6.0 Effects of Plant Operation

This chapter provides descriptions of the potential impacts of the operation of the CCC Project on the physical, natural, and socioeconomic environment on and in the vicinity of the Site. To the extent practicable, the potential operational impacts are quantified and assessed in terms of duration (i.e., long-term or short-term) and character (i.e., adverse or beneficial and significant or minimal). In addition, the impact assessments in this chapter provide reasonable assurance that the operation of the CCC Project will comply with all applicable nonprocedural requirements of agencies that any potential adverse impact will be minimized or avoided through use of proven, state-of-the-art project design, equipment, and pollution control systems and measures.

6.1 Effects of the Operation of the Heat Dissipation System

This discussion will focus on three potential impacts of the heat dissipation system: (1) effects of discharge of heated effluent in the form of cooling tower blowdown, (2) effects associated with operation of the cooling water intake structure (i.e., impingement and entrainment of aquatic organisms), and (3) changes in water circulation in the vicinity of CREC.

As described more fully in the following subsections, the operation of the CCC heat dissipation system will: (1) reduce thermal loading to the receiving water body as compared to operation of Crystal River Units 1, 2, and 3; (2) result in a net reduction in the rate of withdrawal from the existing Unit 3 intake bays (and ultimately elimination of once-through cooling for Units 1 and 2); and (3) result in a reduction in discharges to Crystal Bay via the existing CREC discharge canal.

6.1.1 Temperature Effects on the Receiving Water Body

The condenser cooling system for the proposed combined cycle units will consist of two 14- or 16-cell, closed-cycle, mechanical draft cooling towers for heat dissipation. Evaporative cooling towers operate by using the latent heat of water evaporation to cool recirculating water. The facility also uses the waste heat from the combustion process to generate steam and electricity. Use of closed-cycle cooling and combined-cycle generation will greatly reduce facility cooling water demand relative to an open-cycle facility of the same electrical output.

Not only is the flow rate and total thermal loading much lower, but the maximum temperature is typically lower as well. Operation of the proposed CCC Project will comply with existing thermal limits in the CREC NPDES permit for CREC Units 1, 2, and 3, which will be revised to include the new outfall to the existing discharge canal for the CCC Project. The existing CREC discharge NPDES permit for Units 1, 2, and 3 currently includes alternative temperature discharge limits for the protection of a balanced indigenous population authorized under Section 316(a) of the CWA. These alternative limits were established through numerous in-water thermal studies, thermal modeling, and biological monitoring efforts. Importantly, the effluent temperature determined to be protective was predicated on the operation of Units 1, 2, and 3 with their combined discharge of nearly 1,900 MGD (1.3 million gpm).

The existing NPDES permit sets a maximum discharge temperature of 96.5°F as a 3-hour rolling average at the thermal point of discharge located at the end of the main CREC discharge canal near the bulkhead line for compliance with the CWA Section 316(a) thermal variance. DEF is not requesting to change the maximum discharge temperature or the measurement point for same. As discussed in Section 4.5.1.4, the cooling tower design and other design features for the CCC Project will result in a conservatively estimated maximum effluent temperature into the CREC discharge canal of 95.6°F based on extreme ambient conditions. The CCC Project cooling towers are designed to remove 1.9 billion Btu/hr at a flow rate of 270 gpm at a wet bulb temperature of 86°F.

With the planned retirement of Units 1 and 2 (coordinated with commencement of commercial operations of the proposed CCC Project units) and elimination of the once-through cooling employed by these units, thermal loading to the receiving waters of Crystal Bay will be substantially reduced.

6.1.2 Effects on Aquatic Life

The effects of the existing cooling water intakes and thermal discharges from CREC have been studied extensively over several decades. In September 1988, EPA granted a Section 316(a) variance from thermal effluent limitations to CREC after a determination that the thermal variance was adequately protective of a balanced indigenous population in the receiving body of water. At the same time, EPA determined that CREC's helper cooling towers, seasonal flow reductions, and mitigation efforts constituted BTA for protection of adverse environmental impacts under CWA Section 316(b) requirements. The potential for adverse effects to federally listed species also were carefully evaluated by the relevant agencies. Their determinations either concluded that there would not be substantial impacts or resulted in control plans approved by the agencies.

As listed in Table 3.3.6-3, the federally listed aquatic species potentially present near the CCC Site are gulf sturgeon, Florida manatee, and five species of sea turtles (Section 3.3.6.1). Potential risks from impingement and entrainment to the gulf sturgeon were reviewed in the NMFS's 2002 biological opinion (NMFS, 2002) on CREC. NMFS considered it unlikely that the gulf sturgeon would enter the rock-bottomed intake canal and, in conjunction with the absence of documented occurrences of impingement or entrainment of the species, concluded that the potential for impacts to the species from operation of CREC was "discountable."

A biological opinion was issued by NMFS in June 1999 that determined the cooling water intake system was not likely to jeopardize the existence populations of the five species of sea turtles that might be found in the area. A second biological opinion, initiated at the request of NRCS, was issued by NMFS in August 2002 and concluded that continued operation of the cooling water intakes for Units 1, 2, and 3 would not jeopardize any of the listed sea turtle populations (NMFS, 2002) (see Appendix 10.6.7). It is anticipated that the reduced intake flows and velocities associated with the CCC Project will be even more protective of these species.

The existing CREC once-through cooling water discharge provides a secondary thermal refuge for the local population of manatees but is not considered a primary refuge because of the presence of the springs in the area region (FDEP, 1995). The projected reductions in the effluent temperature and total thermal loading in the discharge canal from operation of the CCC Project will be minor and are unlikely to adversely impact manatees, particularly given the presence and importance of springs in the region. However, CREC's manatee protection plan includes a requirement for timely communication with manatee recovery program personnel regarding any long-term changes in the availability of warm water (see Appendix 10.6.6). Retirement of Units 1 and 2 would be subject to this notification requirement. Toward that end, DEF has initiated discussions with the agencies relative to the retirement of Crystal River Units 1 and 2.

The CCC Project's use of a closed-cycle recirculating cooling system will result in significant reductions in cooling water withdrawals, which will produce commensurate reductions in adverse environmental effects. The CCC Project will use seawater to manage chlorides concentrations in the cooling tower blowdown. When considered on the basis of electricity output (i.e., million gallons per day per megawatt [MGD/MW]), the generation provided by Units 1, 2, and 3 require 1.03 MGD/MW. In contrast, the proposed CCC Project will use cooling tower makeup and chloride augmentation water at a rate of 0.07 MGD/MW, an overall 93-percent reduction relative to a facility of the same output that uses once-through cooling, thus producing a commensurate decrease in impingement and entrainment rates.

The use of closed-cycle recirculating cooling systems is identified in the final Section 316(b) existing facilities rule as BTA for new units at existing facilities (40 CFR § 125.94(e)(1)). The existing Unit 3 intake bays will be retrofitted with intake screens with a design through-screen velocity of less than 0.5 fps, considered BTA for mitigation of impingement mortality effects from existing cooling water intakes (40 CFR § 125.94(c)(2)).

The CCC Project will intermittently use sodium hypochlorite and/or sodium bromide to control biofouling in the cooling towers, consistent with the 40 CFR Part 423 effluent guidelines for the steam electric generating sector. Dechlorination will be performed during this procedure. No other toxic chemicals will be introduced into the cooling tower blowdown, which is expected to be similar in quality to the blowdown from the existing Units 4 and 5 cooling towers. Semiannual toxicity testing of the Unit 4 and 5 blowdown conducted under conditions of the current NPDES permit for those units has shown no issues with toxicity.

Given that the discharge's characteristics will be relatively unchanged from the intake, no toxic effects to aquatic life because of the CCC Project's discharge in the discharge canal are expected.

6.1.3 Biological Effects of Modified Circulation

Historically, the once-through cooling systems for CREC Units 1, 2, and 3 created a localized circulation pattern in Crystal Bay. With the cooling water system for Units 1, 2, and 3 operating at design capacity, the induced velocity in the intake and discharge canals during low tide was approximately 1.3 and 2.4 fps, respectively (PEF, 2007). The retirement of Unit 3 reduced once-through cooling by approximately 52 percent, which proportionately reduced the induced velocities in the intake and discharge canals.

The combined withdrawal for CCC Project cooling tower makeup and blowdown augmentation water will be only approximately 10 percent of the former Unit 3 flows; therefore, the induced velocities in the canals will only marginally increase from current levels (i.e., with Unit 3's retirement). More importantly, with respect to biological effects, the addition of augmentation water in the CCC Project blowdown will result in a commingled discharge that approximates ambient water quality conditions. The controlled use of biocides is not expected to have an impact to receiving water biota. No impacts to biota are therefore expected given the larger reductions in circulation due to the retirement of Unit 3, as well as the augmentation of the CCC Project cooling tower blowdown.

6.1.4 Effects of Off-Stream Cooling

Cooling towers transfer heat from plant processes to the atmosphere through the evaporation and dispersion of cooling water. Depending on the meteorological conditions, warm, moist air leaving a tower may become cooled to the point of saturation, causing the water to condense and form a visible plume. Ground level fogging and/or icing may occur if this plume does not rise and dissipate after being emitted from the cooling tower. An additional potential impact from a cooling tower can occur when the drift from a tower carries dissolved and suspended solids (mostly salt), which could be deposited locally and may have the potential to affect soils and vegetation. The frequency and magnitude of these potential impacts are dependent on the size, design, and location of the cooling tower, as well as meteorological conditions.

The CCC Project will include two 14- or 16-cell (each having a diameter of 28 ft) mechanical draft cooling towers, one per power block, equipped with high-efficiency drift eliminators having a drift loss rate of only 0.0005 percent. These cooling towers will be used to cool the condenser cooling water and cool the other plant heat exchangers. The cooling towers will be located just north of their respective power block. The cooling tower cells will be arranged in a two-by-eight configuration and oriented in an east-west direction and will have a deck height of 44 ft above grade. The height to the top of the outlet stacks will be 58 ft above grade. Air flow exiting the cooling tower will be approximately 1,450 cfs per cell.

The CCC Project, as proposed, may also include two smaller six-cell cooling towers for the potential inlet air chillers. These inlet air chiller cooling towers, if constructed, would be located north of the 16-cell cooling towers and will be configured in a two-by-three configuration.

Because of direct contact between the cooling water and ambient air, a small portion of the recirculating cooling water is entrained in the air stream and discharged from the cooling tower as drift droplets. These water droplets contain the same concentration of dissolved solids as found in the recirculating cooling water. Large water droplets quickly settle out of the cooling tower air flow stream and deposit near the tower. The remaining smaller water droplets may evaporate prior to being deposited in the area surrounding the cooling tower. These evaporated droplets represent potential $PM/PM_{10}/PM_{2.5}$ emissions because of the fine $PM/PM_{10}/PM_{2.5}$ formed by crystallization of the dissolved solids contained in the droplet.

6.1.4.1 Cooling Tower Plume Visibility/Fogging

When a visible plume is formed from a cooling tower, the extent to which it will disperse and dissipate will vary depending on the prevailing meteorological conditions. The location of a visible plume may vary significantly from hour to hour, thereby reducing the duration of fogging events.

Due to the generally moderate temperatures that occur in west-central Florida and the significant distance to the nearest roadway or major highway, the Project cooling towers will not cause any adverse impacts with respect to fogging/icing on either North Access Road, West Power Line Street, U.S. 19, or any other off-Site location.

6.1.4.2 Cooling Tower Drift/Deposition Analysis

The amount of salt deposition is directly related to the total dissolved solids (TDS) concentration found in the cooling tower recirculation water. The Project cooling tower recirculation water will have an average TDS concentration of approximately 30,680 parts per million (ppm) by weight due to the use of seawater withdrawn via the CREC intake canal.

In general, saline drift can result in adverse impacts to vegetation from the absorption of salt that is deposited on a plant's leaves or through absorption of salt accumulation in the soil.

The CCC Site is located in close proximity to the Gulf of Mexico, and all vegetation in the general area is tolerant of salt deposition due to wind and salt spray from the Gulf of Mexico. The soils have also been exposed to salt deposition and accumulated salt from the close proximity to the Gulf of Mexico. The cooling towers will use saltwater and will be located well within the property boundaries of the CCC Site thus minimizing any transport of drift and PM beyond the Site boundaries. Use of seawater for cooling tower makeup results in a higher portion of larger particle size PM emissions. These larger-sized particles tend to deposit in close proximity to the cooling towers and not be transported off-Site.

The emissions from the CCC Project cooling towers will also be offset by the elimination of the emissions from CREC Units 1 and 2. Since DEF intends to retire CREC Units 1 and 2 in conjunction with operation of the CCC Project units, PM emissions associated with the process cooling water for CREC Units 1 and 2 will be eliminated.

Therefore, due to the close proximity of the CCC Site to the Gulf of Mexico, the tolerance of existing vegetation to salt deposition, and the elimination of emissions from CREC Units 1 and 2 salt deposition from the CCC Project cooling towers will not have an adverse effect on off-Site natural vegetation or soils in the vicinity of CCC Project.

6.1.5 Measurement Programs

The current NPDES permit for operation of CREC Units 1, 2, and 3 requires periodic monitoring to ensure compliance with the conditions of the permit. It is expected that the revision of this permit to include the CCC Project units will include monitoring requirements for the CCC Project facility similar to those for the Units 4 and 5 cooling towers, including intake and blowdown rates, temperature, salinity/conductivity, pH, and total residual oxidants.

The administrative order accompanying issuance of the NPDES permit renewal for Units 1, 2, and 3 (issued on April 7, 2014) requires further evaluation of the thermal discharge to demonstrate the protectiveness of the thermal variance after retirement on Unit 3. A thermal plan of study was submitted to FDEP on July 3, 2014, that included a phased approach for physical and biological sampling of the CREC thermal discharge.

The administrative order also requires DEF to assess 316(b) compliance under the final existing facilities intake rule. It is anticipated that continued implementation of existing monitoring plans will be required.

6.2 Effects of Chemical and Biocide Discharges

Use of water treatment chemicals and biocides are detailed in Section 4.6. This section discusses the potential effects of the discharge of these chemicals to the environment.

6.2.1 Industrial Wastewater Discharges

IWW discharges include low-volume waste streams as defined in 40 CFR Part 423. These discharges include, but are not limited to, flows from plant service water systems and floor drains, blowdown from the HRSGs, raw water treatment filter backwash, neutralized condensate polisher regeneration wastes, and other residual waters from the demineralized water treatment systems (Section 4.6.1.3). Discharges from these sources will be treated, as appropriate, and discharged to the appropriately sized on-Site percolation pond. With the exception of cooling tower blowdown (Section 6.2.2), IWWs will not be discharged to surface waters. The percolation pond system will be designed in accordance with all applicable nonprocedural requirements for IWW percolation ponds.

The wastewater from floor and equipment drains throughout the plant may be exposed to oily products and, therefore, will be collected and treated through oil/water separators. Residual water from the demineralized water system will be neutralized. Infrequent HRSG and pipe cleaning that produces metal cleaning wastes will be collected and disposed off-Site by a licensed vendor.

6.2.2 Cooling Tower Blowdown

The closed-cycle recirculating cooling towers will be intermittently treated with biocides (sodium hypochlorite and/or sodium bromide; see Section 4.5.1.1). Cooling tower blowdown will be treated with sodium bisulfite to ensure that the total residual oxidants (TRO) meet regulatory standards. No impacts to surface waters will result from use of biocides due to routine dechlorination. Constituents in the ambient seawater used for cooling tower makeup that will be concentrated by evaporation in the cooling towers will be discharge at close to ambient concentrations by the addition of augmentation water used to reduce chloride levels in the blowdown.

6.2.3 Measurement Programs

CREC has an approved groundwater monitoring plan with groundwater monitoring wells located at various locations on the CREC property. It is expected that the COCs for the CCC Project will likewise require groundwater monitoring of the on-Site percolation pond to assess potential effects of discharges to the IWW pond. The revised NPDES permit for Units 1, 2, and 3 will include monitoring of TRO in the cooling tower blowdown during use of biocides as required by the EPA's Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category (40 CFR Part 423).

6.3 Impacts on Water Supplies

6.3.1 Surface Water

No freshwater surface waters will be used for operation of the CCC Project. As discussed in Sections 4.5 and 6.1, the Project will use marine surface water for cooling tower makeup and flow augmentation water to manage concentrations of chlorides in the cooling tower blowdown. The makeup water will be withdrawn via the existing CREC intake canal through the former CREC Unit 3 cooling water intake structure, and the blowdown will be discharged through a new discharge structure to the Gulf of Mexico via the existing CREC discharge canal. As shown in the water balance in Figure 4.5.0-2, up to approximately 7,596 gpm or 10.9 MGD of seawater will be lost due to evaporation and drift from the cooling towers. This use of seawater is negligible compared to the source. Also, as discussed in Sections 4.5 and 6.1, the cooling water withdrawals and discharges for the Project will be significantly less than the historical once-through cooling water withdrawals and discharges for the now-retired CREC Unit 3. Therefore, the operation of the Project will not cause significant changes in hydrologic or water quality conditions in the existing CREC canals or in Crystal Bay and the Gulf of Mexico and will have no adverse impacts on surface waters.

As discussed in Section 4.8, noncontact stormwater runoff from the plant facilities areas will be collected and routed to detention ponds for flow attenuation and treatment. Contact stormwater will be directed through an oil-water separator prior to routing to the detention pond. The stormwater management system will be designed to meet applicable substantive requirements. Therefore, the Project operations will have no adverse impacts on surface water.

6.3.2 Groundwater

6.3.2.1 Consumptive Use Impacts

The CCC Project will require groundwater for various plant process and potable water uses. As stated in Section 4.1, process and potable freshwater needs for the Project include demineralized water for steam cycle makeup, plant service water, wash water, fire protection water, and potable water. The freshwater needs will be provided through groundwater withdrawals from the three existing or replacement wells currently used for CREC Units 1, 2, and 3 operations.

Consumptive uses include sanitary wastewater and wastewater from service uses, such as HRSG boiler blowdown, floor drains, and equipment drains. Sanitary wastewater will be discharged to an on-Site septic tank and drainfield or appropriately sized package domestic wastewater treatment plant with on-Site disposal. In accordance with the water balance diagram provided on Figure 4.5.0-1, the potable water needs will consume approximately 1,440 gpd. Low-volume wastewater from the remaining wastewater will be collected and discharged to an appropriately sized and constructed on-Site percolation pond.

The septic tank and drainfield or package domestic wastewater treatment plant with land application will be designed in accordance with applicable regulations. As needed, the drainfield will be installed in the area where fill will be brought onto the Site. This fill material, plus the natural depth to groundwater, will provide adequate treatment of sanitary wastes prior to infiltration into the aquifer.

Wastewater from containment areas, floor drains, and equipment drains through the plant facilities will be collected, treated through oil/water separators, and discharged to an on-Site IWW percolation pond. Other miscellaneous, low-volume wastewaters will also be discharged to the pond. The preliminary IWW pond system design will be based on a 2-inch-per-hour infiltration rate. The pond system will be designed to handle approximately 148 gpm and will accommodate a 25-year, 24-hour rainfall event of 8.7 inches. As shown on Figure 4.2.0-2, the proposed IWW system will be located northwest of the power blocks. Final design of the percolation pond system will be based on further geotechnical testing in the specific area of the pond during detailed design for the Project.

Currently, Units 1, 2, and 3 are permitted for an annual average groundwater withdrawal of 1,000,000 gpd and a peak monthly withdrawal rate of 1,500,000 gpd. CREC Units 1, 2, and 3 currently use approximately 650,000 gpd on an average basis. The water balances discussed in Section 4.5 show an annual average groundwater need of approximately 122,400 gpd and a maximum expected need of approximately 200,160 gpd. The Project may be designed to reuse condensate from the inlet air chillers, if constructed. The freshwater needs reported in Section 4.5 document that the additional needs of the CCC Project will not require an increase in the groundwater use allocations.

Further, the current COCs for CREC Units 4 and 5 include the requirement for DEF to conduct an environmental monitoring program to evaluate the relative condition of surface waters and wetlands in the areas affected by the water withdrawals for CREC and submit annual reports. Based on the results presented in the 2013 annual report (WRA, July 2014), both the hydrologic and environmental monitoring of the area showed no evidence of impact to wetlands due to groundwater pumping from the CREC wellfield. The results also showed that there was no direct correlation between pumpage on groundwater elevations and the elevation trend significantly with rainfall over time. Compared to the baseline evaluations in 2009, wetland conditions have remained stable throughout the monitoring period.

The transition of water usage from Units 1, 2, and 3 to the CCC Project will not require an increase in water usage and, therefore, will not result in additional impacts to groundwater supplies.

As discussed in Section 4.5, as part of this SCA, DEF is requesting that the existing water use allocations for Units 1, 2, and 3 and ultimately the CCC Project be combined with the allocations for Units 4 and 5 to provide more flexibility and efficiency in managing the overall groundwater use at CREC facilities.

6.3.2.2 Potential Surficial Aquifer Impacts

At the CCC Site, the Floridan aquifer is contiguous with the surficial aquifer. Discharges to the aquifer are expected to occur at the septic tank drainfield or package plant land application system, stormwater ponds, and at the IWW percolation pond system. The upper portions of the Floridan aquifer at the Site are not used as a drinking water source due to the proximity of the Site to the coast and the freshwater-saltwater transition zone.

Potential impacts from the stormwater infiltration will be avoided and minimized through implementation of a stormwater management plan.

A groundwater monitoring program is incorporated in the existing CREC COCs. It is anticipated that the COCs incorporating the CCC Project COCs will likewise require groundwater monitoring of the wastewater discharges to the IWW percolation pond.

6.3.3 Drinking Water

The proposed source of drinking water for the CCC Project during operation is the Floridan aquifer. CREC Units 1, 2, and 3 receive water from three permitted water supply wells located east of the complex in the vicinity of U.S. 19. As proposed, the CCC Project would also obtain drinking water from those existing wells, but there will be no increase in water use allocations as a result of the CCC Project operations. The CCC Site is located at the distall end of the groundwater flow system, near where the fresh water in the Floridan aquifer mixes with saltwater. Hydraulic pressure in the

Floridan aquifer pushes the freshwater against the saltwater. As long as the hydraulic pressure in the Floridan aquifer is higher than the hydraulic pressure in the saltwater portion of the aquifer, the transition zone between the fresh water and salt water will not encroach further landward. Because there will be no increase in water use allocations as a result of CCC operations, the CCC Project is not anticipated to affect this hydraulic pressure and, therefore, will not cause or contribute to saltwater intrusion in the area.

Operation of the proposed CCC Project is not expected to have any adverse impacts on the quality or quantity of the drinking water source.

It is anticipated that CCC Project operation potable water needs will average 1,440 gpd. A potable water treatment system will be constructed at the proposed CCC Site to treat groundwater used for potable uses.

Figure 3.3.3-1 provides a map of water use permits located within 5 miles of the proposed CCC Site. Again, because there will be no increase in water use allocations as a result of CCC operations, the proposed CCC Project is not anticipated to have any adverse impact on any existing user of groundwater.

6.3.4 Leachate and Runoff

Because the fuel source for the proposed CCC Project is natural gas, there will be no leachate generated or runoff from coal and material storage piles, ash ponds, or flue gas desulfurization storage areas associated with the Project.

Contact process waters (IWW), i.e. wastewater from containment areas, floor drains, and equipment drains, will be discharged through an oil/water separator prior to discharge to the on-Site percolation pond system. Other, low-volume wastewaters will also be discharged to the percolation pond. BMPs will be used to minimize the entrainment of wastes into the wastewater streams to ensure compliance with all applicable nonprocedural requirements. As discussed previously, however, it is anticipated that the CCC Project COCs may require monitoring of groundwater quality in the vicinity of the percolation pond. The groundwater monitoring will ensure continued compliance with the COCs.

Stormwater runoff will be managed through a stormwater management plan.

6.3.5 Measurement Programs

DEF currently has a groundwater monitoring, operation, and measurement program in place at CREC. It is anticipated that the measurement program required by the COCs for the proposed CCC Project will follow a similar monitoring and measurement program pursuant to a revised Sitewide groundwater monitoring plan reviewed and approved by FDEP.

6.4 Solid/Hazardous Waste Disposal Impacts

6.4.1 Solid Waste

The types of nonhazardous solid waste produced by the CCC Project operations are described in Section 4.7.1. These wastes primarily consist of office wastes, used air filters, used oil and lubricants, and other typical maintenance wastes. These wastes will be collected, temporarily stored, and transported off-Site by a licensed hauler for disposal at an appropriately permitted facility in Citrus County. Material removed from the Crystal River Units 4 and 5 cooling tower basins is allowed to be disposed at the exiting CREC ash storage area. It is anticipated that material collected from the CCC cooling tower basin will also be directed to this area. However, no other solid wastes will be disposed on the Site. The Project operations will have no adverse impacts related to solid waste.

6.4.2 Hazardous Waste

As described in Section 4.7.2, the CCC Project will occasionally generate small quantities of potentially hazardous waste during operations and maintenance activities. These wastes will generally include laboratory chemicals, solvents, and cleaning fluids. To the extent practicable, DEF will select materials that produce only nonhazardous waste. The potentially hazardous waste will be collected, managed, and temporarily stored in a designated hazardous waste storage area(s) and periodically transported off-Site by a licensed hazardous waste hauler for disposal at an appropriately permitted facility. Hazardous waste will be managed, reported, and documented in accordance with all applicable requirements. No hazardous waste will be disposed of in Citrus County's solid waste disposal facility. Project operations will have no adverse impacts due to hazardous waste.

6.5 Sanitary and Other Waste Discharges

A regional sanitary wastewater system is not available in the area of the CCC Project. As described in Section 4.5.2, sanitary wastewaters generated by employees and visitors during operations will be disposed through the use of an on-Site septic tank and drainfield system or package treatment plant with land application. The septic treatment system or package treatment plant will be designed, sized, and sited to handle the wastewater flows generated by the approximately 50 and up to 75 operational employees in accordance with all applicable nonprocedural requirements. There will be no adverse impacts due to sanitary wastewater disposal during the Project operations.

As discussed in Sections 4.5 and 4.6, several low-volume wastewater streams generated during the Project operations will be collected and routed to an on-Site percolation pond for disposal. These IWWs include, but are not limited to, HRSG boiler blowdown, filter backwash from the potable and service water treatment system, residual water from the RO demineralized water treatment system, condensate polisher regeneration waste, and wash water and runoff from the plant drains system. The percolation pond will be designed in accordance with all applicable nonprocedural requirements. The pond system initial design is based on a wastewater flow of approximately 148 gpm plus the water from a 25-year, 24-hour rainfall event with no surface water discharge and providing for approximately 3 ft of freeboard above the water surface.

The Project is not expected to have adverse impacts due to wastewater disposal in the percolation pond. The operations of existing Crystal River Units 1, 2, 4, and 5 have used percolation ponds for disposal of similar types of low-volume wastewaters for an extended period of time with no adverse impacts. Also, to ensure compliance with the COCs, it is anticipated that the CCC COCs will require DEF to implement a groundwater monitoring program similar to that employed at CREC pursuant to an approved revised groundwater monitoring plan.

6.6 Air Quality Impacts

6.6.1 Impact Assessment

Source impact analyses are required to determine if any PSD pollutant emissions increase is greater than the respective PSD significant emissions rate. The objective of the source impact analyses is to demonstrate that emissions changes from the project do not cause or contribute to a violation of any NAAQS.

Under federal PSD review requirements, all major new or modified sources of air pollutants regulated under the Clean Air Act (CAA) must be reviewed and approved by EPA or the state agency if PSD review authority has been delegated to an approved state program, as is the case in Florida. A *major* stationary source is defined to include any 1 of 28 named source categories, including power plants, that have the potential to emit 100 tpy or more or any other stationary source that has the potential to emit 250 tpy or more of any pollutant regulated under the CAA. Potential to emit means the capability at maximum design capacity to emit a pollutant after the application of control equipment.

A netting analysis was performed to determine the net change in emissions due to the emissions increase from the proposed natural gas-fired CCC Project and the emissions decrease due to the permanent shutdown of the coal-fired CREC Units 1 and 2. Emissions increases from the proposed CCC Project were based on potential emissions from the Project assuming continuous operation of the CTGs, i.e. operating 8,760 hr/yr. Emissions from all other air emissions sources such as the HRSG duct burners (4,000 hr/yr), auxiliary boiler (2,000 hr/yr), fuel gas dew point heater (8,760 hr/yr), emergency engines (500 hr/yr), and cooling towers (8,760 hr/yr), inclusive of the potential inlet air chiller towers, were also included the CCC Project potential emissions.

Emissions decrease due to the permanent shutdown of CREC Units 1 and 2 were derived based on the baseline actual emissions. Baseline actual emissions are defined as the average rate, in tons per year, at which the unit actually emitted the pollutant during any consecutive 24-month period within the 5-year period immediately preceding submittal of a complete air permit application. Baseline actual emissions were determined based on reported emissions data from EPA's Clean Air Markets Division, the facility's annual operating reports, and/or were calculated based on other relevant information.

Table 6.6.1-1 provides the results of the netting analysis.

As shown, overall emissions for CREC will decrease for all pollutants with the exception of VOCs and GHGs. These emissions decreases, due to the replacement of the existing coal-fired Units 1 and 2 with a high-efficiency, natural gas-fired combined-cycle CTG facility, will have an overall positive impact on the air quality in and around the Crystal River area.

Overall, GHG emissions will increase as a result of replacing the existing coal-fired Units 1 and 2 with high-efficiency, natural gas-fired combined-cycle CTG units. However, the proposed units will utilize high-efficiency generating technology fired exclusively with natural gas. These units will generate electrical power in a more efficient manner than the existing coal-fired units, thereby resulting in lower GHG emissions per unit of electricity produced (pound per megawatt-hour).

The net emissions from the CCC Project do not result in PSD applicability or PSD review for any pollutant. Therefore, a quantitative impact assessment is not required in support of the air construction permit application (see Appendix 10.2.5) or needed in this SCA.

6.6.2 Monitoring Programs

Since the net emissions from the CCC Project do not trigger PSD applicability, no monitoring of ambient air quality is required.

The CCC Project CTGs will be subject to new source performance standards (NSPS) Subpart KKKK, Standards of Performance for Stationary CTGs. The emergency generator and firewater pump diesel engines will be subject to NSPS Subpart IIII (Stationary Compression Ignition Internal Compression Engines) and National Emission Standard for Hazardous Air Pollutants (NESHAPs) Subpart ZZZZ (Stationary Reciprocating Internal Combustion Engines). Emissions monitoring will be performed as required by each of these NSPS and NESHAPs.

Table 6.6.1-1. PSD Applicability Netting Analysis Results

Pollutant	Project Net Emissions Increase/Decrease (tpy)	PSD Significant Emissions Rate (tpy)	PSD Applicability
CO	-3,148	100	No
NO_x	-3,747	40	No
SO_2	-28,897	40	No
PM (filterable)	-562	25	No
PM_{10} (filterable and condensable)	-1,766	15	No
$PM_{2.5}$ (filterable and condensable)	-1,439	10	No
Ozone/VOC	14	40	No
Lead	-0.38	0.6	No
Fluorides	Not present	3	No
H_2SO_4 mist	-49	7	No
Hydrogen sulfide	Not present	10	No
Total reduced sulfur (including hydrogen sulfide)	Not present	10	No
Reduced sulfur compounds (including hydrogen sulfide)	Not present	10	No
Municipal waste combustor organics (measured as total tetra- through octa-chlorinated dibenzo-p-dioxins and dibenzofurans)	Not present	3.5×10^{-6}	No
Municipal waste combustor metals (measured as PM)	Not present	15	No
Municipal waste combustor acid gases (measured as SO_2 and hydrogen chloride)	Not present	40	No
Municipal solid waste landfills emissions (measured as nonmethane organic compounds)	Not present	50	No
Mercury	-0.07	0.1	No
For the pollutants listed above, and for major stationary sources locating within 10 km of a Class I area having an impact equal to or greater than 1 μg/m^3, 24-hour average	Not applicable	Any amount	No
GHGs (as CO_2e)	1,766,553	—	No*

*See Util. Regulatory Grp. v. EPA, Case No. 12-1146 (June 23, 2014).

Sources: Rule 62-210.200(282), F.A.C.
Burns & McDonnell, 2014.
DEF, 2014.
ECT, 2014.

The CCC Project CTGs are also subject to the requirements of EPA's Acid Rain Program, Clean Air Interstate Rule, and Mandatory GHG Reporting Rule. Monitoring of emissions will be conducted in accordance with the requirements of these federal programs. Continuous monitoring of NO_x, CO, and CO_2 will be conducted in accordance with the provisions of 40 CFR 75, Acid Rain Program.

6.7 Noise

During operation of the CCC Project, the primary continuous sources of noise will include noise emanating from the gas turbine generator, STGs, HRSGs, cooling towers, and rotating equipment such as pumps and fans. Other intermittent sources of noise will include the emergency diesel generator and emergency firewater pump. The CCC Project will comply with the applicable noise standards in Section 21-20 of the Citrus County Code and applicable Occupational Safety and Health Administration requirements for on-Site worker noise protection. Citrus County's applicable noise standard prohibits activities that exceed 75 dBA across property lines more than 10 percent of the time during a 10-minute measurement period. In addition, the maximum instantaneous noise should not exceed 85 dBA across property lines.

To assess noise impacts from CCC Project operations, a noise modeling analysis was performed. The purpose of this noise modeling analysis was to predict the noise levels from CCC Project operations at the CCC Site property line to ensure compliance with the Citrus County noise standard. The following subsections describe the noise model used, noise modeling inputs, and results.

6.7.1 Noise Model

The noise model used was Computer-Aided Noise Abatement (CadnaA) Version 3.7, developed by DataKustik, Greifenberg, Germany. This noise model is a state-of-the-art noise prediction software for outdoor noise sources based on International Organization for Standardization (ISO) Standard 9613, Parts 1 and 2. ISO 9613-1 relates to atmospheric attenuation, while ISO 9613-2 specifies an engineering method for calculating environmental noise from a variety of noise sources by accounting for various attenuation effects observed during outdoor sound propagation. ISO 9613-2 conservatively uses meteorological conditions favorable to sound propagation; i.e., downwind propagation with wind velocities between 1 and 5 meters per second.

6.7.2 Noise Model Inputs

6.7.2.1 Noise Source Data

The CCC Site layout was imported into CadnaA to accurately locate the major noise sources and also the noise receptors along the CCC Project property line. Most noise sources were input as point sources, which means that noise emanating from these sources will diverge hemispherically from a single point in all directions from grade level. Noise sources input as point sources include the HRSGs, gas turbine enclosure, gas turbine generator, inlet and exhaust ducts, inlet filters, fuel gas units, lubricating oil units, and STGs. Sources located at grade were assigned a source height of 1.5 meters (5 ft), while source height for noise emanating from the main stacks were assigned a source height equal to the stack height of 180 ft. Although the cooling tower cells were input as point sources, a vertical divergence factor was used to simulate the noise emanating vertically from each cooling tower cell.

Sound power level data for the noise sources was obtained from the equipment manufacturers, when available, and from typical equipment sound power levels from similar projects. Noise data for the Mitsubishi Model 501GAC was used. Sound power levels at octave band center frequencies were used for the noise sources, if available. If sound power levels were not available, the sound pressure levels measured at 1 meter were input into the model. Table 6.7.2-1 presents a summary of the noise sources used in this noise analysis and their respective sound power or pressure levels.

Several noise sources used in the noise analysis will not operate continuously through the entire 24-hour day but were conservatively analyzed as if they will be continuously operating.

Intermittent sources that operate infrequently were not included in the noise analysis. These sources include the two emergency diesel generators and a firewater pump engine.

Figure 6.7.2-1 presents a graphical representation of the noise source locations.

Table 6.7.2-1. Sources and Sound Pressure Levels Used in Noise Modeling Analysis

Source Description	Sound Pressure Level (dB) at Octave Band Center Frequency (Hz)									Sound Pressure Level (dBA)
	31.5	63	125	250	500	1000	2000	4000	8000	
Generator and slipring housing	NA	88	100	72	70	70.5	60.6	55.3	45.8	85
CTG inlet filter	NA	85	88	78	77	80	79	76	67	85
CTG inlet air duct – II	NA	91	91	84	82	85	84	80	71	89
CTG enclosure	NA	94	83	81	78	81	78	76	67	85
Cooling tower*	112	115	115	112	109	105	102	99	91	111
CTG exhaust expansion joint	NA	80	78	78	75	79	79	79	73	85
CTG exhaust duct	NA	85.6	84.4	85.1	78.6	78.5	78.5	76.9	65.9	85
CTG ventilation Fan A	NA	90	86	83	82	78	78	75	66	85
CTG ventilation Fan B	NA	90	86	83	82	78	78	75	66	85
Recirculation pump A	0	50	62	71	76	77	80	76	66	84
Recirculation pump B	0	50	62	71	76	77	80	76	66	84
HRSG – CTG A	120	122	119	112	103	96	97	87	81	108
HRSG – CTG B	112	109	107	105	99	98	105	103	76	109
Lubricating oil unit	NA	81	86	86	82	81	75	65	53	85
CTG fuel gas unit	NA	94	83	81	78	81	78	76	67	85
STG (HP portion)	89.6	84.4	86.3	87.8	83.4	79.2	73.0	65.2	55.3	85
STG (LP portion)	89.4	86.1	87.6	87.6	83.2	79.0	72.8	65	55.1	85
STG and slipring housing	90	92.9	100.9	72.3	66.4	67.7	62.1	56.4	48.1	85
STG lubricating oil unit	67.9	74.6	81.7	79.3	82.6	81.1	76.6	71.9	63.4	85

*Sound pressure level is for each cooling tower cell. Six decibels were added to the sound pressure level in all octave bands to reflect the equivalent sound pressure level for four cooling tower cells which was used in the CadnaA model.

Sources: Burns & McDonnell, 2014.
ECT, 2014.

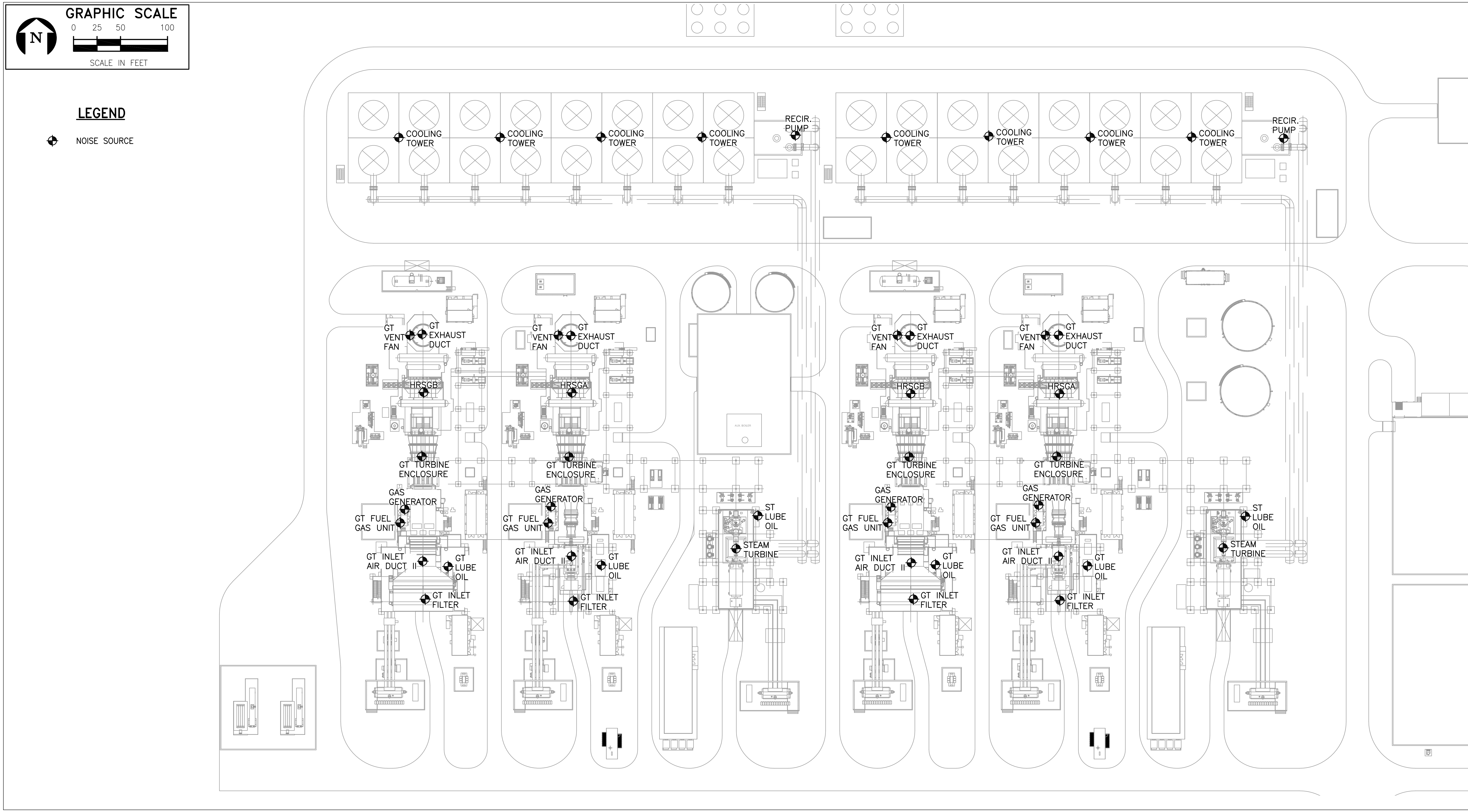

FIGURE 6.7.2-1.

NOISE SOURCE LOCATIONS

Sources: Burns & McDonnell Engineering Company, Inc., 2014; ECT, 2014.

DUKE ENERGY FLORIDA

6.7.2.2 Attenuation Data

CadnaA calculates sound pressure levels based on attenuating factors from geometrical divergence, atmospheric absorption, ground effects, screening, and miscellaneous factors such as industrial sites and foliage. The major attenuating factor in this modeling study is due to geometric divergence; i.e., the reduction in sound pressure levels due to distance from the noise receptor to the noise source. Atmospheric absorption was based on default values of 10 degrees Celsius (50°F) ambient temperature and 70-percent relative humidity.

6.7.2.3 Noise Receptors

Noise receptors were placed along the northern, eastern, and southern CCC Site boundaries. In addition, one noise receiver was placed along the road adjacent to the power block within the property boundary. The receptors along the northern and eastern property boundaries are of utmost importance since the Citrus County noise standards apply across real property lines. DEF owns the property to the south and west of the Site. All noise receivers were place at a height of 1.5 meters or 5 ft.

Figure 6.7.2-2 presents a graphical representation of the noise receptor locations.

6.7.3 Noise Results

Table 6.7.3-1 presents the predicted noise levels from CCC Project operations at various noise receptor locations along the property line. The maximum predicted noise level along the property line was 48.9 dBA and occurred at the noise receptor located along the northern property line. All predicted noise levels are well below the applicable Citrus County sound level limit of 75 dBA for adjacent industrial or manufacturing (i.e., existing mining and power plant use) land uses.

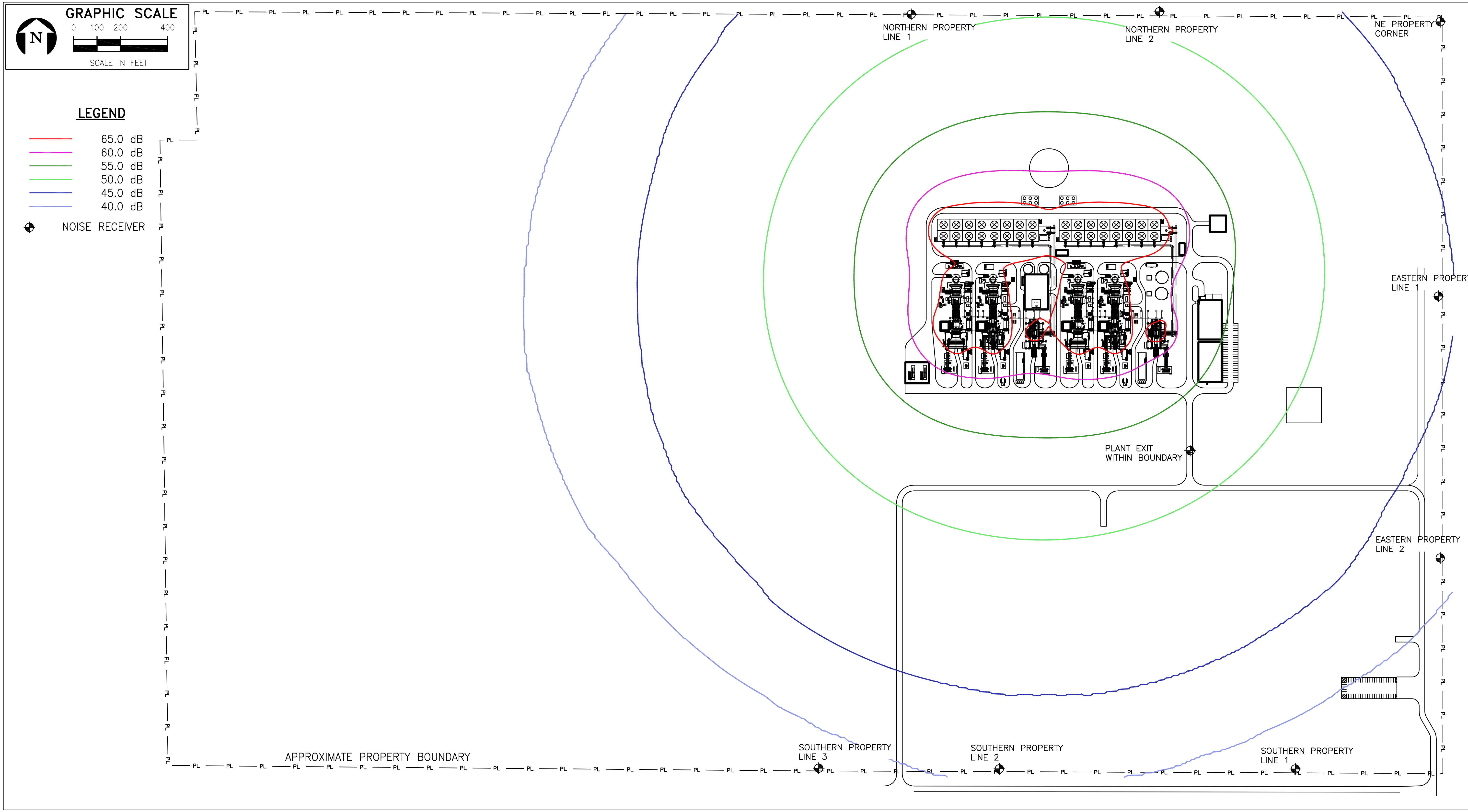

FIGURE 6.7.2-2.

RECEPTOR LOCATIONS AND MODELING RESULTS

Sources: Burns & McDonnell Engineering Company, Inc., 2014; ECT, 2014.

DUKE ENERGY FLORIDA

Table 6.7.3-1. Results of Noise Modeling Analysis—CCC Project Sources Only

Noise Receiver Location	Sound Pressure Level (dBA)
Citrus County sound level limit*	75
Property line noise receivers	
Northeast property corner	41.1
Northern property line 1	48.7
Northern property line 2	48.9
Eastern property line 1	45.3
Eastern property line 2	41.1
Southern property line 1	24.5
Southern property line 2	41.6
Southern property line 3	35.2
Plant entrance within property line	51.7

*Sound level limits are based on receiving land use district of industrial or manufacturing business.

Source: ECT, 2014.

Noise emanating from the CCC Project will be consistent and will not include fluctuations that are typically attributed to intermittent noise sources. The only intermittent noise sources at CCC Project will be the two emergency diesel generators and the emergency diesel firewater pump. Other than for testing and maintenance purposes, these sources will not be in operation when the CTGs and HRSGs are in operation. The Citrus County Code exempts the emergency and routine maintenance of public service utilities from its noise standards. Therefore, the CCC Project will also meet the noise standard for maximum allowable instantaneous sound levels.

It should be noted that the predicted noise levels from this quantitative noise analysis presented in Table 6.7.3-1 does not include the ambient background noise levels presented in Section 3.1.1. The ambient noise levels measured along the eastern property boundary adjacent to the power block were approximately 48 dBA during daytime hours and 42 dBA during nighttime hours. Adding the measured ambient noise levels to the predicted noise levels from the CCC Project operations would result in a maximum daytime noise level of 52 dBA and a maximum nighttime noise level of 50 dBA. These predicted noise levels are still well below the sound level limits specified in the Citrus County ordinance.

This noise modeling analysis demonstrates that the operation of the CCC Project will meet the applicable sound level limits in the Citrus County Code and will not adversely affect ambient noise levels.

6.8 Changes in Nonaquatic Species Populations

The CCC Project operational impacts on wildlife potentially include direct impacts (mortality) and indirect impacts (noise, human presence, air emissions, increased water use, etc.). As stated previously, no significant impacts to on-Site or local/regional populations of wildlife are expected from air emissions or cooling system operation. Additional vehicular traffic on the Site may result in some minor mortality from road kills of less motile organisms such as reptiles, amphibians, or small mammals. These are expected to be minor and possibly not noticeably increased from those impacts already occurring from existing vehicular traffic on and around the CCC Site.

Human presence and noise associated with operating a power plant are impacts already present near the Site from existing CREC operations. Current wildlife usage of the Site reflects those species already accustomed to these activities. It is anticipated that the relative minor increases in noise or human presence will not significantly affect wildlife usage of the Site.

6.9 Transportation and Other Plant Operation Effects

The CCC Project operations will result in the employment of approximately 50 (and up to 75) fulltime employees. The peak CREC employment did not result in adverse impacts to the transportation network. Operation of the CCC Project is, therefore, likewise not anticipated to adversely impact the transportation network.

During the operation of the Project, consumables will be delivered to the Site, creating minimal additional traffic on the existing transportation network. Consumable materials to be delivered include acid and caustic materials, boiler chemicals, lime, lubrication oils and greases, and miscellaneous gases. It is anticipated that all of these and other miscellaneous deliveries will not exceed 10 trips per day. These additional trips will not lower the functional capacity of roadways to an unacceptable LOS or significantly impact a.m. or p.m. peak hour traffic volumes based on the existing traffic volumes and the excess capacities of the surrounding roadway network.

Two factors should minimize such potential degradation of paved surface (e.g., potholes) of the roadways nearest the Site. First, if necessary during operations, heavy power plant components will be primarily delivered via rail or barge. Second, access improvements were constructed during the initial development of CREC to facilitate construction worker and machinery access to the Site. Those improvements will similarly facilitate CCC operation. These two factors will minimize roadway degradation impacts, especially at the Project entrances. DEF will repair and maintain these entrances as necessary.

6.10 Archaeological Sites

Based on the results of the cultural resources assessment conducted in May 2014 (see Appendix 10.7.1), no significant archaeological sites are expected to be found on the CCC Site. Therefore, no on-Site, postconstruction monitoring is planned or required for the Project. As previously described in Section 5.9, if encountered, DEF will notify the Florida Division of Historical Resources and consult with them to determine appropriate action.

6.11 Resources Committed

The major irreversible and irretrievable commitments of state and local resources due to the operation of the CCC Project include:

- Use of land.
- Loss of wetlands.
- Consumptive use of water.
- Consumption of air quality increments.

The proposed use of land (i.e., approximately 400 acres) for the Project, while irreversible, will have a minimal impact to Citrus County. The use of the Site is consistent with the adjacent, existing CREC power plant usage. Also, the entirety of the Site is currently permitted for limestone mining. The proposed CCC Project, concentrated in the eastern half of the property, will have significantly less impact on the land resources. Further, any impact to Citrus County will be offset by the Project’s benefits in terms of job opportunities, local business expenditures, and tax revenues.

Only 44.9 acres of the 400-acre Site (approximately 11.2 percent) include wetlands. The construction of the Project, in turn, will impact only approximately 7.4 acres (16 percent) of those wetlands. Most of the impacted wetlands are relatively small and isolated and have relatively low functional habitat values. Other lands in the general vicinity of the Site have extensive areas of high-quality wetlands and other ecological resources. All wetland impacts will be fully mitigated through the purchase of credits from a permitted mitigation bank.

The Project will use seawater for cooling and groundwater for plant service and potable water uses. In the cooling process, some seawater is lost through evaporation, but this loss is insignificant compared to the volume of the water source. The Project will be designed to minimize the consumptive use of groundwater and recycle water to the extent feasible. Also, as discussed in Sections 4.5 and 6.3, the Project will not require an increase in the existing water use allocation for CREC.

Air quality increments will be consumed by air pollutant emissions from the Project. However, with the retirement of CREC Units 1 and 2, the increments used by the Project will be less than existing conditions. Therefore, the use of these increments will create no impediment to additional growth in the area and will have no significant impacts on air quality in the area.

Overall, the commitment of these resources will be more than offset by the higher efficiency of the Project in providing reliable, cost-effective electricity to DEF’s customers.