lake Swamps (Bottomland) (Code 615)

Approximately 59 ha (146 ac.) or 4.7 percent of the LNP site acreage are classified as Stream and Lake Swamps. This bottomland cover type consists of low-lying forest with mostly hardwoods in the vegetative canopy, often associated with streams, lakes, floodplains, or overflow areas. On the LNP site this community type surrounds cypress swamp and wetland forested mixed systems and is seasonally flooded. Dominant canopy species are red maple, sweetgum (*Liquidambar styraciflua*), swamp laurel oak (*Quercus laurifolia*), water ash (*Fraxinus caroliniana*), black gum (*Nyssa sylvatica*), Florida elm (*Ulmus floridana*), redbay, and sweetbay. Cypress stumps are also common. Associated subcanopy species include Carolina willow (*Salix caroliniana*), stiff cornel (*Cornus foemina*), black haw (*Viburnum obovatum*), wax myrtle, saw palmetto and buttonbush. Groundcover species include bristlegrass, panic grasses (*Panicum spp.*), frog-fruit (*Phyla nodiflora*), poison ivy (*Toxicodendron radican*s), and musky mint.

2.4.1.1.1.5 Freshwater Marshes (Code 641)

Freshwater marshes encompass 58 ha (143 ac.), or just under 5 percent of the total acreage of the LNP site. Freshwater wetlands with predominantly herbaceous emergent vegetation are classified under the broad category of freshwater marshes. On the LNP site, most of these systems are successional habitats that develop after cypress swamps or pine flatwoods are logged. Vegetative composition of these systems varies depending on several factors, including hydroperiod, the nature of the community prior to disturbance, and the length of time since the disturbance occurred.

Wet prairie-type vegetation occupies small, shallow depressions within planted pine stands, in clearings, and in borrow areas for road construction and bedding. Vegetation in these freshwater marshes is typically dominated by grasses, sedges, and forbs that are tolerant of wet conditions. Common species include maidencane, blue maidencane, bushy bluestem (*Andropogon glomeratus)*, sand cordgrass (*Spartina bakeri*), sawgrass (*Cladium jamaicense*), yellow-eyed grass (*Xyris* spp.), redroot, bogbutton (*Lachnocaulon* spp.), spikerush (*Eleocharis spp*.), red ludwigia (*Ludwigia repens*), sedges (*Carex* spp.), and beakrush (*Rhynchospora* spp.) with scattered groundsel bush (*Baccharis halimifolia*), St. Andrew's Cross (*Hypericum hypericoides*), and buttonbush.

The depressional marshes on the LNP site are shallow, often circular basins deepening towards the center, with herbaceous and shrub vegetation in concentric bands. The central portion of these systems is vegetated by emergent plant species such as pickerelweed (*Pontedaria cordata*), firelag (*Thalia geniculata*), and cattail (*Typha latifolia*), surrounded by shrubs such as buttonbush, St. Peter's Wort (*Hypericum crux-andreae*), St. Andrew's cross, and wax myrtle, as well as various graminoids and forbs including maidencane,

rushes (*Juncus repens, J. marginatus, J. effusus)*, beakrushes, sedges, yellow-eyed grass, and bogbutton.

Where logging is very recent and the soil is exposed, early successional species associated with disturbance, like redroot, broomsedge, bushy bluestem, dog fennel, and annual ragweed *(Ambrosia artemisiifolia*), vegetate the area. Later colonizers include wax myrtle, blackberry, groundsel bush, buttonbush, and persimmon (*Diospyros virginiana*). Some cypress stands are not clearcut; instead, a few widespread individual cypress trees are left for regeneration.

2.4.1.1.1.6 Other Open Lands, Rural (Code 260)

Approximately 43 ha (106 ac.), or 3 percent of the LNP site, are classified as Other Open Lands. This land cover class describes agricultural lands of indeterminant nature. On the LNP site, the clear-cut portions of the plant site are classified as Other Open Lands, vegetated by broomsedge, redroot, dog fennel, annual ragweed, red top panicum (*Panicum rigidulum*), bracken fern (*Pteridium aquilinum*), and slash pine saplings. Relative to other areas of the LNP site, this central portion shows the most conspicuous results of prolonged silvicultural operations with a heavily scarified ground surface, scattered piles of woody debris, and a network of existing and relict logging roads.

2.4.1.1.1.7 Hardwood Conifer Mixed (Code 434)

The Hardwood Conifer Mixed land cover classification describes forests in which upland conifers and hardwoods share dominance in the crown canopy. A fragment of this forest type encompasses approximately 6.5 ha (16 ac.), or less than 0.5 percent of the LNP site, in the northwestern corner just east of US-19/US-98. Common species include laurel oak, sweet gum, slash pine, loblolly pine, live oak (*Quercus virginiana*), and cabbage palm (*Sabal palmetto*).

2.4.1.1.1.8 Utilities (Code 830)

Encompassing close to 2 ha (4 ac.), or 0.1 percent of the total acreage of the LNP site, the Utilities land cover class is represented by a natural gas pipeline corridor in the northwest corner of the site, roughly parallel to US-19/US-98. Vegetative communities along the corridor are maintained in herbaceous to shrub strata, and are dominated by early successional species including dog fennel, bluestem, goldenrod (*Solidago* spp.), bracken fern, flat-topped goldenrod (*Euthamia minor*), winged sumac (*Rhus copallina*), groundsel bush, and blackberry. Wetter areas support hydrophytic grasses and forbs, including cattail, pickerelweed, maidencane, and blue maidencane.

2.4.1.1.1.9 Upland Coniferous Forest (Code 410)

The Upland Coniferous Forest land cover classification is defined as any natural forest stand in which at least 66 percent of the canopy is dominated by conifers. On the LNP site this area includes small patches of natural pine forest. This class comprises just over 4 ha (11 ac.), or 0.3 percent of the total site area. Nearly all

of the upland area on the LNP site that is capable of supporting planted pine is either planted in pine (Tree Plantations, Code 440) or has been recently cleared of pine; very little natural pine forest remains on the LNP site.

2.4.1.1.1.10 Pine Flatwoods (Code 411)

Natural pine flatwoods cover a little over 1 ha (3 ac.), or 0.1 percent of the LNP site. These systems are dominated by slash pine or longleaf pine with an understory of saw palmetto, wax myrtle, and gallberry. This category represents a small remnant of pine flatwoods that was replaced with planted pine.

Shrub and Brushland (Code 320) and Wet Prairie (Code 643) land cover classifications comprise less than 1 ha of the LNP site acreage.

2.4.1.1.2 Wildlife Resources

Wildlife resources on and in the vicinity of the LNP site were identified based on literature reviews and site reconnaissance visits conducted between September 2006 and January 2008. Site reconnaissance activities consisted of habitat characterizations, wetland delineations, and wildlife observations. Direct observations of individuals, as well as signs of wildlife (e.g., tracks, scat) were recorded.

By definition, even-aged and monospecific planted pine stands generally exhibit lower biodiversity compared to native systems. Pine plantations are often managed to exclude vegetative strata and species that provide habitat for a variety of wildlife species. (Reference 2.4-008) With the short rotation scale characteristic of pulpwood operations, for example, trees are harvested before reaching their maximum growth, thereby excluding species such as cavity-dwelling birds that use mature trees (Reference 2.4-002). A closed canopy in mid-growth planted pine stands can block sunlight and restrict the growth of grasses and forbs that support species such as white-tailed deer, bobwhites, cottontails, and wild turkeys (Reference 2.4-008).

Although individual pine stands at the LNP site are even-aged, they are at different stages of production, expanding the habitat types available to wildlife. The landscape matrix of cypress swamps, clearcut fields, and hardwoods interspersed within the planted pine stands provides habitat for common species of mammals, birds, reptiles, and amphibians.

Mammalian species that occur at the LNP site are those widespread in the pine plantation/cypress swamp landscape mosaic of the region. These include whitetail deer (*Odocoileus virginianus*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), feral hog (*Sus scrofa*), nine-banded armadillo (*Dasypus novemeinctus*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), eastern cottontail rabbit (*Sylvilagus floridanus*), striped skunk (*Mephitis mephitis*), gray squirrel (*Scuirus caroliniensis*), eastern mole (*Scalopus aquaticus*), and southeastern shrew (*Sorex longirostris*). Most of the common mammals on the LNP site are generalists in that they are not exclusive to any one habitat type, but use various

habitats for different purposes. Mammalian species that have been observed or are likely to inhabit the area are listed in Table 2.4-2.

Bird species that were observed on the LNP site or are considered likely to use the site include northern cardinal (*Cardinalis cardinalis*), eastern kingbird (*Tyrannus tyrannus*), black vulture (*Coragyps atratus*), turkey vulture (*Cathartes aura*), and northern mockingbird (*Mimus polyglottus*) (Table 2.4-3). Wood ducks (*Aix sponsa*) use the bottomlands and cypress swamps, as do barred owls (*Strix vamria*), red-shouldered hawks (*Buteo lineatus*), woodcocks (*Scolopax minor*), hairy woodpeckers *(Picoides villosus*), and pileated woodpeckers (*Drycopus pileatus*). Several species of wading birds forage in wetland areas, such as great blue heron (*Ardea herodias*), little blue heron (*Ardea caerulescens)*, and white ibis (*Eudocimus albus*). (Reference 2.4-009)

Nesting colonies of wading birds have not been observed nor is it considered likely that colonies will become established on the LNP site because of the absence of open water habitats that are preferred by these species. Wading bird nesting colonies are usually located over or near water, which helps protect the nests from terrestrial predators, such as raccoons and rats (*Rattus* spp.) (Reference 2.4-010).

Near the Gulf of Mexico and along the path of the Eastern Atlantic Flyway, the site is well-situated as a stopover for migratory birds; although, the proximity of natural areas such as the Goethe State Forest and Waccasassa Bay Preserve State Park may make the LNP site a relatively less attractive alternative for some avifauna (Reference 2.4-011). Figure 2.4-7 provides a description of the natural resource areas. Migratory bird species observed on the LNP site include American robin (*Turdus migratorius*), yellow-rumped warbler (*Dedroica coronata*), yellow-throated warbler (*Dendroica dominica*), and cedar waxwing (*Bombycilla cedrom*).

Reptile and amphibian species that have been observed or are likely to live on the site are listed in Table 2.4-4. These species include black racer (*Coluber constrictor*), eastern indigo snake (*Drymarchon corais couperi*), eastern mud snake (*Farancia abacura*), cottonmouth (*Agkistrodon piscivorus*), gopher tortoise (*Gopherus polyphemus*), river cooter (*Pseudemys floridana floridana*), southern leopard frog (*Rana utricularia*), broadhead skink (*Eumeces laticeps*), and ground skink (*Scincella lateralis*) (Reference 2.4-012). Depression marshes on the LNP site are likely provide breeding and foraging habitat for such species as the Southeastern five-lined skink (*Eumeces inexpectatus*), mole salamander (*Ambystoma talpoideum*), tiger salamander (*Ambystoma tigrinum tigrinum*), striped newt (*Notophthalmus perstriatus*), oak toad (*Bufo quercicus*), cricket frog (*Acris gryllus gryllus*), and squirrel treefrog (*Hyla squirella*) (Reference 2.4-009).

#### 2.4.1.1.3 Important Species

Important species are defined in NUREG-1555 as those animal or plant species that meet the following criteria:

- Commercially or recreationally valuable.
- Federally or state-listed as threatened or endangered.
- Critical to the well-being of important species.
- Critical to the structure and function of a valuable ecological system.
- Biological indicators of radionuclides in the environment.

Important species identified at the LNP site include several game species and certain protected species that either have been observed on the site, or may occur on-site based on occurrence records (Reference 2.4-013). These species are discussed below and are presented in Table 2.4-5. Species that are critical to the well-being of important species or a valuable ecosystem, or that can function as suitable bioindicators, have not been identified for the LNP site.

2.4.1.1.3.1 Recreationally Valuable Species

Recreationally valuable game species inhabiting the LNP site are white-tail deer, bobwhite quail (*Colinus virginianus*), and wild turkey *(Meleagris gallopavo)*. These species are locally plentiful. White-tail deer prefer habitats with abundant "edge," or ecotonal areas between grassy openings and forest cover. Bobwhite quail thrive in early successional environments, such as open fields or very young planted pine stands. Wild turkeys prefer open, mature stands of hardwoods interspersed with clearings and conifers. (Reference 2.4-008) Feral hogs are also hunted on the site but are considered a nuisance species (Reference 2.4-014). Feral hogs are discussed further in ER Subsection 2.4.1.1.4.

2.4.1.1.3.2 Threatened or Endangered Species

Threatened or endangered species are defined by the Federal Endangered Species Act of 1973 (ESA) (16 United States Code [USC] 1531 et seq.), as amended, as follows:

> The term "endangered species" means any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the provisions of this Act would present an overwhelming and overriding risk to man . . . The term "threatened species" means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

The U.S. Fish and Wildlife Service (USFWS) is responsible for administering the ESA for federally protected species. The Florida Fish and Wildlife Conservation Commission (FFWCC) has jurisdiction over state-protected wildlife species, while

FDAC is responsible for issues related to rare and protected plant species. The Florida Natural Areas Inventory (FNAI) compiles and maintains a comprehensive database of biological resources in Florida, including documented occurrences of both federally and state-listed protected plant and animal species. In order to identify protected species that may occur on the LNP site, applicable agency databases and literature pertaining to the site were reviewed, and an FNAI Occurrence Report for the LNP site was requested and evaluated.

Based on the FNAI Occurrence Report, several protected species are known to occur in the vicinity of the site (Tables 2.4-6, 2.4-7, 2.4-8, and 2.4-9) (Reference 2.4-013). Although the report identifies no documented occurrences of protected species on the LNP site, it identified the site as having the potential to provide for several protected species. Several species, including the gopher tortoise, gopher frog, red-cockaded woodpecker, bald eagle, and sandhill crane, were documented as occurring in the Goethe State Forest just north of the LNP site.

Pedestrian surveys were conducted between October 2006 and June 2007 to characterize on-site habitats and identify areas that may support protected plant and/or wildlife species. Additional surveys for targeted areas are ongoing. Species observed on the LNP site or considered likely to occur on the site are discussed below.

2.4.1.1.3.2.1 Eastern Indigo Snake (*Drymarchon corais couperi*)

The Eastern Indigo snake is federally and state-listed as a threatened species (Reference 2.4-015). It is a large, heavy-bodied snake, shiny black or bluish-black above and below with chin and throat often tinged with red. Eastern Indigo snakes inhabit a variety of habitats from high pine and scrub communities to moister communities such as wet prairies and swamps. Common prey animals include fish, frogs, toads, lizards, snakes, birds, and small mammals. (Reference 2.4-016) The indigo snake frequently uses gopher tortoise burrows for shelter, especially in areas such as northern Florida, where cool winter temperatures represent a threat. The indigo snake was not observed on the LNP site during pedestrian surveys; although, its presence is likely.

The home range of adult indigo snakes is large, ranging from approximately 19 ha (45 ac.) to nearly 200 ha (470 ac.) (Reference 2.4-017). Threats to this species include over-collecting, road mortality, habitat loss, and habitat fragmentation (Reference 2.4-015).

2.4.1.1.3.2.2 Gopher Tortoise (*Gopherus polyphemus*)

The gopher tortoise is currently classified by the State of Florida as a threatened species, its status having been elevated in 2007 from a Florida Species of Special Concern. Gopher tortoises prefer dry upland habitats such as sandhills, scrub oak, xeric oak, and dry pine flatwoods, as well as disturbed sites such as pastures, old fields, and road shoulders. They excavate burrows that serve as refuge for many other commensal species. (Reference 2.4-015)

Gopher tortoise burrow locations were documented by pedestrian surveys to assist with facility siting and future detailed survey efforts. A total of 58 gopher tortoise burrows were identified within the LNP site and south along the planned pipeline and heavy haul road corridor. The majority of burrows were located in relatively open canopy and shrub layer areas, along existing roads, edges of wetlands, and on spoil areas. Around the LNP site, the density of gopher tortoise burrows was low due partly to the shallow groundwater depth. The occurrence and density of gopher tortoises increased significantly toward the south, immediately north of CR-40 and along the spoil areas of the CFBC. Surveyed gopher tortoise habitat is shown on Figure 2.4-2. Several listed species are known to co-exist in gopher tortoise burrows, including the eastern indigo snake (*Drymarchon corais couperi*), gopher frog (*Rana capito*), and Florida mouse (*Podomys floridanus*). No evidence of activity or occurrence of these commensal species was noted during field surveys.

2.4.1.1.3.2.3 Bald Eagle (*Haliaeetus leucocephalus*)

Bald eagles were recently de-listed under the ESA but are federally protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. Bald eagles are locally common, preferring coastal areas or inland waterways where fish, waterfowl, and other prey are plentiful. Most bald eagles in northern and central Florida migrate north after the breeding season in late May through July. (Reference 2.4-015)

An active bald eagle nest is located just south of the LNP site, west of the proposed heavy haul road (see ER Subsection 2.4.1.2.2.1). Bald eagles are occasionally observed in flight over the LNP site.

2.4.1.1.3.2.4 Florida Black Bear (*Ursus americanus floridanus*)

The Florida black bear is listed as a threatened species by the FFWCC (except in Apalachicola National Forest and Baker and Columbia counties) (Reference 2.4-015). Florida black bears are known to inhabit the adjacent Goethe State Forest (Reference 2.4-018), and it is likely that they occasionally use the LNP site to forage or as a travel corridor. Individual bears have large home ranges, from approximately 65 to 260 $km^2$ (25 to 100 $mi.^2$) or more. Black bears are omnivorous, eating berries, fruits, seeds, nuts, roots, insects, lizards, frogs, armadillos, snakes, and carrion. (Reference 2.4-019)

2.4.1.1.3.2.5 Red-Cockaded Woodpecker (*Picoides borealis*)

The red-cockaded woodpecker is listed as endangered by the USFWS and threatened by the FFWCC. This woodpecker has a black and white-barred back and wings, black cap and nape, and white cheek patches. Its preferred habitat in northern Florida is open, mature longleaf pine flatwoods. It forages in forested community types with pines of various ages but only within a small radius from its nest. The red-cockaded woodpecker is a cooperative breeder and habitat specialist that excavates cavities in live, usually mature pine trees. (Reference 2.4-020)

The Goethe State Forest, which is directly north of the LNP site, supports a community of red-cockaded woodpeckers (Reference 2.4-018). This species is not known to nest on the LNP site and is considered unlikely to do so because of the absence of its preferred nesting habitat.

2.4.1.1.3.2.6 American Alligator (*Alligator mississippiensis*)

The American alligator is listed as a Florida Species of Special Concern by the FFWCC because of its similarity in appearance to the endangered American crocodile (*Crododylus acutus*) (Reference 2.4-015). This reptile is a common inhabitant of most types of freshwater bodies in the state, including marshes and swamps such as those on the LNP site. One juvenile American alligator was observed on the LNP site during field surveys.

2.4.1.1.3.2.7 Wood Stork (*Mycteria americana*)

The wood stork is both federally and state-listed as an endangered species. These birds are large, white with black along the wing margins, and have a short black tail. They nest colonially in inundated forested wetlands. Wood storks forage mainly on small fish. They are tactile rather than visual feeders, using their bills to probe in shallow water and snapping the bill shut when a fish touches it. For this reason, wood storks preferentially feed in areas where the prey are concentrated, such as ditches or shallow marshes where there are seasonal drawdowns in water level. (Reference 2.4-020)

Wood storks have been observed feeding in on-site ditches and wetlands. No known nesting colonies have been observed on the LNP site, based on field surveys and according to the Florida Waterbird Colony database; nor is it likely that colonies will become established due to the lack of open water habitat (see ER Subsection 2.4.1.2).

2.4.1.1.3.2.8 Other Wading Birds

Several species of wading birds, including the great blue heron, little blue heron, and white ibis, have occasionally been observed feeding in wetland areas on the LNP site. These species are classified by the FFWCC as Florida Species of Special Concern and are locally common (Reference 2.4-013).

2.4.1.1.3.2.9 Protected Plants

The FNAI Occurrence Report for 2007 identifies several documented protected plant species in the vicinity of the LNP site, although none were identified on the property in either the FNAI report or during on-site surveys (Reference 2.4-013). Table 2.4-6 presents the protected plant species occurring on the LNP site.

A Godfrey's privet (*Forestiera godfreyi*) specimen was documented in 1937 just outside of the northwestern site boundary, close to US-19/US-98 (Reference 2.4-013). No recent documentation of this shrub on the LNP site is recorded, nor

has this species been identified on the site during ecological surveys. Pinewood dainties (*Phyllanthus leibmannianus*) were documented as occurring west of the LNP site and are classified as endangered. The conversion of native vegetative communities to planted pine reduces the likelihood that rare plants occur on the LNP site. (Reference 2.4-013)

#### 2.4.1.1.4 Nuisance Species

Nuisance plant species on the LNP site include exotic and invasive plants such as cogon grass (*Imperata cylindrical*), Japanese honeysuckle (*Lonicera japonica*), and Chinese privet (*Ligustrum sinense*). These species can be highly invasive in disturbed environments where they may out-compete native vegetation. However, at the time of the survey the infestation of each of these species appeared mild, occupying small and widely-scattered patches on the site.

Feral hogs were identified during the survey as the major nuisance animal species on the LNP site based on field observations. The site is infested with a large population of feral hogs, a nonnative species descended from domestic animals. Hogs can destroy native vegetative communities through rooting and wallowing. The LNP site shows abundant evidence of damage to wetland systems where hogs have rooted up the vegetative cover. They eat ground-nesting birds, reptiles and amphibians, and compete with native wildlife species for seeds, acorns, and other foods. Hogs can harbor diseases and parasites that may spread to native wildlife and people, such as cholera, pseudorabies, brucellosis, tuberculosis, anthrax, ticks, fleas, lice, and various flukes and worms. (Reference 2.4-014)

Other disease vectors present on the LNP site are mosquitos and ticks. Mosquitos can carry West Nile Virus and Eastern Equine Encephalitis, and deer ticks may carry Lyme disease, each of which can be transferred to humans through a bite (Reference 2.4-021).

#### 2.4.1.1.5 Important Terrestrial Habitats

Important terrestrial habitats are defined in NUREG-1555 as the following:

- Wildlife sanctuaries, refuges, and preserves.
- Habitats identified by federal or state agencies as unique, rare, or a protection priority.
- Wetlands and floodplains.
- Land areas identified as critical habitat for species listed as threatened or endangered.

These habitats and their presence on and in the vicinity of the LNP site are described in the following subsections.

2.4.1.1.5.1 Wildlife Sanctuaries, Refuges, and Preserves

Levy County, along with adjacent Gulf Coast counties, is an area known as Florida's Nature Coast, valued for its vast natural areas, water, wildlife resources, and scenic beauty. Several conservation areas are located in the vicinity of the LNP site. Figure 2.4-7 presents the natural resource areas, which include the following:

- Goethe State Forest
- Waccasassa Bay Preserve State Park
- Big Bend Seagrasses Aquatic Preserve
- Crystal River State Buffer Preserve
- CFG State Recreation and Conservation Area

No unique or rare habitats or habitats with priority for protection were identified on the site. However, some of these areas occur in the vicinity, such as the Withlacoochee River, which is located approximately 2 mi. south of the LNP site (Figure 2.4-7) and designated by the State of Florida as an OFW (Reference 2.4-022). Wildlife sanctuaries, refuges, and preserves associated with the transmission corridors are also discussed in ER Subsection 2.2.2.4.

Wetlands are defined jointly by the USACE and the U.S. Environmental Protection Agency (USEPA) as the following (Reference 2.4-023):

> Those areas that are inundated or saturated by surface or ground water 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 include swamps, marshes, bogs, and similar areas. The USACE currently uses the *Corps of Engineers Wetlands Delineation Manual* to establish jurisdiction under Section 404 of the CWA (Reference 2.4-023). The State of Florida uses the *Florida Wetlands Delineation Manual* (Reference 2.4-024) to determine wetland boundaries pursuant to Chapter 62-340, F.A.C. *Delineation of the Landward Extent of Wetlands and Surface Waters*.

Wetlands in the study area were delineated in accordance with the definitions and routine methodologies described in the manuals listed above. The limits of jurisdictional wetland boundaries are based on the dominance of hydrophytic vegetation, the presence of hydric soils, and evidence of wetland hydrology (Reference 2.4-023).

Wetlands on and in the vicinity of the LNP site were initially identified and characterized through review of agency databases, published documents, and subsequently through field delineation. Formal jurisdictional determinations of wetlands on the LNP site by the FDEP Wetland Evaluation and Delineation Section are ongoing.

The most common wetland systems on-site are cypress swamps, cypress-hardwood mixed swamps, and freshwater marsh. These and other wetland systems on the site are described in ER Subsection 2.4.1.1. There were no USFWS-designated critical habitats for protected species found on the LNP site.

#### 2.4.1.1.6 Preexisting Environmental Stresses

In addition to feral hogs (see ER Subsection 2.4.1.1.4), the major preexisting environmental stresses on the LNP site are associated with the prolonged silvicultural operations that re-shaped the local landscape and converted diverse native vegetative communities to even-aged, monospecific planted pine stands. Earthwork can alter the soil substrate, distort local drainage patterns, and profoundly transform natural communities.

The predominant forces shaping the succession of vegetative communities in pine plantations are fire and logging. Fire suppression encourages the proliferation of dense understory vegetation and the buildup of peat, which can fill what were formerly open water areas. Fire suppression also facilitates succession from cypress swamps to hardwood swamps (Reference 2.4-007). Heavy equipment may compact and damage wetland soils, and logging directly alters the vegetative composition of forests and changes drainage patterns through the construction of dikes, roads, and bedding (Reference 2.4-012). Clear-cutting can exacerbate localized flooding, at least temporarily, through the loss of transpiring vegetation (Reference 2.4-025).

### 2.4.1.2 Associated Facilities

The facilities associated with the LNP site comprise the following:

- Access roads.
- Heavy haul road and barge slip access road.
- Barge slip.
- Makeup and blowdown pipeline corridor.
- Transmission line corridors.

The access roads, heavy haul road, barge slip access road, barge slip, makeup and blowdown pipelines, and the portion of the transmission corridor north of CR-40 are identified collectively as early infrastructure facilities, because they will be constructed in advance of the LNP generating facilities. Locations for the early infrastructure facilities are depicted on Figure 2.4-8 and land cover classes are listed in Table 2.4-10. Transmission corridors are described in ER Subsection 2.2.2. Locations of the transmission corridors (south of CR-40) are depicted on Figure 2.4-9, and land cover classes for the transmission corridors are listed on Table 2.4-11.

#### 2.4.1.2.1 Existing Cover Types

Existing vegetative cover types crossed by the early infrastructure facilities that are described below are based on FLUCCS, as interpreted and mapped by the SWFWMD (Figure 2.4-8) (References 2.4-003 and 2.4-004). Vegetative cover types crossed by the early infrastructure facilities are described below in order of decreasing prevalence (Reference 2.4-004). Species lists are based on either FLUCCS code descriptions or observations made during field surveys performed by CH2M HILL ecologists between September 2006 and January 2008 (References 2.4-003 and 2.4-004).

##### 2.4.1.2.1.1 Tree Plantations (Code 440)

Tree Plantations represent the largest land area crossed by the early infrastructure facilities. Approximately 135 ha (333 ac.) or 41 percent of the early infrastructure facilities acreage are classified as Tree Plantations. These areas are predominantly planted with slash pine. Understory and groundcover vegetation generally includes gallberry, saw palmetto, sand blackberry, wax myrtle, broomsedge, or blue maidencane.

##### 2.4.1.2.1.2 Open Lands (Rural) (Code 260)

Open Lands (Rural) encompass 40 ha (100 ac.), representing 12 percent of land covered by the early infrastructure facilities. In the areas crossed by early infrastructure facilities, this land cover generally consists of tree plantations that have been clear-cut. Remaining vegetation includes broomsedge, redroot, dog fennel, annual ragweed, or slash pine saplings.

##### 2.4.1.2.1.3 Other Open Lands (Code 190)

Other Open Lands represent nine percent or 31 ha (76 ac.) of land covered by the early infrastructure facilities. Parcels that are undeveloped and are without indicators of the intended land use are generally classified as Other Open Lands. These areas are generally comprised of turf grass or ruderal species such as bahia grass (*Panicum notatum*), dog fennel, or annual ragweed.

2.4.1.2.1.4 Cypress (Code 621)

Cypress swamps encompass approximately 21.96 ha (54.26 ac.), representing seven percent of the total early infrastructure facilities land area. These wetlands are characterized by a dominant canopy cover of pond cypress with a subdominant cover of slash pine, redbay, swamp tupelo, or red maple. The understory and groundcover strata are generally composed of woody or herbaceous vegetation including buttonbush, fetterbush, Virginia willow, lizard's tail, maidencane, cinnamon fern, and Virginia chain fern.

2.4.1.2.2 Important Species

2.4.1.2.2.1 Early Infrastructure Facilities

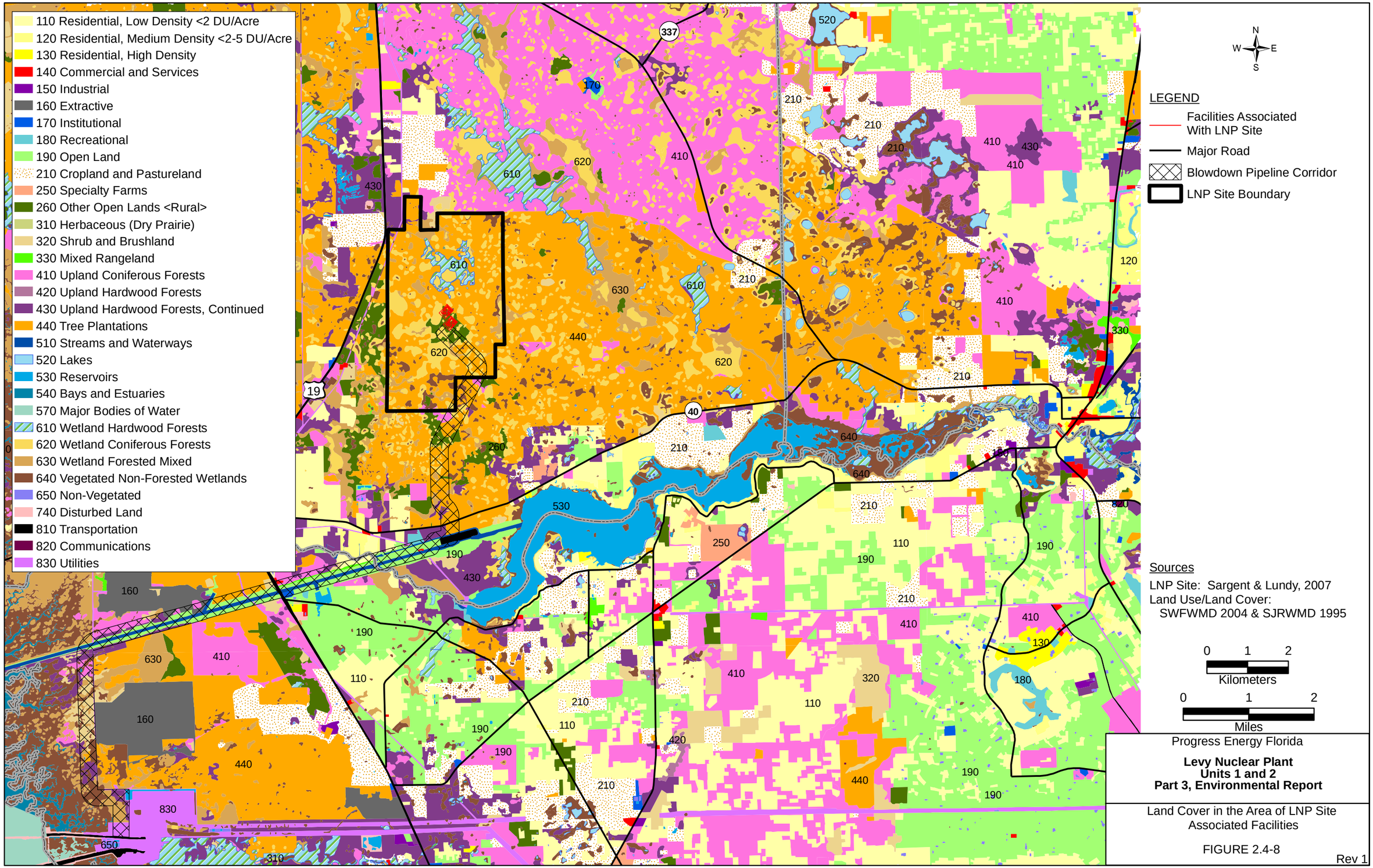
Field surveys by CH2M HILL ecologists on and in the vicinity of the early infrastructure facilities are ongoing. Recreationally valuable species that were identified during these field surveys included white-tail deer, bobwhite quail, and wild turkey. These species are common in the area. Feral hogs are also widespread, but are considered a nuisance species (Reference 2.4-014).

One active bald eagle nest was identified approximately 1000 m (3281 ft.) west of the proposed heavy haul road area. In addition, an FNAI Occurrence Report generated for the LNP site and vicinity identified several protected species known to occur within the areas surrounding the early infrastructure facilities (see Tables 2.4-6, 2.4-7, 2.4-8, and 2.4-9) (Reference 2.4-013). Although the report identifies no documented occurrences of protected species on early infrastructure sites, some areas were identified as having the potential to provide habitat for protected species including the gopher tortoise, gopher frog, red-cockaded woodpecker, bald eagle, and sandhill crane.

2.4.1.2.2.2 Transmission Corridors

2.4.1.2.2.2.1 500-kilovolt (kV) transmission lines from the LNP to proposed Citrus Substation (LPC)

Listed species refers to those plant and animal species that are designated by the USFWS as threatened, endangered, or of special concern (Reference 2.4-026). Wildlife habitat in the area of the LPC corridor has been altered significantly from its natural state for mixed forest land, cropland and pasture, roadways, and residential use. However, several wildlife species do utilize the area within and adjacent to the LPC corridor for foraging and cover. Wildlife resources were evaluated through site reconnaissance, literature reviews, and availability of suitable habitat. In addition, the FNAI Geographic Information System (GIS) database of documented occurrences of listed species was queried. Wildlife observations recorded during site reconnaissance activities conducted in November 2007, including direct visual observation, calls, tracks, scat, burrows, or other signs, and those wildlife species (including listed species) that are reasonably expected to inhabit the corridor based on habitats present, are presented in Appendix 2.4-1.




Progress Energy Florida

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Land Cover in the Area of LNP Site
Associated Facilities

FIGURE 2.4-8

Rev 1

  - Stormwater ponds.

- Transmission Corridor and Off-Site Areas:
  - Transmission corridors (south transmission line corridor leaving the site as well as the individual 500-kV transmission line corridors and associated substations and switchyard).
  - Heavy haul road and barge slip access road.
  - Anticipated barge slip.
  - Makeup and blowdown pipeline corridor and associated cooling water intake and discharge structures.

It is noted that the construction impacts described in this section are in reference to the cumulative construction impacts that will occur during the construction of the entire LNP. These cumulative impacts are summarized in ER Subsection 4.6.2. ER Subsection 4.6.2 also provides a summary of the estimated construction impacts attributable to the construction of "safety-related structures, systems, or components (SSCs)" of the facility (that is, as defined in 10 CFR 50.2, "Definitions"). These estimates provide additional information on "construction" and "pre-construction" activities, where "construction" refers only to SSC-related activities. Originally, a rail spur was proposed that would provide service to LNP. The decision was made in late 2008 that the rail spur would not be pursued. With no rail service planned for the LNP site, an increase in truck and barge traffic is expected; however, the overall impacts related to this change in construction traffic are expected to remain SMALL to MODERATE and other impacts are expected to remain SMALL.

## 4.1 LAND USE IMPACTS

This section describes the land use impacts of construction and is divided into three subsections that address the site and vicinity, appurtenant facilities and off-site areas, and historic properties, respectively. Because land use impacts are also discussed in ER Subsection 4.3.1 and ER Section 4.4, the discussion in this section is limited to those direct physical changes and restrictions on land use at the site and vicinity as a result of plant construction.

The following assumptions, which are discussed further in ER Subsection 4.4.2, are used to bracket land use impacts associated with construction:

- Site preparation will take approximately 18 months, commencing by 2012 or 2013.
- Construction will take approximately 3 to 4 years, with the construction schedule staggered 1 year between units.
- Construction will be complete in 2018 or 2019 for LNP 1 and in 2019 or 2020 for LNP 2.

- Peak workforce is projected by Florida Power Corporation doing business as Progress Energy Florida, Inc. (PEF) to be 3300 workers during 2016.

Existing land use information from the Southwest Florida Water Management District (SWFWMD), St. Johns River Water Management District, and Suwannee River Water Management District for the time period from 1994 to 2004 was used to create a contiguous coverage for the entire LNP region (see Figures 2.2-26 and 4.1-1) (References 4.1-001 and 4.1-002). The Florida Land Use and Cover Classification System (FLUCCS) categories were rectified with U.S. Geological Survey (USGS) Anderson Level II classifications, as presented in Table 2.2-1 (References 4.1-003 and 4.1-004).

Generalized future land use for the site, vicinity, and region was acquired from the Florida Geographic Data Library (FGDL) is illustrated on Figure 4.1-2. The future land use designation areas are mapped as polygons that represent the areas of future land use as defined by a county or municipalities comprehensive growth plans as of 2008 (Reference 4.1-005). Note that the LNP site future land use designation is still shown as agricultural/rural residential pending final approval of the “Public Use” future land use designation, as discussed in ER Subsection 4.1.1.1.1. These maps are maintained by county and municipal planning agencies, as well as private agencies through contract, to create regional maps of "sociocultural" features, including hospitals, parks, cemeteries, historical structures, and others. Other future land use components such as developments of regional impact (DRIs) and planned unit developments (PUDs) that are also indicative of future development trends are shown on Figure 4.1-3 and summarized in Tables 4.1-1 and 4.1-2. (References 4.1-006 and 4.1-007)

### 4.1.1 THE SITE AND VICINITY

This subsection assesses the direct impacts of construction on land use at the site and in the vicinity of the LNP site; it builds on the following information found in ER Chapter 2 and later subsections of this chapter:

- ER Subsection 2.2.1.1 — Land use categories, major uses, and absence of prime farmland (Table 2.2-2 and Figures 2.2-2, 2.2-3, and 2.2-4).
- ER Subsection 2.2.1.3 — Highways, railroads, and utility right-of-ways (ROWs) (Figures 2.1-1 and 2.2-1).
- ER Subsection 2.2.1.4 — Special land uses, recreation, and visually sensitive areas (Figures 2.1-1 and 2.2-5).
- ER Subsection 2.2.1.2 — Mineral resources.
- ER Subsection 2.5.3 — Native American tribal land uses.
- ER Section 2.8 — Confirmation that no federal project activities associated with the LNP project were identified.

- ER Subsection 2.4.1.1.1.3 — Existing wetlands.
- ER Subsection 4.2.1.1 — Floodplains.

It provides analysis and evaluation of the potential land use impacts and mitigation recommendations, where appropriate; however, it is limited to the consideration of potential direct land use impacts at the site and indirect impacts in the site vicinity, and it does not include transmission line, access corridor, or off-site area impacts, which are addressed under ER Subsection 4.1.2.

#### 4.1.1.1 Long-Term Land Use Restrictions and Physical Changes of Site and Vicinity

The following subsections discuss the area and location of the land in the site and vicinity that will be disturbed by construction on either a long-term or short-term basis. Table 4.1-3 summarizes the special land types in the LNP site and vicinity while providing a cross reference to where potential impacts on these special lands are discussed in ER Chapter 4.

##### 4.1.1.1.1 Long-Term Land Use Restrictions

The State of Florida is made up of state, regional, and local planning authorities. At the local level, a comprehensive land use plan discusses the current and future land use classifications. Each of the counties located within the site and vicinity have prepared comprehensive land use plans, which are discussed in ER Subsection 2.2.2.6. Chapter 8, Future Land Use Element, of Levy County's 1999 Comprehensive Plan discusses the current and future land use plans for the county which currently designate the site as Forestry/Rural Residential (1 dwelling unit [DU] per 20 ac.) (Reference 4.1-008). A large-scale future land use map and text amendment were submitted to the Florida Department of Community Affairs (FDCA) in February 2007 to change the LNP site designation to Public Use to allow for a nuclear power generating facility, and to change the definition of public use in the comprehensive plan. The FDCA returned an Objections, Recommendations, and Comments (ORC) report to the Levy County Board of County Commissioners (BOC) on September 28, 2007 (Reference 4.1-009). In response to the ORC, the BOC addressed development intensity issues and site suitability issues during amendment of the conservation element, infrastructure element, and the future land use element of the comprehensive plan. PEF agreed the two nuclear plants would produce no more than 3000 megawatts, and traffic from workers would be limited because the maximum number of full-time employees will not exceed 1500 workers.

The BOC adopted ordinances related to the Amendment on March 18, 2008, and the FDCA issued its Notice of Intent on May 8, 2008 that the ordinances are in compliance. The effective dates of the ordinances are pending a 21-day administrative review period and either an FDCA final order or the Administration Commission finding the amendment adopted by the BOC to be in compliance with Section 163.3184 of the Florida Statutes (F.S.), after which the site will be

designated as Public Use. Public use provides for public buildings and grounds including public utilities, which are defined as gas, water, and electric, water power, well houses, electric substations, power generating facilities, sewerage, telephone facilities, utility poles and street lighting, and other similar equipment necessary for the furnishing of adequate services (References 4.1-010 and 4.1-011).

As stated in ER Subsection 2.2.1.1, there are no special land use categories, such as Prime Farmland, within the site boundary as defined by NUREG-1555 (Table 4.1-3). Based on Figure 4.1-1 and Table 4.1-4, a total of 50.8 ha (125.5 ac.) of mixed forest lands and 15.2 ha (37.6 ac.) of other agricultural land, described further in ER Subsection 2.2.1 as rural open lands, tree plantations, and cypress, would be changed on-site at the LNP. Table 2.2-2 illustrates that these lands are not unique to the site or vicinity, with mixed forest lands and other agricultural lands representing 28.6 percent and 3.9 percent of the vicinity, respectively. Because of the limited area (under 75 ha [185 ac.]) and the fact that these lands are not unique to the vicinity, no restrictions on the use of land (that is, farmlands/forests) are expected. Therefore, land use restriction impacts are anticipated to be SMALL.

#### 4.1.1.1.2 Long-Term Physical Changes of Site and Vicinity

As mentioned previously, the LNP site is approximately 1257 ha (3105 ac.) in size, with the primary location for the two reactors and ancillary power production support facilities comprising approximately 121 ha (300 ac.) near the center of the site. This subsection discusses the direct physical changes to land use on-site and indirect physical changes to land use in the vicinity. ER Subsection 4.1.2.2 discusses the off-site land use impacts.

Table 2.2-2 summarizes the land use distribution for the site, vicinity, and region. Mixed forest lands (57 percent of the total site) and forested wetlands (34 percent) are the primary land uses at the LNP site as illustrated in relation to the LNP-associated facilities in Figures 2.2-3 and 4.1-1.

Much of the LNP site, in particular, the reactor locations, has been in intensive silviculture production for over a century. Tree production and harvesting operations have extensively altered the natural configuration of the vegetation and the land surface by creating a series of elevated hillocks, separated by shallow furrows. Young saplings are planted on the hillocks, and following periodic harvesting, the harvested areas are re-tooled and new trees are planted on the hillocks. Planted pine has replaced natural vegetative communities across much of the LNP site. Areas that will be disturbed by construction on either a long- or short-term basis are located at or near the coordinates listed in Table 2.1-1.

##### 4.1.1.1.2.1 On-Site Land Use Changes

Table 4.1-4 summarizes the on-site land use changes anticipated by construction of the LNP by general component (Figure 4.1-1). Construction activities within

the LNP site boundary will change the existing use of 82.2 ha (203.2 ac.) of land, or 6.5 percent of the total LNP site, and 0.3 percent of the total vicinity area. The footprints of LNP 1, LNP 2, and cooling towers will change 14.8 ha (36.6 ac.) of land from primarily other agricultural lands (62.5 percent), forested wetlands (18.2 percent), and mixed forests (17.1 percent) to a transportation, communications, and utilities land use. Other on-site features include a 500-kV switchyard affecting 17.8 ha (44.0 ac.) of land. Upgrading site access roads will affect 11.7 ha (28.9 ac.) (Table 4.1-4 and Figure 4.1-1). The creation of the three stormwater ponds (A, B, and C) illustrated on Figure 2.1-2 will replace 36.2 ha (89.5 ac.) of land currently used for mixed forests (25.1 percent), wetlands (8.2 percent), and other agricultural lands (3.0 percent) (as illustrated on Figure 2.2-3).

The three stormwater ponds will be designed to fully retain the runoff from a 25-year, 24-hour rainfall event. If necessary, the stormwater collected in the ponds may be pumped to the cooling tower blowdown basin. To comply with SWFWMD rules, these ponds will recover in no less than 5 days. The bottom of the storage zone of the ponds (pump off) will be at an elevation of 12.8 meters (m) (42 feet [ft.]), which is also the estimated high groundwater elevation. Although the ponds are designed to retain a 25-year, 24-hour rainfall event, larger storm events (100-year rainfall) will be drained out of the ponds through broad-crested weir emergency spillways provided in each of the ponds. A minimum freeboard of 0.6 m (2 ft.) will be provided for each pond above the spillway elevation. Water will be discharged from the spillways through long spreader swales to pass runoff to the surrounding wetland as sheet flow to prevent erosion.

As discussed in ER Subsection 2.3.1 and illustrated in Figure 4.1-4, much of the LNP site and much of the vicinity is located in the 100-year floodplain. The existing ground elevation near the main reactors and the cooling towers is 12.8 m (42 ft.) North American Vertical Datum of 1988 (NAVD88), while the overall property elevation varies from 12.5 m to 14.9 m (41 ft. to 49 ft.) NAVD88. After grading, the land around the reactors and cooling towers will be raised to elevation 15.2 m (50 ft.) NAVD88, while the switchyard and construction laydown areas in the periphery around the main plant building will be raised to 14.3 m (47 ft.) NAVD88. Because the ground elevation at the main reactors and the cooling towers will be raised 2.4 m (8 ft.) above the existing grade, these structures will be above the 100-year floodplain.

Table 4.1-4 summarizes and ER Subsection 2.4.1.1.1 discusses field observations of the approximately 16 ha (39.61 ac.) of forested and nonforested wetlands found on-site (Figure 4.1-1). Coordination with the appropriate regulatory agencies to address Clean Water Act (CWA) 404 and 401 requirements will occur, and mitigation will be undertaken before construction begins.

No mineral rights have been leased within the exclusion area, and there are no outstanding mineral rights that could result in the production of either surface or subsurface minerals at the LNP site. However, a brick manufacturing facility

operates in the vicinity. No LNP-related construction activities will significantly affect the operation of this facility, nor will they affect existing mineral rights or land use at the brick manufacturing operation.

4.1.1.1.2.2 Off-Site Indirect Land Use Changes

ER Subsection 4.1.2 discusses the direct impacts of the LNP transmission corridors and other off-site features. Figure 2.1-2 illustrates these facilities in relation to the vicinity, which is primarily mixed forest lands (29 percent of the total vicinity area), forested wetlands (18 percent), and evergreen forest lands (18 percent). Other land uses representing greater than 5 percent of the vicinity include residential lands (9 percent) and deciduous forest lands (6 percent). As detailed in the following subsections, construction activities will not significantly affect land use in nearby communities or in the greater region.

Land use impacts on nearby communities or properties would be the result of an increased construction labor force (up to 3300 new employees) in the area. Up to 50 percent of the construction labor force may opt to relocate to the vicinity. However, based on the discussion in ER Subsection 2.5.2 and ER Section 4.4, adequate property and community services are available to support relocated workers. It is anticipated that minimal infrastructure and/or expanded development will be required to accommodate their needs. As discussed in detail in ER Section 4.4, a significant amount of the labor force needed for construction of the LNP would not permanently relocate to the vicinity but would commute from within the region.

Normal recreational practices near the LNP site will not be altered during construction with the exception of the cessation of historical hunting practices on the site. However, hunting and fishing are available in other parks and recreational areas throughout the region as discussed in ER Subsection 4.4.2.6.

4.1.1.1.2.3 Land Use Plans

This subsection summarizes the federal, state, or regional land use plans relevant to the site and vicinity. Construction at the LNP site and in the vicinity will primarily affect Levy, Marion, and Citrus counties. Although eight counties are within the region, only three counties could be primarily affected by construction at the LNP site. Planning and development activities within these counties — Levy, Marion, Citrus — are discussed in the following subsections along with other future land use components such as DRIs and PUDs that are also indicative of future development trends (Figure 4.1-3) (References 4.1-006 and 4.1-007). ER Subsection 2.2.2.6 discusses the county comprehensive and future land use plans in detail. Figure 4.1-2 illustrates the projected future land uses for the LNP on-site and off-site components.

Figure 4.1-3 illustrates the DRIs and PUDs in the LNP vicinity and region, which are generally indicative of future development trends. A DRI is defined as any development which, because of its character, magnitude, or location, would have a substantial effect on the health, safety, or welfare of citizens in more than one

county. (References 4.1-006 and 4.1-007) Table 4.1-1 summarizes the eight DRI applications received by FDCA in the region since 2000, all of which are located outside of the LNP site and three vicinity counties listed above. A PUD is a self-contained development in which the subdivision and zoning controls are applied to the project as a whole rather than to individual lots, as is the case in most subdivisions, to provide more flexibility than conventional zoning. A combination of diverse land uses, such as housing, recreation and shopping may be accommodated within a single development, and buildings may be clustered on smaller lots, permitting the preservation of natural features in common areas or open park-like areas (Reference 4.1-007). Table 4.1-2 summarizes the 575 PUDs (45,672 ha [112,587 ac.]) located within the region by planning agency. While there are no PUDs on-site and one in the vicinity, a 2.9-ha (7.2-ac.) PUD is located in Marion County on the border it shares with Levy County, directly east of the LNP (Figure 4.1-3). Additionally, public comment testimony related to the Levy County Large Scale Plan Amendment indicated that a developer was planning to develop 2703 ha (5700 ac.) next to the plant with 1250 residential sites ranging in size from 0.2 to 8.1 ha (0.5 to 20 ac.).

The Marjorie Harris Carr Cross Florida Greenway (CFG) Management Plan, completed in 2007, describes the natural resources and intended management of the CFG. The land was acquired through a transfer agreement between the federal government and the State of Florida, Preservation 2000 funds, Florida Forever funds, and donations. The management plan was developed based on the statutes and rules that define the purposes for which the CFG was acquired. (Reference 4.1-012)

New recreational facilities and improvements to the existing areas and trails along the CFG have been proposed for the next 5 to 10 years. An extension of the Withlacoochee Bay Trail and a proposed trail to connect the Inglis Lock area with Dunnellon along the Lake Rousseau shoreline will enhance recreational opportunities and improve connections between managed areas (Figure 4.1-5). The addition of the Eagle's Nest campground on Inglis Island with an anticipated 30 to 60 campsites is being evaluated, and a 30-year lease to Citrus County has been planned for a boat ramp on U.S. Highway 19 (US-19). A visitor center is also proposed near Felburn Park on the western end of the CFG. Overall, new emphasis will be placed on loop and paved trails to accommodate the more casual user. The funding and existing partnerships for these projects involve the Florida Department of Transportation (FDOT), Felburn Foundation, University of Florida Fisheries Department, U.S. Fish and Wildlife Service (USFWS), and the involved counties and towns (primarily Citrus and Marion counties). (Reference 4.1-012)

The Florida Ecological Greenways Network (FEGN) began studying and prioritizing critical linkages, which are crucial for protecting connected landscapes, in November 2005. Studies of critical linkages determine the most important areas to link with existing conservation areas and wildlife corridors for a variety of species. The 2005 update of the linkage prioritization was needed to address changes in the base boundary of the FEGN adopted by the Florida Greenways and Trails Council in 2004. The FEGN strives to identify opportunities

to protect intact landscapes important to the overall conservation of Florida's biodiversity and ecosystem services. (Reference 4.1-013)

The Florida Forever Board of Trustees (formerly known as CARL projects) plans to acquire lands with outstanding natural resources, with opportunities for natural resource-based recreation, or for the historical and archaeological resources found therein. Florida Forever conducted an inventory in December 2007 and mapped all the properties the board wishes to acquire with the aim of conserving the lands in perpetuity. (Reference 4.1-014)

Paddling trail opportunities were first identified by the Office of Greenways and Trails in the 1999 Implementation Plan adopted by the Florida Legislature. The Greenways and Trails Implementation Plan for prioritizing paddling trail opportunities was completed in May 2004. Paddling trail segments studied and prioritized included trails not previously designated or part of the Florida Circumnavigational Trail. (Reference 4.1-015)

Impacts from construction on current land use plans in the LNP site and vicinity will be SMALL, short term, and minimal.

#### 4.1.1.2 Short-Term Physical Changes in Land Use and Mitigation

Mitigation measures designed to lessen the impact of construction activities will be specific to erosion control, controlled access roads for personnel and vehicle traffic, and restricted construction zones. The LNP site preparation work will be completed in two stages. The first stage will consist of stripping, excavating, and backfilling the areas occupied by structures and roadways. The second stage will consist of developing the LNP site with the necessary facilities to support construction, such as construction offices, warehouses, trackwork, large unloading facilities, water wells, construction power, and construction drainage.

Stormwater runoff from the LNP site will be collected and controlled by a stormwater drainage system. The three drainage ponds on the LNP site affect 36.2 ha (89.5 ac.). After site grading, a series of stormwater drainage features will be constructed within the plant site to drain the stormwater to three stormwater detention ponds located around the LNP site. Site drainage will be maintained through a series of features such as pipes, open ditches, culverts, and storm sewers.

Given the scale and quality of the land use changes discussed in ER Subsection 4.1.1.1, the land use impacts associated with the construction of the LNP site will be SMALL. ER Section 4.6 discusses associated measures and controls to limit environmental impacts.

#### 4.1.1.3 Construction Impacts on the Geologic Environment

As described in ER Subsection 2.2.1.2, Mineral Resources, no active quarrying or mining facilities are located within the 9.7-kilometer (km) (6-mile [mi.]) radius of the LNP site. Gulf Rock, Inc. is an inactive mine located 6.3 km (3.9 mi.) from the

LNP site. Tarmac America, LLC, is planning a mining operation, Tarmac King Road Limestone Mine, within 8 km (5 mi.) of the LNP site, approximately 1.6 km (1 mi.) west of US-19 (Reference 4.1-016). The proposed facility plans to mine approximately 12.1 ha (30 ac.) of the 1942.5-ha (4800-ac.) tract annually for the next century. Tarmac America, LLC estimates that the King Road Limestone Mine will utilize less than 1 mgd of water and will generate approximately 500 truck trips entering US-19/US-98 at King Road each day (Reference 4.1-017). The USACE anticipates that the Environmental Impact Statement (EIS), triggered by their Section 404 review of the project's permit application, will result in a Record of Decision in the summer of 2009 (Reference 4.1-016).

No mineral rights have been leased within the exclusion area, and there are no outstanding mineral rights that could result in the production of either surface or subsurface minerals at the LNP site. Because LNP-related construction activities will neither affect the operation of an active quarry or mine, nor will they affect existing mineral rights, impacts on the geologic environment are expected to be SMALL.

### 4.1.2 TRANSMISSION CORRIDORS AND OFF-SITE AREAS

This subsection assesses the direct impacts of construction on land use within all LNP corridors, including those within the site and vicinity, and all off-site areas; it builds on the information found in ER Subsection 2.2.2. Where necessary and appropriate, consideration that is given to alternative routing, location, or construction practices that would mitigate adverse environmental impacts are discussed. For the purposes of this subsection, transmission corridors include the south transmission line corridor leaving the site, as well as the individual 500-kV transmission line corridors as they exit the south transmission line corridor and connect with two high-voltage substations and a 500-kV switchyard east and south of the LNP site at the Crystal River Energy Complex (CREC). Off-site areas include the heavy haul road, barge slip access road, anticipated barge slip, makeup and blowdown pipeline corridor including the associated cooling water intake and discharge structures.

#### 4.1.2.1 Transmission Corridors

The transmission corridors discussed in this subsection include the south transmission line corridor leaving the site, as well as four major 500-kV transmission lines. As discussed in detail in ER Subsection 2.2.2 and ER Section 3.7, two of the major lines will connect to the proposed Citrus Substation, one line to the proposed Central Florida South Substation, and one to the existing CREC 500-kV switchyard. Additional system upgrades will be constructed by PEF to accommodate demand in the central and south Florida areas primarily served by the LNP. Detailed descriptions of the transmission line system and associated environmental impacts are described in ER Subsection 2.2.2 and ER Section 3.7. Corridors are defined as transmission line routes of variable widths which are sufficient to contain the eventual ROWs (NUREG-1555, Section 3.71[a]). Several new transmission line corridors will be

required to integrate the LNP to the Florida electrical grid system as described in ER Subsection 2.2.2 and ER Section 3.7.

PEF has not precisely defined or located the potential ROWs that will be located within the transmission line corridors; however, Tables 2.2-4, 2.2-5, and 2.2-6 summarize the anticipated land use changes based on the corridors described in ER Subsection 2.2.2.

The actual ROW width and alignment within the corridors will depend on adjacent land uses, property boundaries, ownership patterns, structure types and height and span lengths. Acreages of land uses and vegetative communities for the transmission line corridors are provided in ER Subsection 2.2.2. Typical structure types, height, and span lengths of the proposed transmission line structures are provided in ER Section 3.7.

In general, line construction activities will include erosion control, ROW preparation, construction and placement of foundations, assembly and erection of structures, and installation of conductors.

In its ROW selection and construction of the new lines, PEF will minimize effects on human populations, water bodies and wetlands, archaeological and historic sites, vegetation, and wildlife to the extent practicable by complying with state and federal regulatory requirements, including the specifications in the current FDOT Utility Accommodation Manual. To the extent PEF is able to locate the proposed transmission lines, either wholly or partly, within existing ROWs, the use of adjacent undisturbed areas will be minimized.

In general, the entire width of the ROW will be completely cleared except in wetlands. For areas where existing ROW widths are insufficient for placement of the proposed transmission lines, additional clearing will be necessary. Clearing will be in accordance with the descriptions shown below, and will be determined by existing conditions, environmental constraints, and line design requirements.

PEF is seeking certification of the corridors pursuant to the Florida Electrical Power Plant Siting Act (PPSA), Chapter 403, F.S., and Chapter 62-17, Florida Administrative Code (F.A.C.). The certification provides for the centralized and coordinated permitting of the LNP, as well as the associated facilities, including the associated transmission lines included in this application. For linear facilities associated with an electrical power plant, such as the proposed transmission lines, the PPSA provides for the certification of "corridors," which is the area within which the associated linear facility ROW must be located. Certification under the PPSA is the sole license of the State of Florida and nonfederal agency approval of the location of the LNP, associated facilities, and transmission corridors, and authorizes construction and maintenance of the transmission lines. The actual ROW width and alignment within the corridors will depend on adjacent land uses, property boundaries, ownership patterns, structure types and height and span lengths as discussed in ER Subsection 2.2.2.

Impacts on land use associated with the construction of transmission corridors and related substations and switchyard are anticipated to be SMALL.

#### 4.1.2.1.1 Clearing in Upland Areas

Vegetation in upland areas will be cleared to ground level. Stumps will either be cut or ground down to natural grade and treated with an approved herbicide to prevent regrowth, or the entire stump and root mat will be grubbed to 15.24 centimeters (cm) (6 inches [in.]) below grade. All holes resulting from the removal of stumps will be refilled to natural grade. Chipping material will be spread up and down the ROW, not to exceed 15.24 cm (6 in.) in depth, unless specific landowner restrictions require them to be removed and disposed of off-site. Limbs, brush, stumps, and cleared debris may be piled and burned within the limits of the ROW in compliance with the appropriate state and local regulations.

#### 4.1.2.1.2 Clearing in Wetland Areas

Vegetation in wetland areas will be cleared using restrictive clearing techniques. Restrictive wetland clearing will be done by hand, usually with chain saws, or with low-ground pressure shear or rotary machines to reduce soil compaction and damage to vegetation. These methods may be used alone or in combination, as may be necessary for specific sites. Restrictive clearing will consist of the cutting and removal of all trees and growth with a mature height greater than 3.7 m (12 ft.), leaving all other vegetation in the ROW outside of the access road and structure pad areas. Trees will be cut to as low as possible or to existing water level. Stumps may be left in place to preserve the root mat, and treated with an approved herbicide to prevent regrowth. All trees and debris will be removed from the ROW and disposed of in upland areas or off-site depending on landowner restrictions. The cut material will be removed from the wetland using either low ground pressure equipment or temporary construction mats. Care will be taken at all times to minimize rutting and disturbance of the root mat.

The ROW in wetland areas will be cleared in expectation that they will be maintained in an herbaceous state.

Tree stumps under the conductors and in the cleared work areas at the structure sites will be removed, sheared, or ground to 15.24 cm (6 in.) below the ground line to allow for the installation of access roads and structure pads, as well as general travel and related construction activities.

If practicable, an 8-m- (25-ft.-) deep foliage screen of existing vegetation with mature heights not exceeding 3.7 m (12 ft.) will be left intact at locations where the ROW crosses a navigable waterway.

### 4.1.2.2 Off-Site Areas

Table 4.1-5 summarizes the off-site land use changes anticipated by construction of the LNP by general component (Figure 4.1-1). A total of 309.8 ha (765.5 ac.),

or 1.1 percent of the LNP vicinity area will be affected during construction, including the following components, which are discussed and are further described in the next subsections, unless otherwise noted:

- Heavy haul road and barge slip access road south from the site (28.2 ha [69.7 ac.]).
- Anticipated barge slip along the Cross Florida Barge Canal (CFBC) (0.2 ha [0.6 ac.])
- Blowdown pipeline corridor (46.8 ha [115.6 ac.]) and associated cooling water intake structure (0.4 ha [1.1 ac.]).
- Makeup pipeline corridor (27.5 ha [68.0 ac.]).

The majority, 75 percent, of the affected land is forested, 21 percent are wetlands, 10 percent is developed, and 7 percent are general agricultural lands. Impacts from construction on off-site area land use in the LNP vicinity will be SMALL and minimal.

#### 4.1.2.2.1 Heavy Haul Road and Barge Slip Access Road

The heavy haul road will be constructed specifically to transport equipment and materials. The heavy haul road extends north from County Road (CR-40) to the LNP site. The barge slip access road extends from CR-40 south to the anticipated barge slip. Table 4.1-5 shows that the heavy haul road and the barge slip access road will primarily affect mixed forested lands (16.9 ha [41.8 ac.]), forested wetlands (4.4 ha [10.9 ac.]), and other agricultural lands (3.5 ha [8.7 ac.]). The land use will change to a transportation, communications, and utilities land use, as illustrated in Figure 4.1-1.

Stormwater runoff will be diverted away from the roadways near the LNP site by constructing swales along the roads. These swales will be constructed on the sides of the roadway to provide essential drainage and water quality treatment. Roadways and swales will be designed using FDOT design standards. Overflow from these swales will discharge to surrounding lands as sheet flow to reduce the potential for erosion. Cross drains under roadways will be designed to equalize the water levels on both sides of the roads around the plant site.

For the purposes of LNP on-site construction, the PPSA certification will address stormwater permit requirements typically included in the state Environmental Resource Permit (ERP). Federal stormwater construction site permitting will be obtained by using the Generic Permit for Stormwater Discharge from Large and Small Construction Activities, which is also administered by the Florida Department of Environmental Protection (FDEP). Site grading and drainage during site preparation activities will be designed to mitigate erosion and comply with a comprehensive erosion and sedimentation control plan (E&SCP) and a Stormwater Pollution Prevention Plan (SWP3), which are required by FDEP to

comply with the generic permit. These plans will be written and approved for the LNP prior to the start of site grading and construction activities.

4.1.2.2.2 Barge Slip

Construction of the LNP will utilize an anticipated barge slip being considered on the CFBC (Figure 4.1-1). The new slip will be located on the northern bank of the CFBC at the end of the proposed barge slip access road. Creation of the new barge slip will require dredging of 0.45 ha (1.1 ac.) below mean high water (MHW) and excavation of 0.41 ha (1 ac.) above MHW, which will result in a change in land use of 0.85 ha (2.1 ac.) from Mixed Forest Land to Streams and Canals. It is anticipated that this will have limited impact on surrounding land use because these lands are not unique to the vicinity. It is estimated that 83,044 cubic yards ($yd^3$) (63,491 cubic meters [$m^3$]) of material will be excavated for the barge slip of which 23,260 $yd^3$ (17,784 $m^3$) will be dredged material 23,260 $yd^3$ (17,784 $m^3$) of dredged material will require disposal. ER Subsection 4.2.1.5 addresses the disposal of any dredge spoil materials that are created as a result of construction activities in wetlands or other water bodies.

4.1.2.2.3 [Not Used]

4.1.2.2.4 Makeup and Blowdown Pipeline Corridors and Associated Structures

A makeup water pipeline and corridor will connect the CFBC and the LNP, while a blowdown pipeline and corridor will connect the LNP to the CREC resulting in 46.8 ha (115.6 ac.) of land use changes, or 0.2 percent of the vicinity, to land already used for other urban or built-up purposes (Table 4.1-5 and Figure 4.1-1).

Operations at the LNP will require makeup water from the CFBC. The construction of an LNP makeup water system intake structure and LNP makeup water system pumphouse on the CFBC is proposed. The intake structure will be located approximately 11.1 km (6.9 mi.) from the Gulf of Mexico on the berm that forms the north side of the canal and is within 0.8 km (0.5 mi.) of the Inglis Lock. The cooling water intake structure (CWIS) consists of the intake structure, vertical bar screens, traveling screens, pumps, and pumphouse. The makeup water pumphouse at the intake location affects 0.4 ha (1.1 ac.) of land already used for transportation, communications, and utilities (Table 4.1-5).

Cooling tower blowdown from a series of on-site mechanical draft cooling towers, including residual waste heat, will be transported in two pipelines (one for each unit) from the LNP. The two pipes, one per unit, will carry blowdown from the cooling towers to the proposed discharge location at the CREC. These two pipes will follow a pipeline corridor located in Levy and Citrus counties to reach the discharge location.

Impacts from construction on current land use in the pipeline corridors and off-site areas will be SMALL, short-term, and minimal.

#### 4.1.2.3 Short-Term Physical Changes in Land Use and Mitigation

Mitigation measures designed to lessen the impact of construction activities will be specific to erosion control, controlled access roads for personnel and vehicle traffic, and restricted construction zones. The LNP corridor preparation work will be completed in two stages. The first stage will consist of stripping, excavating, and backfilling the areas occupied by structures and roadways. The second stage will consist of developing the LNP corridors and off-site areas with the necessary facilities to support construction, such as construction offices, warehouses, trackwork, large unloading facilities, water wells, construction power, and construction drainage.

Stormwater runoff from the LNP corridors will be collected and controlled by a stormwater drainage system, which will include a series of pipes, open ditches, culverts and storm sewers. Given the scale and quality of the land use changes discussed in ER Subsections 2.2.2 and 4.1.2.1, the land use impacts associated with the construction of the LNP corridors will be SMALL. ER Section 4.6 discusses associated measures and controls to limit environmental impacts.

### 4.1.3 HISTORIC PROPERTIES

This subsection provides an assessment of the potential impacts of the proposed construction activities on historic properties on the LNP site and associated facilities, and within the respective Areas of Potential Effect (APEs) for archaeology and structures. It builds on the information found in ER Subsection 2.5.3.

#### 4.1.3.1 Historic Properties within the LNP Site and Associated Facilities

Cultural resource investigations conducted in 2007 and 2008 determined that the LNP site APEs did not include any resources that were listed in or eligible for listing in the National Register of Historic Places (NRHP). The surveys also covered the proposed construction areas for the property south of the LNP site (including the heavy haul road, transmission corridor, and the makeup and blowdown pipeline corridor) and the off-site blowdown pipeline. Based on a review of the Florida Master Site File (FMSF) records, no previously recorded resources of local, regional, or state significance were located in the LNP site, or in the above-listed construction areas (References 4.1-018 and 4.1-019). See ER Subsection 2.5.3 for further detail on the 2007 and 2008 cultural resource surveys. The survey findings have not yet been submitted to the FL State Historic Preservation Officer (SHPO) for concurrence. The technical report with the archaeological and standing structure findings, as well as eligibility recommendations, will be submitted by PEF to the SHPO for comment and concurrence prior to submittal of the Combined License Application (COLA). PEF will coordinate with the SHPO as part of the permitting process. Field surveys will be conducted on the proposed transmission line corridors after the routes have been finalized and before construction activities begin, in accordance with federal regulations.

#### 4.1.3.2 Previously Surveyed Properties within 15 Km (9 Mi.) of the LNP Site

A review of FMSF records in October 2007 showed 197 previously surveyed archaeological sites within a 15-km (9-mi.) radius: 101 in Levy County, 75 in Citrus County, and 21 in Marion County. Of the 197 previously surveyed sites, 32 have been determined ineligible for listing in the NRHP by the SHPO; 24 sites showed insufficient information to make a determination; two sites were recommended for more work by the surveyor but were not yet evaluated by the SHPO; 82 were recommended ineligible by the surveyor but had not yet been evaluated by the SHPO; and 49 had not been evaluated by the surveyor or by the SHPO. Eight sites were recommended eligible for listing in the NRHP by the surveyor, but had not been evaluated by the SHPO. Of those, only four are in Levy County, and all but one of them is located more than 8.1 km (5 mi.) from the LNP site. The Tidewater site (LV0253) is approximately 6.4 km (4 mi.) from the LNP site. The others, more than 8 km (5 mi.) from the LNP site, are the Spring Run Burial Ground (LV0469), located along the western coast, the Sand Slough Burial Mound (LV00250), and the Goethe site (LV00259). None of these sites are located within the APE and none have been determined eligible for listing in the NRHP. It is customary not to publish the locations of potentially sensitive archaeological sites. (Reference 4.1-020)

The Knotts Supply Company Store (LV00707) at 6302 Riverside Drive in Yankeetown, Levy County, was constructed in 1920, with a later addition to the north side of the building from 1940. It was built to serve as a general store, post office, and lumber yard office, and continues to fulfill a commercial use as a real estate office. It is a simple, balloon-framed structure with a rectangular footprint and a gable roof. It sits on a concrete block foundation. Next door is the former Yankeetown Post Office (LV00708), at 6304 Riverside Drive. It was constructed in 1926 in the same style as the Knotts Supply Company Store. Like its neighbor, it is a simple, balloon-framed structure with a rectangular footprint and a gable roof on a concrete block foundation. The primary decorative features of both buildings are wood slat gable vents, and palm tree posts supporting the shed roofs of the front porches. No significant archaeological sites were identified when the buildings were surveyed in February 2007. At that time, they were recommended as eligible for the NRHP for architectural significance, and for significance related to the history of the commerce of the area at the local level. SHPO agreed they were potentially eligible on May 1, 2007. (Reference 4.1-021) See Figure 2.5-13 for the locations of LV00707 and LV00708.

#### 4.1.3.3 Inadvertent Discovery of Human Remains

If human remains are discovered during survey or site development, all work in the near vicinity of the human remains will cease and reasonable efforts will be made to avoid and protect the remains from additional impact. When human remains are encountered, federal and state guidelines must be followed, including those contained in the Native American Graves Protection and Repatriation Act of 1990 (on federal land) and Chapter 872.05, F.S. (on state-owned or privately owned land). Regardless of which law takes

precedence, consultation with the SHPO (or the State Archaeologist in the case of Chapter 872.05, F.S.) and appropriate interested parties will occur to determine appropriate treatment and disposition of the remains.

#### 4.1.3.4 Impacts of Construction on Historic Properties

Impacts from construction on historic properties are anticipated to be SMALL. Results of 2007 and 2008 archaeological and architectural resource surveys (see ER Subsection 2.5.3) indicate that the LNP site lies within an area of low probability for containing significant archaeological resources, and that the survey areas contained no structures that are listed in or eligible for listing in the NRHP. The survey did not identify any NRHP-eligible cultural resources within the respective APEs on the LNP site, the property south of the LNP site, or along the blowdown pipeline. No properties listed or eligible for listing in the NRHP will be affected by the proposed construction activities in the areas surveyed (Reference 4.1-018). This does not include the off-site transmission line corridors.

PEF has guidelines for employees and contractors designed to protect historic sites, historic landmarks, and artifacts or archaeological sites during land-disturbing activities. If a project or work activity inadvertently uncovers an archaeological site or other historical artifacts, activities in the site area will be halted, and the appropriate PEF Environmental Support Organization (ESO) will be contacted. For the LNP project, PEF's Environmental Health and Safety Services (EHSS) would be contacted. In the event of an inadvertent find, a cultural resource assessment would be performed, and EHSS would consult with the SHPO, as necessary, to determine appropriate steps to be taken prior to resuming site activities. PEF will coordinate directly with the Florida SHPO to determine appropriate mitigation or other measures, as needed, in accordance with federal and state regulations and PEF policy.

### 4.1.4 REFERENCES

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4.1-003 State of Florida Department of Transportation Geographic Mapping Section, "Florida Land Use, Cover and Forms Classification System," 3rd ed., January 1999.

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4.1-010 Levy County Florida, "Ordinance Number 2008-03 and Ordinance Number 2008-04," March 18, 2008.

4.1-011 State of Florida Department of Community Affairs, "Notice of Intent", May 8, 2008.

4.1-012 Muller and Associates and Florida Department of Environmental Protection Office of Greenways and Trails, "Marjorie Harris Carr Cross Florida Greenway Management Plan," June 15, 2007.

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4.1-014 University of Florida GeoPlan Center, "Florida Forever Board of Trustees Projects – December 2007," Website, www.fgdl.org/metadataexplorer/explorer.jsp, accessed March 8, 2008.

4.1-015 University of Florida GeoPlan Center, "Greenways Trails Prioritization Project Paddling Trails Priorities - 2004," Websites, www.fgdl.org/metadataexplorer/explorer.jsp and www.fgdl.org/metadataexplorer/full_metadata.jsp?docId=%7B62235F47-0A5E-4BC8-9560-8A9369B0F631%7D&loggedIn=false, accessed August 19, 2008.

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4.1-020 Florida Division of Historical Resources, Florida Master Site File, October 2007.

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## Table 4.1-1
## Developments of Regional Impacts Since 2000 for LNP Region

| FDCA DRI Identification Number | Project Name | Local Government | Development Order Status | Type 1 | Size 1 | Unit | Type 2 | Size 2 | Unit |
|---|---|---|---|---|---|---|---|---|---|
| 2001-006 | Alachua West | Alachua City | Project Denied | Industrial | 946 | AC | Office | 1417500 | GSF |
| 2005-020 | Sunrise | Hernando County | Pending | Residential | 4800 | DU | Retail | 430000 | GSF |
| 2005-021 | Hickory Hill | Hernando County | Approved With Conditions | Residential | 1750 | DU | Retail | 50000 | GSF |
| 2006-036 | Lake Hideaway | Hernando County | Pending | Residential | 3700 | DU | Retail | 180000 | GSF |
| 2001-002 | Harbor Hills | Lake County | Pending | Residential | 773 | AC | Retail | 17 | AC |
| 2007-007 | Secret Promise | Leesburg City | Pending | Residential | 9211 | DU | Industrial | 3827 | GSF |
| 2007-001 | Renaissance Trails | Sumter County | Pending | Residential | 4500 | DU | Retail | 315000 | GSF |
| 2007-030 | Wildwood Springs | Wildwood City | Pending | Retail | 215000 | GSF | Residential | 3000 | DU |

Notes:

AC = acre
DRI = Development of Regional Impact
DU = dwelling unit
FDCA = Florida Department of Community Affairs
GSF = gross square feet

Source: Reference 4.1-006

## Table 4.1-2
## Planned Unit Developments by Agency for LNP Region

| PUD Administrating Agency | Hectares |
|---|---|
| MARION COUNTY | 4438 |
| WITHLACOOCHEE REGIONAL PLANNING COUNCIL | 1669 |
| ALACHUA COUNTY | 3819 |
| CITY OF ALACHUA | 413 |
| CITY OF GAINESVILLE | 1107 |
| EAST CENTRAL FLORIDA REGIONAL PLANNING COUNCIL | 1236 |
| HERNANDO COUNTY | 5609 |
| LAKE COUNTY | 115 |
| PASCO COUNTY | 2044 |
| SHPO SURVEYS OCT06 | 235 |
| SUMTER COUNTY | 5604 |
| SWFWMD | 18,432 |
| TAMPA BAY REGIONAL PLANNING COUNCIL | 953 |
| Grand Total | 45,672 |

Source: Reference 4.1-007

## Table 4.1-3
## Federal Sources Consulted for Various Special Land Types

| Special Land Type | Federal Statute | Site | Vicinity | Chapter 4 |
|---|---|---|---|---|
| Coastal Zones | Coastal Zone Management Act (16 United States Code [USC] 1451-1464)<br><br>National Oceanic and Atmospheric Administration regulations implementing the Coastal Zone Management Act (15 Code of Federal Regulations [CFR] 923) | Y | Y | See Appendix 10.2.7 of the LNP Florida Site Certification Application (SCA). |
| Farmland | Farmland Protection Policy Act (7 USC 4201)<br><br>U.S. Department of Agriculture regulations implementing the Farmland Protection Policy Act (7 CFR 658)<br><br>Council on Environmental Quality (CEQ) memorandum on "Analysis of Impacts on Prime and Unique Agricultural Lands in Implementing the National Environmental Policy Act" (45 CFR 59189) | N | N | Not applicable<br><br>See ER Subsection 2.2.1 |
| Floodplains | Executive Order 11988, "Floodplain Management" (42 CFR 26951)<br><br>U.S. Water Resources Council, "Floodplain Management Guidelines" (40 CFR 6030) | Y | Y | See ER Subsections 4.1.1.1.2.1 and 4.2.1, Figure 4.1-4 |
| Wetlands | Executive Order 11990, "Protection of Wetlands" (42 FR 26961) as amended by Executive Order 12608 (52 CFR 34617) | Y | Y | See ER Subsections 4.1.1.1.2.1 and 4.3.1 |
| Wild and Scenic Rivers | Wild and Scenic Rivers Act (16 USC 1271-1287)<br><br>CEQ memorandum on "Procedures for Interagency Consultation to Avoid or Mitigate Adverse Effects on Rivers in the Nationwide Inventory" (45 CFR 59191-59192) | N | N | |

## Table 4.1-4
## LNP On-Site Land Use Impacts by Major Component (in Hectares)

| USGS Land Use | LNP 1, LNP 2, and Associated Cooling Towers (2) | 500-kV Switchyard | Site Access Roads | Drainage Ponds | Total On-Site Impacts |
|---|---|---|---|---|---|
| Forested Wetland | 2.7 | 2.9 | 1.7 | 8.0 | 15.3 |
| Mixed Forest Land | 2.5 | 15.6 | 7.7 | 25.1 | 50.8 |
| Nonforested Wetland | 0.3 | 0.1 | 0.2 | 0.2 | 0.8 |
| Other Agricultural Land | 9.2 | 0.9 | 2.1 | 3.0 | 15.2 |
| Transportation, Communications, and Utilities | -- | -- | 0.2 | -- | 0.2 |
| Total (hectares) | 14.8 | 19.5 | 11.7 | 36.2 | 82.2 |

Sources: References 4.1-001 and 4.1-002

## Table 4.1-5 (Sheet 1 of 2)
## LNP Off-Site Land Use Impacts by Major Component (in Hectares)

| USGS Land Use | Heavy Haul Road and Barge Slip Access Road | Barge Slip | Makeup Water Pumphouse Units (2) | Transmission Line Corridor to the CFBC | Blowdown Pipeline Corridor from CFBC to CREC | Blowdown and Makeup Pipeline Corridors from LNP to CFBC | Total Off-Site Impacts |
|---|---|---|---|---|---|---|---|
| Cropland and Pasture | -- | -- | -- | -- | -- | -- | -- |
| Deciduous Forest Land | 0.2 | -- | -- | 6.7 | 1.4 | 0.5 | 8.8 |
| Evergreen Forest Land | 0.8 | -- | -- | 7.2 | 0.5 | 0.6 | 9.1 |
| Forested Wetland | 4.4 | -- | -- | 40.4 | 0.8 | 5.6 | 51.2 |
| Lakes | -- | -- | -- | -- | -- | -- | -- |
| Mixed Forest Land | 16.9 | -- | -- | 129.5 | -- | 16.4 | 162.8 |
| Mixed Rangeland | -- | -- | -- | -- | -- | -- | -- |
| Nonforested Wetland | 1.1 | -- | -- | 6.2 | 4.4 | 1.2 | 12.9 |
| Other Agricultural Land | 3.5 | -- | -- | 15.9 | -- | 2.5 | 21.9 |
| Other Urban or Built-up Land | 0.8 | 0.2 | -- | -- | 29.9 | 0.3 | 31.3 |
| Reservoirs | -- | -- | -- | -- | 0.9 | -- | 0.9 |
| Residential | -- | -- | -- | -- | -- | -- | -- |
| Shrub and Brush Rangeland | -- | -- | -- | -- | 1 | -- | 1 |
| Streams and Canals | < 0.1 ha | -- | -- | -- | 0.7 | -- | 0.7 |
| Strip Mines, Quarries, and Gravel Pits | -- | -- | -- | -- | 0.9 | -- | 0.9 |
| Transitional Areas | -- | -- | 0.8 | -- | -- | -- | 0.8 |

## Table 4.1-5 (Sheet 2 of 2)
## LNP Off-Site Land Use Impacts by Major Component (in Hectares)

| USGS Land Use | Heavy Haul Road and Barge Slip Access Road | Barge Slip | Makeup Water Pumphouse Units (2) | Transmission Line Corridor to the CFBC | Blowdown Pipeline Corridor from CFBC to CREC | Blowdown and Makeup Pipeline Corridors from LNP to CFBC | Total Off-Site Impacts |
|---|---|---|---|---|---|---|---|
| Transportation, Communications, and Utilities | 0.5 | -- | 0.4 | -- | 6.3 | 0.3 | 7.5 |
| Total | 28.2 | 0.2 | 1.2 | 205.9 | 46.8 | 27.5 | 309.8 |

Notes:

ha = hectare

Sources: References 4.1-001 and 4.1-002

## 5.3 COOLING SYSTEM IMPACTS

### 5.3.1 INTAKE SYSTEM

The information presented in this section addresses that defined in NUREG-1555, Environmental Standard Review Plan (ESRP) 5.3.1.1, Hydrodynamic Descriptions and Physical Impacts, and ESRP 5.3.1.2, Aquatic Ecosystems, pertaining to the operational impacts of the cooling water intake system. This information is consistent with 10 CFR 51.70.

The regulatory setting for the evaluation of the cooling water intake systems for new facilities is governed by Section 316 of the Clean Water Act (CWA), The 316(b) Phase I Rule (Federal Register / Vol. 66, No. 243 / Tuesday, December 18, 2001 / Rules and Regulations recirculating cooling system; (40 CFR 125.84[b][1]) establishes requirements for new facilities that use water withdrawn from rivers, streams, lakes, reservoirs, estuaries, oceans, or other waters of the United States for cooling purposes. The final rule establishes national technology-based performance requirements applicable to the location, design, construction, and capacity of cooling water intake structures at new facilities. The national requirements establish the best technology available (BTA), based on a two-track approach, for minimizing adverse environmental impact associated with the use of these structures. This final rule applies to new Greenfield power plant sites, such as the LNP, and standalone facilities that use cooling water intake structures to withdraw water from waters of the United States, and that have or require an NPDES permit issued under Section 402 of the CWA. New facilities subject to this regulation include those that have a design intake flow of greater than 2 mgd and that use at least 25 percent of water withdrawn for cooling purposes. The Phase I Rule establishes a two-track approach for regulating cooling water intake structures at new facilities. Track I establishes uniform requirements based on facility cooling water intake capacity. Track II provides dischargers with the opportunity to establish that alternative requirements will achieve comparable performance. The regulated entity has the opportunity to choose which track it will follow. PEF has chosen to follow Track I for the LNP cooling water system. Under Track I, new facilities with a design intake flow equal to or greater than 10 mgd, must meet the following requirements: (1) cooling water intake flow must be at a level commensurate with that achievable with a closed-cycle, recirculating system, and (2) through-screen intake velocity must be less than or equal to 0.15 meters per second (m/s) (0.5 feet per second [ft/sec]) (40 CFR 125.84[2]).

#### 5.3.1.1 Hydrodynamic Descriptions and Physical Impacts

The operation of a cooling water intake results in the creation of velocity flow fields in front of, and adjacent to, the CWIS that hold the potential to cause bottom scouring, induced localized turbidity, and silt buildup. The potential for these impacts to occur depends on the velocities induced by the water withdrawal pumps, the size of the induced flow field, the nature of the substrates adjacent to the raw water pumphouse, the sediment load characteristics of the water body, and the location and design features of the intake structure. This

subsection describes the proposed cooling water system design and discusses potential impacts from the cooling water system's design and operation.

As discussed in ER Subsection 2.3.2.1, the CWIS will be located approximately 11.1 km (6.9 mi.) from the Gulf of Mexico on the berm that forms the north side of the CFBC, and is within 0.8 km (0.5 mi.) of Inglis Lock. The CWIS consists of the intake structure, vertical bar screens, traveling screens, pumps, and pumphouse. The proposed reactors will require an estimated 5.61 cubic meters per second ($m^3$/s) (198.1 cubic feet per second [$ft^3$/sec]) or 122.1 mgd) of water for cooling processes. This water will be withdrawn from the CFBC and used for cooling tower evaporation, cooling tower blowdown, and pump strainer backwash. The velocity of up-canal water movement associated with the intake flow is about 0.02 m/s (0.07 ft/sec); therefore, no significant change is expected. The CWIS during full operation is pulling approximately 5.38 $m^3$/s (190 $ft^3$/sec), or approximately 33 percent of the mean tidal flow in the CFBC. This rate of withdrawal when compared with the size of the CFBC and the open nearshore Gulf waters will not appreciably affect the water levels in the canal over typical tidal cycles {7 mi. x 5280 feet per mile x (5.27 - 2.44) ft. mean tidal range x 0.5(256 + 180) ft. width / (11 hrs cycle x 3600 seconds per hour) = 574.5 $ft^3$/sec per tide change}. Because of the low velocity of upstream movement of water withdrawn from the CFBC by the CWIS, no adverse impacts on canal sediments or side wall erosion rates are anticipated.

As described in ER Subsection 3.4.2.1.1, the CWIS has been designed with 0.95-centimeters (cm) (3/8-inch [in.]) screen openings and a through-screen velocity at the traveling screens of less than 0.15 m/s (0.5 ft/sec). Because the 0.95-cm (3/8-in.) screens take up approximately 50 percent of the total screen area, the approach velocity at the face of the traveling screens will be approximately 0.08 m/s (0.25 ft/sec), and the velocity at the bar screens will be significantly less. The CWIS design will be in compliance with the requirements of the CWA Section 316 Phase I Rule. Once the CWIS begins operations, these low intake velocities will be a consistent background hydrological force in the CFBC during reactor operation, overlaid with wind-driven and tidal-driven water velocities. Any adverse effects of water velocities from the CWIS on the sediments and side wall substrates of the canal will occur during major storm events and will not result from the operation of the CWIS. Therefore, the effects of the intake on water body velocities will be minimal, and potential physical impacts on the bottom sediments and benthic organism habitats are expected to be SMALL.

NUREG-1555 suggests that calculations or modeling of the flow fields caused by the new raw water pumphouse should be undertaken, where appropriate, to describe impacts on the physical habitats and aquatic biota. Evaluations of the impacts on physical habitats, aquatic biota of water withdrawal, impingement, and entrainment in this section do not include development of calculations or modeling predictions of the induced potential flow fields. This is because development of flow field velocity profiles is not required to evaluate impacts because the facility will be designed to meet the stringent intake design through-screen velocity requirements of less than 0.15 m/s (0.5 ft/sec) required

by the CWA Section 316 Phase I regulations for new raw water pumphouse. Because modeling would not produce different results than this criterion, the through-screen velocity of 0.15 m/s (0.5 ft/sec) was used to evaluate the impacts at the LNP site.

Additional information on the hydrodynamics of the LNP cooling water system can be found in ER Subsections 2.3.1, 2.3.2, 2.3.3, 5.4.1, and 5.4.2, and ER Sections 3.3 and 3.4.

5.3.1.2 Aquatic Ecosystems

As noted in ER Subsection 5.3.1, Section 316 of the CWA establishes the regulatory setting for the evaluation of CWIS. The impacts of the operation of the LNP CWIS on aquatic ecosystems are limited to the following areas of potential concern:

- Increase in salinity in the upper reaches of the CFBC.
- Impingement impacts.
- Entrainment impacts.

5.3.1.2.1 Increase in Salinity in Upper Reaches of the CFBC

As noted in ER Subsection 5.2.1.3, when the CWIS is operational, it is anticipated that withdrawal of the makeup water will, over time, consistently change the characteristics of water in the upper portions of the CFBC and may, during dry conditions and low wind velocity periods, result in slow unidirectional, upchannel flows of higher salinity Gulf waters (approximately 0.02 m/s [0.07 ft/sec] up-canal velocities) toward the CWIS. Lower salinity water will still be present in the upper portions of the CFBC as a result of dilution by freshwater springs discharging in the canal, as observed during the aquatic field studies, and discharges of freshwater over the Lake Rousseau Dam during periods of wet weather.

Therefore, although the upper portions of the canal will be consistently more saline than present-day conditions and during most conditions are expected to closely approximate the average salinity conditions of the lower canal and nearshore Gulf waters, there still may be periods during high freshwater flows in the old Withlacoochee River channel when freshwater could dominate the upper portions of the canal. Freshwater releases from the old Withlacoochee channel will enter the CFBC and be pushed up-canal by flood tides and wind. These less saline conditions will persist in the upper CFBC for as yet unpredicted periods of time. Additional hydrological predictive studies of the old Withlacoochee channel in 2008 are provided in supplemental information in response to an NRC request for additional information.

As shown in ER Section 2.4, the aquatic benthic infauna near the proposed location of the CWIS are depauperate and exhibit the lowest abundance and

diversity of any location in the CFBC. This is likely a result of the variable salinities that occur near the lock and proposed CWIS location. These variable salinities have resulted in an isolated and very limited freshwater aquatic fauna in areas near the lock. The projected consistently higher salinity during CWIS operation will result in an improved aquatic biota in the upper reaches of the canal for much of the yearly weather cycle. This improved aquatic biota will more closely resemble the biota now present in the lower reaches of the CFBC and the near-shore Gulf waters, and allow for the development of a more abundant and diverse aquatic fauna than the very limited existing aquatic community.

Adverse impacts are projected to only affect the existing small population of low-salinity-tolerant benthic and motile aquatic organisms now inhabiting those upper portions of the canal near the lock and proposed CWIS. These adverse impacts are projected to be SMALL because of the low population sizes, limited geographical extent, and low diversity of these low-salinity-tolerant benthic populations. The positive improvements projected to occur with the operation of the CWIS are anticipated to be MODERATE. These positive impacts are projected to include higher populations and higher diversity of benthic aquatic populations, fish, and motile crustaceans; and over time, the developed aquatic communities are projected to more closely resemble those now existing in the lower portions of the canal. Although water quality conditions in the upper portions of the canal are expected to improve and to be more consistent, occasional lower salinities are still expected to occur during high precipitation periods in the Withlacoochee River watershed when water is released over the dam and downstream freshwater flows enter the canal. Also, the CWIS will not alter the fundamentally dead-end nature of the canal, and sediments near the proposed CWIS may remain organically enriched. The aquatic benthic population may remain more limited than those in lower canal locations.

#### 5.3.1.2.2 Impingement Impacts

The impingement and entrainment 316(b) data from the CREC studies from the 1980s were examined to determine if the data would be helpful in evaluating potential future impacts from the proposed LNP CWIS. It was determined that the CREC data were not representative given the greater through-screen velocities at the CREC intakes, the age of the information and the hydrological differences between the proposed LNP CFBC location and the CREC intake forebay.

As noted in ER Subsection 5.3.1, a key component of the Phase I requirements is the design of the intake traveling screens to include through-screen velocities of 0.15 m/s (0.5 ft/sec) or less. The LNP design intake through-screen velocities of less than 0.15 m/s (0.5 ft/sec) and the low approach velocities described in ER Subsection 5.3.1.1 of approximately 0.08 m/s (0.25 ft/sec), at the bar screens ensure that most healthy fish, crabs, and shrimp approaching the CWIS will be able to swim away from the screens. Any manatees approaching the screens will be able to avoid impingement because these animals will be restrained from entering the CWIS forebay by trash rack (that is, bar screens); also, the very low

0.08 m/s (0.25 ft/sec) approach velocities at the bar screens will allow the animals to easily swim away from the screens.

No fish return system is planned at present. The screens will be cleaned by a high pressure spray. Removed debris and organisms will be deposited in a collection basket and the contents will be periodically taken to a local approved landfill. Some crab species are attracted to traveling screens because their food supplies attach and develop populations on the screens' surfaces. Some crabs will retain their position following the high-pressure screen wash and may require periodic manual removal.

Neither protected fish species, the smalltooth sawfish nor the Gulf sturgeon, would be adversely affected by impingement. The smalltooth sawfish is viviparous, and the live birthed young are born 1.5 ft. to 2 ft. long and fully capable of avoiding impingement where the approach velocities are in the very low 0.25 ft/sec range. The Gulf sturgeon does not spawn in the area of the CFBC, and the young are not anticipated to be present near the LNP CWIS.

The CWA Section 316(b) component of the NPDES permit to be issued to the LNP for the operation of the CWIS will likely require some monitoring of impingement rates during early periods of operation to ensure that impingement rates are low, as predicted by the design. The impacts of the CWIS are predicted to be SMALL.

Although the low design approach and through-screen velocity values are expected to result in low impingement rates, should impingement rates be higher than anticipated, adjustments to the installed technology could be made to further reduce impingement impacts.

5.3.1.2.3 Entrainment Impacts

Entrainment refers to those organisms, which, because of the nature of their small size and limited mobility, enter the intake flows of power plants and pass through the designed cooling system. The primary methods for cooling power plant condensers are once-through cooling and closed-cycle cooling. The potential entrainment impacts from the operation of the proposed LNP have been reduced by approximately 90 percent from the potential flows of a once-through cooling system by the decision to utilize Track 1 of the CWA Section 316 Phase I Rule and to use a closed-cycle cooling water system for the LNP. The design use of cooling towers at the LNP means that potential entrainment has been minimized to the extent practical by the use of the BTA cooling system.

The biological studies conducted on the CFBC and presented in ER Section 2.4 showed that the ichthyoplankton and meroplankton collected in the upper portions of the CFBC and in the vicinity of the CWIS were limited. No larval stages of any protected aquatic species were collected, and the number of identified taxa represented in the plankton collections were relatively low compared with the number of aquatic species present in the canal and nearshore Gulf waters. As noted in ER Section 2.4, the protected aquatic species are not

expected to use the CFBC for spawning or as a nursery. The smalltooth sawfish is viviparous, and the live birthed young are born 1.5 ft. to 2 ft. long and are not subject to entrainment through a $^{3}/_{8}$-in. mesh traveling screen. The Gulf sturgeon does not spawn in the CFBC area of the Gulf and the larval and juvenile stages, and therefore, is not subject to entrainment at the LNP CWIS. Results of additional sampling efforts in 2008 for the projected peak ichthyoplankton and meroplankton periods were presented as supplemental information in response to an NRC request for additional information..

Impacts on the CFBC aquatic ecology from those organisms entrained into the CWIS are projected to be minimal based on the use of BTA cooling towers and the approximately 90 percent reduction from once-through cooling water potential usage, the projected low up-canal CWIS-induced water movement velocities (approximately 0.02 m/s [0.07 ft/sec]), the likely limited use of the CFBC for spawning and nursery activities, and the approximately 11-km (7-mi.) distance from the more productive spawning and nursery areas of the near-shore Gulf waters.

## 5.3.2 DISCHARGE SYSTEM

This subsection describes the impact of the thermal heat discharge system for the LNP on the aquatic ecology and the physical impacts, such as scouring, silt buildup, and shoreline erosion induced by the discharge system flows during station operation.

ER Subsection 5.3.2.1 describes the physical impacts associated with thermal discharges to the existing CREC discharge canal. ER Subsection 5.3.2.2 describes the impacts of the thermal discharges on the aquatic ecosystems.

### 5.3.2.1 Thermal Description and Physical Impacts

As noted in ER Sections 2.3 and 3.4, the preferred alternative for the return of the cooling tower blowdown is to the existing CREC discharge canal (Figure 4.3-1). As discussed in ER Subsection 3.4.2.2.1, the design heat dissipation capacity for the mechanical draft cooling towers is 7628 x $10^6$ British thermal units per hour (Btu/hr). At design conditions, water enters the tower at 47.7 degrees Celsius (°C) (117.8 degrees Fahrenheit [°F]) and discharges at 31.7°C (89.1°F). The blowdown rate at 1.5 concentrations is 56,520 gpm for two units, resulting in a required makeup flow of 84,780 gpm for the two units.

Calculation shows that the LNP blowdown will be approximately 4.9 percent of the combined total CREC discharge flow ([81.34 mgd blowdown flow / 1651.8 mgd CREC discharge flow] x 100 = 4.9 percent). The temperature of the LNP blowdown will be approximately 31.7°C (89.1°F) and is not anticipated to result in changes to the requirement for “helper” cooling tower use related to the existing CREC discharge canal during the warm summer months and any reductions to the CREC thermal discharge due to the addition of the LNP blowdown contribution will be slight and comply with applicable permits and regulations. The addition of the LNP blowdown to the existing CREC discharge

canal will not significantly increase velocities within the CREC discharge canal; therefore, no significant physical changes, including shoreline erosion, bottom scouring, increased turbidity and siltation, are anticipated to occur at the end of the discharge canal and in those areas of Crystal Bay affected by the CREC discharge. The potential physical impacts of adding the LNP blowdown on the existing CREC discharge canal are expected to be SMALL due to the significant dilution factor (of approximately 20 times) of adding the LNP blowdown to the much larger flows of the CREC discharge. In addition, the blowdown effluent will be in compliance with the temperature (96.5°F as a 3-hour rolling average) and other parameter requirements of an issued NPDES permit. Additional information on the thermal component of the blowdown discharge can be found in the environmental descriptions provided in ER Sections 2.3, 2.7, 3.3, and 3.4, and Subsection 2.4.2.

#### 5.3.2.2 Aquatic Ecosystems

Blowdown discharges from the LNP heat rejection system may potentially affect the receiving body of water through heat loading and chemical contaminants, most notably chlorine or other biocides. More detail on biocides can be found in ER Subsection 3.6.1. Heated effluents may potentially affect aquatic organisms directly by either heated effluents or cold shock. In addition, a number of indirect or sublethal stresses are associated with thermal discharges that have the potential to alter aquatic communities (for example, increased incidence of disease, predation, or parasitism, as well as changes in dissolved gas concentrations, as well as combined thermal and chemical effects). Additionally, as stated in ER Subsection 5.3.2.1, all effluent discharges are regulated by the CWA and standards established by the USEPA and the individual states. Conditions and limits for the heated discharge are specified in the current CREC NPDES permit, and a new permit to be issued for the combined LNP and CREC is anticipated to have similar conditions.

As noted in ER Subsection 5.3.2.1, the LNP blowdown will be approximately 4.9 percent of the combined total CREC discharge flow ([81.34 mgd blowdown flow / 1651.8 mgd CREC discharge flow] x 100 = 4.9 percent). The addition of the relatively smaller LNP blowdown discharge to the existing CREC discharge canal is not anticipated to have measurable impacts on the aquatic ecology of the estuarine habitats presently affected by the CREC thermal plume. The temperatures of the combined thermal discharge will be slightly reduced; although, the very small change may be difficult to measure and the combined discharge will still utilize the use of helper cooling towers to meet established NPDES permitted limits for temperature during the warm summer months. The original 1985 combined CWA Section 316(a) thermal effluent demonstration and 316(b) intake effects (Reference 5.3-001) demonstration showed adverse impacts on the aquatic ecology, including adverse impacts on area sea grasses and their associated community of aquatic organisms. The effects of the discharge of heated water on benthic infauna, macrophytes, salt marsh, oyster reefs, and fisheries were assessed for the LNP site and are discussed in ER Subsection 2.4.2.5.

The subsequent addition of the helper cooling towers to trim CREC discharge temperatures has resulted in recent visually apparent improvements in the abundance of sea grasses and likely the community of aquatic organisms normally inhabiting sea grass beds. A recent study of sea grass abundance and speciation has been conducted by a subcontractor to PEF, and the results of the study are discussed in ER Subsection 2.4.2.5.1. Additional surveys of aquatic life in the vicinity of the CREC discharge canal are planned for 2008 because the data used in the original 1985 316(a) and (b) demonstration document have not been updated. Based on available ecological information in the 1985 316(a) and 316(b) (Reference 5.3-001) and the relatively small size and lower temperature characteristics of the LNP blowdown plume, the impacts of the LNP addition are anticipated to be SMALL. No measurable adverse impacts on aquatic biota, including populations of important species present in the CREC discharge canal and the nearshore Gulf sea grass habitats are likely to result from the addition of the smaller thermal component of the LNP blowdown. Additional aquatic field surveys for the sea grass habitats within the influence of the CREC thermal plume, the sea grass study results, and the impacts of the combined LNP/CREC discharge canal are provided as supplemental information in response to an NRC request for additional information.

### 5.3.3 ATMOSPHERIC HEAT DISSIPATION SYSTEM

Mechanical draft cooling towers will be used to provide a heat sink during normal operation of LNP 1 and LNP 2. The AP1000 reactor does not rely on site service water as a safety grade ultimate heat sink (UHS) and meteorological design parameters for the cooling tower during normal operation have been established. This subsection contains a brief description of the potential impacts of the normal operation heat sink system for LNP 1 and LNP 2 on the environment in the area surrounding the LNP site.

#### 5.3.3.1 Heat Dissipation to the Atmosphere

##### 5.3.3.1.1 Length and Frequency of Elevated Plumes

The mechanical draft cooling towers that will be used to dissipate waste heat from LNP 1 and LNP 2 to the atmosphere are not expected to have a significant influence on the local environment. While there may be some near-field changes in temperature or humidity (that is, in the immediate vicinity of the towers), the cooling tower plumes should not significantly affect conditions at ground level at any off-site location.

Under full power, it is expected that the LNP cooling towers will evaporate up to 106,142.9 liters per minute (lpm) (28,040 gpm), depending on weather conditions. Under most meteorological conditions, the discharge will condense upon leaving the tower, and the length of the visible plume will depend on the temperature and humidity of the atmosphere. Colder and more humid weather is conducive to longer plumes. On very humid days, when the longest plumes are expected, there may be a naturally occurring overcast. On such occasions, it is more difficult to distinguish the cooling tower plume from the overcast cloud

layer. Most of the time, the visible plume will extend only a short distance from the tower and then disappear by evaporation.

USEPA's CALPUFF dispersion model was used to evaluate cooling tower plume behavior and to estimate the frequency of occurrence and length of visible cooling tower plumes (Reference 5.3-002). The analysis of cooling tower plume behavior was performed under the assumption of full load operation, with maximum heat dissipation to the atmosphere. The maximum potential system heat rejection rate to the cooling towers is 7.63E09 Btu/hr per unit, which was assumed to be a bounding value for purposes of the analysis. The physical and operating characteristics of the cooling towers for each of the two banks of towers (that is, one bank of towers for each generating unit, LNP 1 and LNP 2) are as follows:

| | |
|---|---|
| Number of cells | 44 |
| Orientation of cells | 2x22 |
| Length | 362.8 m (1190 ft.) |
| Width | 292.6 m (97 ft.) |
| Height | 17.1 m (56 ft.) |
| Fan diameter | 10.0 m (32.8 ft.) (per cell) |
| Circulating water flow rate | 2,010,187 lpm (531,100 gpm) |
| Drift rate | 0.0005 percent |
| Cycles of Concentration | 1.5 (normal operation |
| Cycles of Concentration | 2.0 (short-term excursions) |
| Heat rejection rate | 7.63E09 Btu/hr |

The analysis of cooling tower plume behavior was performed using 1 year of hourly surface meteorological data (2003) from the Gainesville, Florida, observing station. The results of the analysis indicate that visible plumes from the LNP cooling towers will remain very close to the cooling towers, primarily on-site and within approximately 100 m (328 ft.) of the cooling towers under most meteorological conditions. Visible vapor plumes greater than 1000 m (3280 ft.) in length (the approximate distance to the nearest property boundary) are predicted to occur less than approximately 2 percent of the time (less than 1 percent during daylight hours). The vertical rise of visible vapor plumes is predicted to be less than 200 m (656 ft.) above the cooling towers more than 98 percent of the time (99 percent during daylight hours). Based on this analysis, the expected frequency of occurrence of visible cooling tower plumes that will leave the property or that will be visible from off-site locations is expected to be very small. The nearest public road (US-19) is approximately 1400 m (0.9 mi.) to the west of the nearest cooling tower bank, and there are no predicted occurrences of fogging or icing at distances of more than 1000 m (3280 ft.) from the cooling towers. Additional detail on the results of the analysis of cooling tower plume behavior is provided in ER Subsection 5.8.1.3.

The nearest airport is the Crystal River Airport, which is a small municipal Airport located approximately 22.5 km (14 mi.) south of the LNP site. The operation of the cooling towers for LNP 1 and LNP 2 is neither expected to affect operations

at this or any other airport, nor is the operation of the towers expected to result in an air traffic safety hazard at any location.

The design of the cooling towers minimizes tower visibility and improves plume dissipation. The additional water and heat released to the atmosphere by the cooling tower plumes is expected to have a SMALL impact on the local environment, and no mitigation is required.

5.3.3.1.2 Ground-Level Fogging and Icing

An analysis of cooling tower fogging and icing was also performed using USEPA's CALPUFF model as described in ER Subsection 5.3.3.1.1. The results indicated that there were no predicted occurrences of ground level fogging or icing beyond 1000 m (3280 ft.) of the cooling towers (that is, the approximate distance to the nearest property boundary). Since the nearest roadway (US-19) is located approximately 1400 m (0.9 mi.) (at its closest point) from the cooling towers, no instances of ground level fogging or icing are expected on any roadway as a result of the operation of the LNP cooling towers.

The impacts attributable to fogging and icing as a result of the operation of the LNP cooling towers are expected to be SMALL and no mitigation is required.

5.3.3.1.3 Solids Deposition

A very small fraction of the water circulating through the LNP 1 and LNP 2 cooling towers will be carried into the cooling tower plumes as small water droplets. These water droplets, referred to as "cooling tower drift" (typically defined as kilograms [kg] of water per second leaving the tower top divided by the kg of water per second circulating through the tower heat exchange section) would not exceed 0.0005 percent for the LNP cooling towers. Because modern cooling towers have almost no drift losses, this is not considered to be a critical design parameter. Site wind velocities and direction have been considered in designing the mechanical draft cooling towers and their orientation on the site to minimize any recirculation of air and vapor exiting the towers and to provide adequate cooling capacity should any recirculation occur.

Water droplets emitted from the cooling towers (as cooling tower "drift") will contain the same concentration of dissolved and suspended solids as the water within the cooling tower basin that is circulated through the towers. The dissolved and suspended solid concentrations in the cooling tower basins will be controlled through use of the makeup and blowdown water lines from the CFBC. Because the cooling water that will be pumped from the CFBC will be from the estuarine portions of the nearshore Gulf, the total dissolved solids of the makeup water is expected to be in the range of 25,000 parts per million (ppm) during normal operating conditions.

The estimated amount of dissolved solids that could potentially escape from the cooling towers in drift from the LNP cooling towers (for both LNP 1 and LNP 2 operating simultaneously) is estimated to be 115.7 pounds per hour (lb/hr) during

normal operation and 154.26 (lb/hr) for short-term excursions (as total particulate). This amount of material could be released and dispersed over the area surrounding the LNP site once both units become fully operational. A description of the results of an analysis of cooling tower plume drift and deposition is provided in Subsection 5.3.3.2.1.

Given the relatively large distances from the cooling towers to the LNP site boundaries, it is expected that the deposition solids from the cooling towers at off-site locations will be SMALL and no mitigation is required.

5.3.3.1.4 Cloud Shadowing and Additional Precipitation

Although there will be visible plumes during some periods of operation of the proposed LNP site, adverse effects attributable to cloud shadowing or additional precipitation are not expected to be significant. Given the large distance to the LNP site boundary and the low profile of the mechanical draft cooling towers, the cooling tower plumes are not expected to be visible except on rare occasions from off-site locations. The impacts of cloud shadowing or additional precipitation are, therefore, expected to be SMALL and no mitigation is required.

5.3.3.1.5 Interaction with Existing Pollution Sources

No synergistic effects of cooling tower plumes mixing with plant radiological (see ER Section 5.4) or any other releases (see ER Subsection 5.5.1.3) are expected to occur. Any gaseous effluents released from the plant during operation would be at a different elevation or at a location well removed from the cooling towers. Any such releases would also be at or near ambient temperature, and no significant plume rise from those releases would occur. The potential for the mixing of the plumes is expected to be minimal and at different locations from where any water droplets in the cooling tower plume would still be present.

Interactions with other sources of air pollution are expected to be SMALL and no mitigation is required.

5.3.3.1.6 Ground-Level Humidity Increase

No discernible increase in atmospheric humidity at off-site locations is expected as a result of the operation of the LNP. No mitigation is required.

5.3.3.2 Terrestrial Ecosystems

The heat dissipation system proposed for the LNP site has only a very small potential to have any discernible impact on local terrestrial plants and animals. The operation of the LNP cooling towers will result in relatively small amounts of salt and particle drift from the tower and very limited occurrences of visible vapor plumes at off-site locations. No occurrences of fogging or icing are expected at any off-site locations. The potential for local precipitation modification is considered to be almost nonexistent. While there will be an increase in noise in the immediate vicinity of the cooling towers and the cooling water intake system,

noise impacts are expected to be minimal, with mobile organisms avoiding high noise environments. Refer to ER Subsection 5.1.1.1 and the Generic Environmental Impact Statement (GEIS) for License Renewal of Nuclear Plants prepared by the U.S. Nuclear Regulatory Commission (NRC) for further discussion on impacts.

The operation of the LNP cooling towers is not expected to have a significant or adverse impact on any terrestrial species from the presence of vapor plumes, the small amount of cooling tower drift and solids deposition, or plume fogging or icing. The impacts are expected to be SMALL, and no mitigation is required.

5.3.3.2.1 Salt Drift

Cooling tower drift, as discussed above, normally contains small amounts of solids that can ultimately deposit at ground level. A deposition analysis was performed to assess the rate of deposition to the surface in the area surrounding the plant site. The analysis was performed using USEPA's AERMOD dispersion model (Reference 5.3-003) and 5 years (2001 through 2005) of hourly meteorological data (Gainesville surface and Jacksonville upper air observations). The analysis resulted in a maximum predicted off-site deposition rate (during normal plant operation) of 6.81 kilogram per hectare per month (kg/ha/mo) (6.13 pounds per acre per month [lb/ac/mo]) of total solids at a location due west of the cooling towers at the nearest property boundary. Even assuming that all of the solids contained in the cooling tower drift are salts, this rate is below the threshold limit of 10 kg/ha/mo (9 lb/ac/mo) as provided in NUREG-1555, which is a threshold above which an adverse impact on vegetation could occur. The predicted off-site deposition impacts were also predicted to decrease significantly with increasing distance from the plant, with the maximum predicted deposition rate decreasing to approximately one-third of the maximum off-site value with an increasing distance of 1000 m (3280 ft.) from the site boundary. The maximum predicted on-site deposition (during normal plant operation) is 10.75 kg/ha/mo (9.68 lb/ac/mo).

It is noted that a comprehensive salt drift deposition study was conducted at the nearby CREC to evaluate the physical impacts of salt deposition from that facility's natural and mechanical draft cooling towers on vegetation surrounding the CREC. This long-term study was conducted from 1981 through 1995 as a condition of the facility's NPDES and Prevention of Significant Deterioration (PSD) permits. The results of the study demonstrated that there were no significant impacts to vegetation in the area surrounding the plant resulting from cooling tower operation and in 1995 FDEP was petitioned to approve termination of the study. In March of 1996, FDEP concluded that there were no significant impacts to vegetation due to salt drift from the plant and authorized facility to discontinue the study.

Impacts on vegetation attributable to salt drift emissions from the proposed cooling tower plumes at the LNP site are expected to be SMALL, and increases in soil salinity are anticipated to be minimal. No mitigation is required.

#### 5.3.3.2.2 Vapor Plumes and Icing

As discussed in ER Subsection 5.3.3.1.1, there will be visible plumes resulting from the operation of the LNP cooling towers. As discussed in ER Subsection 5.3.3.1.2, there could also be icing impacts in the immediate vicinity of the cooling tower, but none are expected at any off-site locations.

The impact of cooling tower plumes on terrestrial ecosystems is expected to be SMALL, and no mitigation is required.

#### 5.3.3.2.3 Precipitation Modifications

As discussed in ER Subsection 5.3.3.1.4, no significant increase in local precipitation is expected to occur as a result of cooling tower operation at the LNP site. Any additional precipitation will be small in comparison with the average rainfall in the region, which has been shown to range from 114 centimeters (cm) (45 in.) to 160 cm (63 in.) (refer to Table 2.7-2).

The operation of the LNP cooling towers is not expected to result in a significant increase in precipitation, its impacts are anticipated to be SMALL, and no mitigation is required.

### 5.3.4 IMPACTS ON MEMBERS OF THE PUBLIC

This subsection describes the potential human health impacts associated with the cooling system proposed for the new LNP units, specifically, potential impacts on human health from thermophilic microorganisms from the aerosolization of waterborne pathogens, and the potential impacts of noise generated by the cooling towers on humans residing outside the property boundary. Because the LNP closed-cycle cooling system will use mechanical draft cooling towers, most of the thermal discharge, and most of the thermophilic organisms, if any, will be released in the lower reaches of the local atmosphere and are not expected to move beyond the site boundary.

#### 5.3.4.1 Thermophilic Microorganism Impacts

Microorganisms associated with cooling towers and thermal discharges can impair human health. These organisms are called thermophilic organisms, because their presence and numbers can be increased by the addition of heat to their habitats. Thermophilic organisms with the potential to affect human health include *Salmonella sp.*, *Shigella sp.*, *Legionella sp.*, *Naegleria sp.* (particularly *Naegleria fowleri*) and *Acanthamoeba sp*.

*Salmonella* and *Shigella* are enteric (digestive system) pathogens and must be ingested to produce symptoms. Other microorganisms normally present in surface water include the bacteria *Legionella sp.*, which is manifested as Legionnaires' disease, so named for the first documented cases at a Legionnaires' convention in Philadelphia some years ago and traced in improperly cleaned air conditioning systems, and the free-living amoebae of the

genera *Naegleria* and *Acanthamoeba*. *Naegleria fowleri* causes primary amoebic meningoencephalitis (PAM) and *Acanthamoebic keratitis* and *Acanthamoebic uveitis* cause granulomatious amoebic encephalitis (GAE). GAE is a particular risk for persons who are immunodeficient, although infections have occurred in otherwise healthy individuals. The primary infection site is thought to be the lungs. The organisms that are in the brain are generally associated with blood vessels, suggesting vascular dissemination. Only 100 to 200 reports of PAM have occurred worldwide. Sources of infection for PAM generally include heated swimming pools, thermal springs, and a variety of naturally or artificially heated surface waters. During 1993 to 1994, only one case of PAM was reported by the Centers for Disease Control (CDC) (Reference 5.3-004).

A study of cooling waters from 11 nuclear power generating facilities and associated control source waters indicated that only two sites were positive for the pathogenic *Naegleria fowleri*. In addition to testing for pathogenic amoebae in cooling waters, the 11 nuclear power generating facilities in the 1981 study were also studied for the presence of *Legionella* sp. In general, the artificially heated waters showed only a slight increase (that is, less than tenfold) in concentrations of *Legionella* sp. relative to source water. In a few cases, source waters had higher levels than did heated waters. Infectious *Legionella* sp. was found in seven of 11 test waters and five of 11 source waters. An additional study of *Legionella* sp. presence in the environs of coal-fired electric power plants showed that *Legionella* was only infrequently found in locations that were not adjacent to cleaning operations. It was concluded that exposure to *Legionella* sp. from power plant operations was a potential problem for part of the workforce, but that it would not be a public health issue because concentrated aerosols of the bacteria would not traverse plant boundaries. Because the route of infection with *Naegleria* sp. is through inhalation, power plant workers directly working on cooling tower maintenance, and who are potentially exposed to aerosols that could harbor this pathogen, may require respiratory protection. The decision to require respiratory protection for workers addressing maintenance of the cooling towers will need to be a PEF decision, based on data and/or information acquired by qualified health professionals.

It is anticipated that the generated plumes from the low-rise banks of mechanical cooling towers will be restricted to within the power plant property boundaries and that the longest plumes will generally be restricted to the cooler months of the year. Coupled with planned biocide treatment of the cooling tower basin and the low probability of aerosol pathogen formation, the predicted impacts of cooling tower dispersed thermophilic pathogens on the public are expected to be SMALL.

#### 5.3.4.2 Noise Impacts from Cooling Tower and CWIS Operation

When the LNP becomes fully operational, the potential for impacts from the cooling water system on ambient noise levels in the areas surrounding the plant and its supporting facilities will exist from the following primary sources of noise or noise-producing activities:

- Mechanical draft cooling towers and circulating water pumps

- CWIS makeup water pumphouse that will be located adjacent to the CFBC, approximately 5.75 km (3.5 mi.) south of the center of the main plant site near County Road 40 (CR-40).

An assessment of the impacts on ambient noise levels during the operation of the LNP was previously evaluated in support of PEF's Site Certification Application (SCA) to the State of Florida and described in a report entitled, "Noise Assessment of Proposed Levy Nuclear Plant," dated March 10, 2008. The noise sources evaluated as part of this assessment included the main plant components, including the cooling towers and the cooling system makeup water pumphouse located near the CFBC.

The noise assessment of the LNP was performed in support of the PEF's SCA to the State of Florida. The noise assessment, which included an ambient background noise survey (described in ER Subsection 2.5.2.7.1), was based on a noise modeling analysis to predict noise levels during operation. This analysis indicated that noise from the main plant equipment may be perceptible at the nearest off-site locations (that is, near the west property boundary of the project site); however, the areas where these perceptible noise levels would exist are not presently developed and there are no sensitive noise receptors (residences) in those areas. The nearest existing residences are located approximately 2.6 km (1.6 mi.) to the northwest and 2.8 km (1.7 mi.) to the west southwest of the center of the project site. There are no other potentially sensitive noise receptors at closer distances than these residences relative to the main plant site. At these locations noise impacts attributable to normal plant operation were predicted to be in the range of 25 to 28 decibels (A-weighted scale) (dBA) at the three nearest residences, which are located to the west of the project site. These noise levels would only be perceptible under limited ambient conditions, such as calm winds with very low background ambient noise levels. The increase in noise levels at the nearest residences would be less than 2 dBA during periods when ambient background noise levels are most quiet. The noise analysis also predicted that off-site noise levels would not threaten or exceed the noise limitations established by the Levy County Noise Ordinance (that is, 65 dBA for daytime hours, 55 dBA for nighttime hours in rural and residential areas).

A noise assessment (described in ER Subsection 2.5.2.7.1) was also performed in the vicinity of the cooling system makeup water pumphouse that will be located adjacent to the CFBC, which parallels the CFG. Maximum noise levels in the publicly accessible areas near the proposed location of the pumphouse (which is expected to be constructed of walls and roof with substantial noise transmission loss and acoustical grade louvers will be used for ventilation air) will be limited to acceptable levels. Noise levels in the vicinity of the pumphouse will be below the Levy County Noise Ordinance limitations for rural and residential areas.

The closest recreation areas to the LNP site (including the pipeline and heavy haul road corridor) are the CFG (parallel to the CFBC) and the Goethe State Forest, the most southerly portion of which borders the north boundary of the

plant site (approximately 2.9 km [1.8 mi.] from the center of the plant site). Because of the large distances of these two areas from the main plant components at the LNP, noise impacts attributable to the operation of that equipment in these recreational areas are not expected to be significant. While noise levels in the immediate vicinity of the pumphouse might be noticeable, it will not exceed the Levy County Noise Ordinance limitations. The area where noise levels might be noticed is expected to be very localized and in close proximity to the pumphouse.

Noise-related impacts from operation of the cooling water system are expected to be SMALL, and no additional mitigation measures are warranted.

## 5.3.5 REFERENCES

5.3-001 Stone and Webster, "Final Report – Crystal River 316 Studies," January 1985, prepared for Florida Power Corporation.

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5.3-003 U.S. Environmental Protection Agency, "American Meteorological Society/U.S. Environmental Protection Agency Regulatory Model (AERMOD), Version 07026," 2007, Office of Air Quality Planning and Standards, Air Quality Assessment Division, Research Triangle Park, North Carolina, 27711. Available at: www.epa.gov/scram001/dispersion_prefrec.htm

5.3-004 Center for Disease Control and Prevention, "Surveillance for Waterborne-Disease Outbreaks – United States, 1993-1994," Website, www.cdc.gov/mmwr/preview/mmwrhtml/00040818.htm, accessed August 29, 2007.