6.0 EFFECTS OF PLANT OPERATION

This chapter provides descriptions of the potential impacts of the operation of the Polk 2-5 Conversion Project on the physical, natural, and socioeconomic environment on and in the vicinity of the Site. To the extent practicable, the potential impacts of the operations 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 Polk 2-5 Conversion Project will comply with all applicable regulations and standards and 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

As discussed in Section 4.5.1, the cooling requirements for the proposed Polk 2-5 Conversion Project, as well as for the existing Unit 1, involve the dissipation of heat from the steam condensers, air separation unit, and other plant auxiliary equipment. Currently, cooling for Unit 1 is accomplished through use of the cooling reservoir. With the Polk 2-5 Conversion Project, a new mechanical draft cooling tower will be used for heat dissipation for the air separation unit for Unit 1 and the auxiliary equipment for Unit 1 and the new CC unit, and the cooling reservoir will be used for condenser cooling for both units. The existing auxiliary cooling system for Unit 1 will be modified to remove all auxiliary cooling loads from the cooling reservoir and place the loads on the new cooling tower.

As part of the conceptual design efforts for the Project, a thermal modeling study of the cooling reservoir was conducted by AECOM (2012). The results of the study determined that the existing cooling reservoir had insufficient heat dissipation capacity to reject the existing heat loads for Unit 1 and the new loads from the Project without adversely affecting the existing plant operations and/or having excessive numbers of exceedances of the thermal criteria for discharges from the reservoir. Tampa Electric evaluated several alternatives to provide the required heat dissipation needs, including a stand-alone cooling tower to meet cooling needs from the proposed Polk 2-5 Conversion Project and a helper cooling tower to remove heat from the reservoir. The proposed new mechanical draft cooling tower to handle auxiliary heat loads was determined to be the preferred option. The cooling tower will be designed as small as possible to reduce consumptive use of water, and makeup water for the tower will primarily be provided from treated, reclaimed water from the City of Lakeland. Blowdown from the cooling tower will be discharged to the cooling reservoir along with the condenser cooling circulating water.

Based on the proposed cooling system design, CWA Section 316 demonstrations are not required for the existing PPS operations or for the proposed Project.

6.1.1 TEMPERATURE EFFECTS

As shown in Figure 4.5.1-1, the cooling reservoir will be used to dissipate approximately 3,450 MMBtu/hr of heat loads from the condenser cooling systems for both Polk Unit 1 and the Polk 2-5 Conversion Project under the maximum daily conditions. The cooling tower will be used to dissipate approximately 518 MMBtu/hr of heat from the plant auxiliary equipment for the units. The cooling system will have the capacity to reject 2,686 MMBtu/hr of thermal energy on an annual average basis.

To manage water quality in the reservoir, a blowdown discharge is needed to avoid a buildup in dissolved solids. Currently, the blowdown is discharged through Outfall D-001, which discharges to an unnamed lake and ultimately to the Little Payne Creek drainage system on the east side of the Site. The average discharge rate at Outfall D-001 is approximately 2 MGD. Depending on weather and plant operating conditions, the monthly average discharge may range from 0 to 5 MGD.

To assess the thermal impacts of thermal discharge at Outfall D-001, AECOM (2012) conducted thermal modeling of the reservoir with the addition of the Polk 2-5 Conversion Project and the proposed heat dissipation systems design. AECOM used historical meteorological data with the proposed heat load to the cooling reservoir. The projected monthly average and monthly maximum temperatures at Outfall D-001 and monthly average delta temperature (ΔT) difference between Outfall D-001 and ambient water temperatures under the full load condition are presented as follows:

	Monthly Temperature (°F)		
Month	Average D-001	Maximum D-001	Average ΔT*
January	68.9	76.0	3.5
February	74.2	79.6	4.4
March	76.3	80.5	3.2
April	77.4	83.5	3.2
May	84.2	88.6	2.7
June	89.6	91.5	2.8
July	91.1	93.4	2.9
August	89.5	92.2	3.2
September	85.4	92.0	2.8
October	84.5	89.2	3.3
November	77.9	81.1	2.5
December	70.1	79.7	4.0
Annual average	80.8	85.6	3.2

*Outfall D-001 temperature minus ambient water temperature.

Source: AECOM, 2012.

The thermal modeling results indicate that the projected maximum water temperature at Outfall D-001 is 93.4°F in July. The highest monthly average temperature at Outfall D-001 is 91.1°F, which is lower than the NPDES permit (No. FL0043869) limit of 92.0°F (monthly average). Thus, the discharge water temperature at Outfall D-001 will comply with the NPDES permit limit after completion of the proposed Polk 2-5 Conversion Project.

According to the NPDES permit, the ambient water temperature is represented by the water temperature measured at an old mine cut (Sampling Point SWA-1). This old mine cut, however, is a relatively small body of water, and its temperature can change rapidly with changes in weather conditions (i.e., wind velocity and direction, rainfall, etc.). Such rapid changes in ambient temperatures can result in superficially high ΔT on a daily basis during cold snaps in the winter. Therefore, Tampa Electric is proposing to use a monthly average ΔT of 4.7°F as the NPDES permit limit instead of the daily maximum value of 4.7°F specified in the current permit. Tampa Electric will monitor water temperatures at Outfall D-001 and SWA-1 continuously and compute the 30-day running average of Outfall D-001 and ΔT. This permit limit change will allow Tampa Electric to more effectively manage and control the ΔT between the outfall discharges and the old mine cut.

For example, Tampa Electric will be able to close off a control valve and stop Outfall D-001 flow whenever the 30-day running average temperature of D-001 or the 30-day running average of the ΔT is approaching exceedances of the permit limit.

The thermal modeling results show that the ΔT will exceed the water quality standard of 3°F above ambient water temperature. The existing NPDES permit allows a thermal mixing zone for ΔT. As indicated in the NPDES permit, the ΔT mixing zone is a 380-ft radius semicircle centered at the point of entry into the unnamed reclaimed lake when the ΔT at the point of discharge is 4.7°F.

The size of the unnamed reclaimed lake is 79 acres. The projected average size of the thermal mixing zone is 5.2 acres (21,073 square meters [m^2]), which is 6.6 percent of the surface area of the receiving water (unnamed lake). Therefore, the projected average thermal mixing zone is less than the 125,600 m^2 allowed by the mixing zone requirement (Rule 62-4.244[1][g], F.A.C.) and is also less than the mixing zone requirement of 10 percent of the receiving lake area (Rule 62-4.244[1][i]2, F.A.C.)

6.1.2 EFFECTS ON AQUATIC LIFE

As described in Section 6.1.1, the projected maximum temperature at Outfall D-001 is 93.4°F, and the highest monthly average temperature at Outfall D-001 is 91.1°F, which is less than the existing permit limit of 92°F for the monthly average temperature. The projected maximum monthly average ΔT is 4.4°F. Based on the permit limit for ΔT of 4.7°F, the size of the average mixing zone is a semicircle with a 380-ft radius and is only 6.6 percent of the unnamed reclaimed lake. The thermal mixing will not occupy the entire width of the unnamed lake and will allow fish passage.

The makeup water for the reservoir will be groundwater and treated reclaimed water from Lakeland. There will be no intake structure in surface waters, and there will be no entrainment or impingement impacts. The intake and discharge within the cooling reservoir are part of the cooling system and are not subject to CWA 316(a) and (b) demonstration considerations.

6.1.3 BIOLOGICAL EFFECTS OF MODIFIED CIRCULATION

No water intake structures will be placed in natural drainages located on or off the Project Site. Discharges from the cooling reservoir will enter the reclaimed lake on the eastern side of the property and eventually enter Little Payne Creek. As previously discussed, a mixing zone of less than 380 ft from the point of discharge at the northwestern corner of the reclaimed lake and the retention time in the lake will limit thermal impacts. The unnamed reclaimed lake is approximately 79 acres, and the average depth of the lake is 15 ft. The average flow retention time of this lake is approximately 103 days. By the time the reservoir discharge exits the unnamed reclaimed lake, no measurable residual heat will be expected at the southern end of the lake. When waters are discharged to Little Payne Creek, no temperature impacts to aquatic organisms are anticipated.

Cooling reservoir blowdown will be discharged at an average rate of approximately 2.0 MGD. The 755-acre cooling reservoir has significant stormwater attenuation effect. The large reservoir will detain the stormwater runoff and allows gradual release of stormwater. The peak flood levels in the receiving water will be reduced in exchange for a more constant flow throughout the year. This benefit will serve to maintain aquatic habitats year-round, thereby maintaining use of the system by aquatic organisms.

The source water for makeup to the cooling reservoir will primarily be treated reclaimed water from the City of Lakeland. The use of the Lakeland reclaimed water will provide significant benefits to water resources in the Tampa Bay region. Nutrient loading in the receiving waters and Tampa Bay has been an ongoing concern with water quality and biological conditions in these water bodies. Use of the reclaimed water for the proposed PPS operations will reduce these discharges and associated nutrient loadings to Tampa Bay and assist in improving water quality and biological conditions.

6.1.4 EFFECTS OF OFFSTREAM 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 Project will include one six-cell mechanical draft cooling tower equipped with high-efficiency drift eliminators. The cooling tower will be located just west of the existing Units 4 and 5 approximately 4,500 ft (0.85 mile) from the nearest major highway (SR 37).

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. The Project cooling tower high-efficiency drift eliminators will result in estimated cooling tower PM, PM_{10}, and $PM_{2.5}$ emissions of 0.35, 0.31, and 0.0021 tpy, respectively.

6.1.4.1 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.

The Project mechanical draft cooling tower will consist of six cells, each having a diameter of 31.5 ft. The cooling tower will be arranged in an east-west orientation and will have a deck height of 37 ft above grade. The height to the top of the outlet stacks will be 51 ft above grade. Air flow exiting the cooling tower will be approximately 19,750 cfs per cell. Water droplet drift from the cooling tower will be minimized by drift eliminators having a drift loss rate of only 0.0005 percent.

Due to the generally moderate temperatures that occur in Central Florida and the significant distance to the nearest major highway, the Project cooling tower will not cause any adverse impacts with respect to fogging/icing on SR 37 or any other offsite location.

6.1.4.2 Deposition Analysis

The amount of salt deposition is directly related to the TDS concentration found in the cooling tower recirculation water. The Project cooling tower recirculation water will have a relatively low TDS concentration of 514 parts per million by weight (ppmw) due to the use of treated reclaimed water. As noted previously, Project cooling tower estimated PM, PM_{10}, and $PM_{2.5}$ emissions are 0.35, 0.31, and 0.0021 tpy, respectively.

Direct salt damage to vegetation is due to the absorption of salt from drift that is deposited on a plant's leaves. Another mechanism for the impact of saline drift on plants is through the absorption of salt accumulation in the soil. Accumulation will occur as the annual deposition of salt exceeds the rate at which salt is washed from the soil by rainfall. The absorbed salt can cause immediate damage or accumulate in the woody tissue of perennial plants until it reaches toxic levels. Due to the low cooling tower PM emissions rates, salt deposition due to the Project cooling tower will have no adverse effect on offsite natural vegetation or soils in the vicinity of PPS.

6.1.5 MEASUREMENT PROGRAMS

Current PPS operations are governed by NPDES permit No. FL0043869. The permit requires monitoring at discharge locations D-001 and D-002, as well as internal Outfalls I-003 and I-004. Water temperature monitoring is also required at Sampling Point SWA-1. Monitoring requirements issued with the permit modification for the proposed Project will be implemented and will continue through the required monitoring period identified in the permit.

6.2 EFFECTS OF CHEMICAL AND BIOCIDE DISCHARGES

6.2.1 INDUSTRIAL WASTEWATER DISCHARGES

Table 6.2.1-1 presents the water quality of the source water and the projected water quality of the key wastewater streams. These streams include:

- Raw water supply from onsite wells.
- Treated reclaimed water used for cooling tower and cooling reservoir makeup water.
- Blowdown from the cooling tower.
- Unit 1 process blowdown wastewater.
- Cooling reservoir water discharged through Outfall D-001.

Table 6.2.1-1. Water Quality of Source Water and Projected Water Quality of Key Process Water Streams into and Discharges from Cooling Reservoir

Parameter	Unit	Raw Water from Onsite Wells*	Projected Treated Reclaimed Water†	Projected Cooling Tower Blowdown to Cooling Reservoir	Cooling Reservoir Water Analysis 03/14/12	Unit 1 Process Blowdown to Cooling Reservoir‡	Projected Cooling Reservoir Discharge at Outfall D-001	Drinking Water Standards per Chapter 62-520, F.A.C. Primary	Drinking Water Standards per Chapter 62-520, F.A.C. Secondary	Class III Surface Water Criteria per Chapter 62-302, F.A.C.§
Aluminum	mg/L	0.01	5.13E-06	0.002	0.286	0.499	0.038		0.2	
Antimony	mg/L	0.0004	***9.23E-06***	0.0001	0.00176	0.006	0.0008	0.006		<4.3
Arsenic	mg/L	0.0006	9.15E-06	0.0002	0.00687	0.22	0.0126	0.01		<0.05
Barium	mg/L	0.027	8.65E-05	0.005	0.0125	0.347	0.047	2		
Beryllium	mg/L	0.000072	***2.05E-06***	0	0.00004	0.00004	0.00008	0.004		<0.00013
Boron	mg/L	0.018	0.71	3.32	2.18	1.37	1.74			
Cadmium	mg/L	0.000097	***8.21E-07***	0	0.0001	0.001	0.00016	0.005		0.0005
Calcium	mg/L	52	4.28	29.5	77.2	67.7	68			
Chromium, total	mg/L	0.00042	0.00017	0.0009	0.00765	0.01	0.001	0.1		
Copper	mg/L	0.0011	***7.67E-05***	0.0006	0.00142	0.044	0.0037		1	0.021
Iron	mg/L	0.13	0.04	0.21	0.0283	0.76	0.27		0.3	<1.0
Lead	mg/L	0.00019	***3.28E-07***	0.0001	0.000202	0.0008	0.0002	0.015		0.011
Magnesium	mg/L	17	1.38	9.5	40	29.2	22.4			
Manganese	mg/L	0.0026	0.00135	0.0068	0.00361	1.55	0.09		0.05	
Mercury	mg/L	2.0E-07	***2.56E-06***	0	0.00005	9.27E-06	6.63E-06	0.002		0.000012
Molybdenum	mg/L	0.001	0.00005	0.0004	0.0109	0.01	0.0014			
Nickel	mg/L	0.00021	0.00019	0.0009	0.0212	0.0247	0.002	0.1		0.118
Potassium	mg/L	0.8	7.28	34	2.92	1.32	18			
Selenium	mg/L	0.0004	1.05E-05	0.0001	0.00347	0.005	0.0007	0.05		<0.005
Silver	mg/L	0.00009	***5.13E-07***	0	0.00002	0.0002	0.0001		0.1	<0.00007
Sodium	mg/L	9.47	32.31	152.1	98.7	9.2	84.9	160		
Strontium	mg/L	0.002	0.018	0.085	2.43	0.05	0.047			
Thallium	mg/L	0.0005	3.72E-06	0.0001	0.000126	0.001	0.0006	0.002		<0.0063
Vanadium	mg/L	0.0025	5.13E-05	0.0007	0.0119	0.04	0.005			
Zinc	mg/L	0.0037	4.67E-04	0.0029	0.01	0.1	0.01		5	0.271
Chloride	mg/L	10	62.62	293.2	125	29	156.5		250	
Sulfate	mg/L	65	4.44	32.6	229	46	80.3		250	
Nitrate	mg/L	0.1	0.02	0.1	0.01	2.51	0.28	10		
Ammonia-nitrogen	mg/L	0.21	—	—	0.01	—	—			
Silica	mg/L	7.5	0.6	4	2.53	1.3	7.9			
TDS	mg/L	306	107	552	626	123	650		500	
Conductivity	µmhos/cm	423	187	947	1040	205	999			
Total M-alkalinity	mg/L	160	2	41	177	0.1	172			>20
Total hardness	ppm as $CaCO_3$	200	13.3	99	358	289	262			
pH	s.u.	7.0 to 7.7	4.0 to 5.0	7.0 to 9.0	6 to 9	7.0 to 9.0	7.0 to 9.0			
TSS	mg/L	—	0	<0.1	8	1	<1			
Temperature	°F	75	40 to 90	85 to 95	65 to 93	65 to 93	85 to 94			

Note: — = not modeled. µmhos/cm = micromhos per centimeter. mg/L = milligram per liter. s.u. = standard unit. ***Bold italics*** indicates minimum detection limit.
°F = degree Fahrenheit. $CaCO_3$ = calcium carbonate. ppm = part per million. TSS = total suspended solid.

*Well water analysis taken from SCA Table 4.5-3.
†Treated reclaimed water projected RO permeate calculated from known AECOM schematic recovery rates.
‡Heavy metals (except mercury) provided by August 28, 2012, sampling data. All remaining constituents from weighted average of blended Unit 1 process streams.
§Class III surface water criteria for cadmium, copper, lead, nickel, and zinc are calculated based on the projected hardness value of 262 mg/L at Outfall D-001.

Sources: Black & Veatch, 2012.
ECT, 2012.

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In addition to the chemical characteristics of each stream, Table 6.2.1-1 presents the applicable Class III water quality criteria for comparison. Of note, the quality of the cooling reservoir water discharged to Outfall D-001 reflects expected conditions based on long-term operations of the power plant facilities. According to the projected water quality at D-001, the cooling reservoir discharge will comply with Class III water quality standards.

6.2.2 COOLING TOWER BLOWDOWN

The cooling tower blowdown after three to five cycles of concentration is expected to have an average flow of 0.2 MGD. Table 6.2.1-1 presents the water quality characteristics of the cooling tower blowdown. The blowdown will be discharged into the cooling reservoir. As shown in Table 6.2.1-1, the water quality of the blowdown is projected to comply with the applicable Class III water quality standards. Therefore, no impacts of the blowdown on surface water bodies are expected.

6.2.3 MEASUREMENT PROGRAMS

Current operations are governed by NPDES permit No. FL0043869, which requires monitoring at discharge locations D-001 and D-002, as well as internal Outfalls I-003 and I-004 (see Figure 4.5.1-3). Monitoring requirements issued with that permit will be implemented and will continue through the required monitoring period identified in the modified permit.

6.3 IMPACTS ON WATER SUPPLIES

6.3.1 SURFACE WATER

No surface waters will be used as source water for process water or for cooling water. Treated reclaimed water will be used as makeup for the cooling systems. Stormwater from some areas of the plant site will be routed to the cooling reservoir, but use of this runoff water is not expected to have a noticeable impact on surface waters (see Section 5.2.1).

6.3.2 GROUNDWATER

6.3.2.1 Consumptive Use Impacts

The addition of the proposed Polk 2-5 Conversion Project will require additional water supply at the PPS Site for cooling and plant process water uses. The proposed Project will be integrated into the existing PPS operations and designed to minimize the use of water and maximize the recycling/reuse of water. The plant water supply needs, along with the SCA COC limitations pertaining to groundwater withdrawals, were previously discussed and thoroughly described in Section 4.5. Additionally, Figures 4.5.0-1 and 4.5.0-2 illustrate the proposed water balances for the plant following the Polk 2-5 Conversion Project. Following addition of the Polk 2-5 Conversion Project, the total water supply requirements for PPS will be approximately 7.6 MGD on an annual average basis and approximately 10.4 MGD on a peak month daily basis.

The water supply requirements for PPS will be satisfied by using a combination of treated reclaimed water and groundwater from the four existing onsite wells completed into the Floridan aquifer. To minimize its use of groundwater, Tampa Electric will treat and reuse approximately 4.7 MGD of treated reclaimed water from the City of Lakeland. The treated reclaimed water will primarily be used to supply the makeup water needs of the new cooling tower, a significant portion of the makeup water needs of the cooling reservoir, and a small portion of PPS's process water needs. Other aspects of Tampa Electric's proposed water use plan for the proposed Project include the reuse and recycling of certain treated wastewaters and stormwater and cooling tower blowdown for cooling reservoir makeup water to minimize the use of groundwater. Therefore, consistent with the 1992 SCA COCs, Tampa Electric has undertaken numerous groundwater conservation planning and design actions to minimize groundwater withdrawals on a routine basis for the facility following the addition of the Polk 2-5 Conversion Project.

It is anticipated that the normal total groundwater withdrawals for PPS with the proposed Polk 2-5 Conversion Project will be approximately 2.9 MGD on an annual average basis and approximately 5.7 MGD on a peak month daily basis. As described in Section 4.5, and although these amounts are less than the authorized groundwater withdrawal amounts of 4.3 MGD on an annual average basis and 7.6 MGD on a peak month daily basis for PPS buildout under COC XXVI.A.27, Tampa Electric is requesting these authorized amounts apply to the facility following the Polk 2-5 Conversion Project. As will be discussed in more detail in the following paragraphs, these withdrawal amounts were previously determined by SWFWMD to cause no adverse impacts, plus they provide Tampa Electric operational flexibility to reliably and safely operate the power plant and associated cooling reservoir and cooling tower at PPS during unanticipated events or emergencies and in unusual weather conditions, such as extended periods of extremely dry weather.

The currently authorized 4.3-MGD annual average withdrawal amount is approximately 2.1 MGD or approximately 33 percent less than the 6.4 MGD previously, conditionally authorized for full buildout and will result in less drawdown (i.e., actually groundwater level recovery) when compared to the impact evaluations for the original SCA for PPS.

For the original SCA evaluations, a steady-state leaky confined aquifer analytical method was used to verify the numerical groundwater modeling results and confirm the level of anticipated impacts following completion of the aquifer performance test as required by COC XXVI.A.22. This same analytical method is used here to estimate the amount of groundwater level recovery anticipated to occur from the proposed reduction in the groundwater withdrawal for the full buildout of PPS (6.4 – 4.3 = 2.1-MGD reduction). As shown in Table 6.3.2-1, the results of this analysis indicated that, near the withdrawal point, a recovery of slightly more than 1 ft could be anticipated. The amount of groundwater level recovery expected at a distance of approximately 3 miles away is slightly less than 0.2 ft. The data summarized in Table 6.3.2-1 are also graphically illustrated in Figure 6.3.2-1. The required supporting information for a water use authorization was previously provided in the 1992 SCA as updated by submittal of the current SCA.

As discussed in Section 4.5, the use of treated reclaimed water for cooling reservoir and cooling tower makeup requires Tampa Electric to request an emergency standby allocation of groundwater use to ensure the reliable and safe operations of PPS. In the event of an extended interruption in the availability of reclaimed water from the City of Lakeland, groundwater from the existing onsite wells will be required on a standby/emergency backup basis to supply the cooling reservoir and/or cooling tower makeup needs to avoid a disruption of plant operations and electrical power supply. It is anticipated that any interruptions in the availability of reclaimed water from the City of Lakeland would be relatively short in duration. Under such short interruptions in the reclaimed water, Tampa Electric may need to provide some groundwater makeup to the cooling reservoir and/or cooling tower to maintain suitable operational conditions. Tampa Electric anticipates that these short groundwater use needs can be provided within the authorized groundwater withdrawal amounts. However, in the event of the unavailability of reclaimed water for longer periods, the proposed Polk 2-5 Conversion Project and existing Unit 1 operations would require on an emergency/standby basis up to approximately 7.6 MGD on an annual average basis and up to approximately 10.4 MGD on a maximum daily basis to supply the total water use needs at PPS.

Table 6.3.2-1. Summary of Predicted Recovery in the Upper Floridan Aquifer with 4.3- Versus 6.4-MGD Withdrawal

Distance (miles)	Recovery in Groundwater Level (ft)
0.01	1.16
0.06	0.84
0.13	0.72
0.25	0.60
0.50	0.48
0.75	0.41
1.0	0.36
1.5	0.29
2.0	0.24
2.5	0.21
3.0	0.18
3.5	0.16
4.0	0.14
4.5	0.12
5.0	0.11
8	0.06
10	0.04
13	0.02
15	0.02
20	0.01

Source: ECT, 2012.

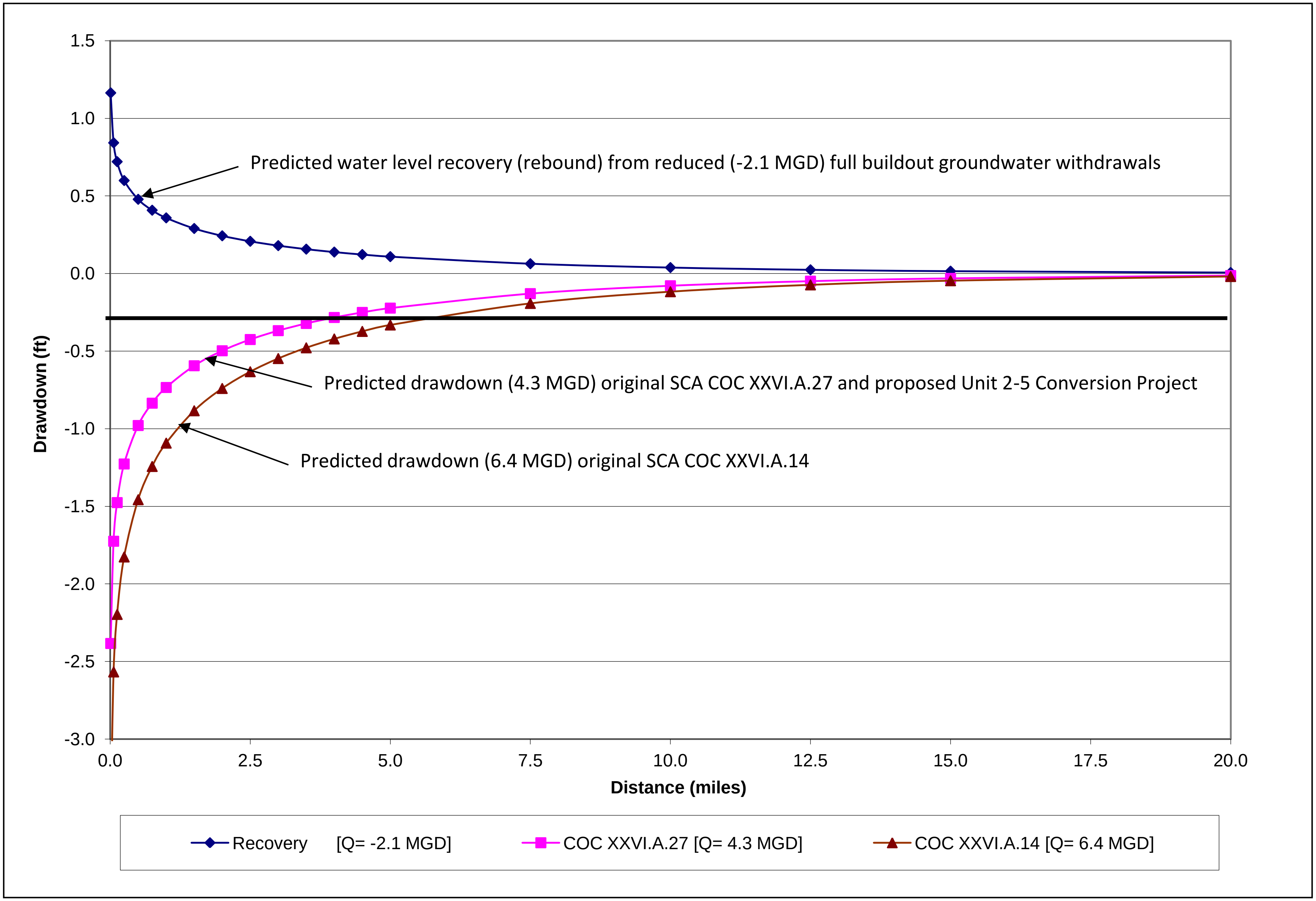

FIGURE 6.3.2-1.

PREDICTED DRAWDOWN—UPPER FLORIDAN AQUIFER

Source: ECT, 2012.

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TAMPA ELECTRIC

During the initial phase of construction for Unit 1, four production wells were drilled onsite to accommodate the future build-out of the power plant. Two 10-inch inside diameter wells, each providing yields of 230 to 290 gpm, plus two 24-inch outside diameter wells were installed with yields ranging from approximately 1,750 to 2,900 gpm. All four of these wells are cased to approximately 300 ft bls and completed with an open hole to depths of approximately 900 ft bls. The 24-inch wells will be capable of obtaining substantially higher yields and, with assistance of the two 10-inch wells, achieve the required facility groundwater production inclusive of the Polk 2-5 Conversion Project. If one of the large wells requires unscheduled well maintenance or is temporarily lost, the makeup into the reservoir will be temporarily stopped. Thus, at this time, it is not anticipated that additional production wells will be necessary for backup or standby water supply purposes.

6.3.2.2 Potential Surficial Aquifer Impacts

The surficial aquifer in the Site area is not used as a drinking water source. However, the two primary potential sources of impacts to the surficial aquifer during plant operation are infiltration from stormwater and seepage from the reservoir to the surficial aquifer. Potential impacts from stormwater infiltration will be mitigated through implementation of an approved stormwater management plan.

A GWMP for the facility was previously developed and implemented in accordance with applicable FDEP regulatory requirements under COCs A.XXVII.B.14 and B.I.C.1. Data obtained from the existing GWMP indicate that the background monitoring well for the surficial aquifer routinely exhibits exceedances of applicable drinking water quality criteria for pH (too low), aluminum, iron, thallium, and vanadium (SCS, 2001). These conclusions are also substantiated by review of the data summarized in Table 3.3.2-3. In addition to the parameters listed previously, the data in this table also indicate that manganese is frequently detected above its regulatory criteria. However, it is also common knowledge that it is not unusual for the surficial aquifer in the west-central portion of Florida to have naturally occurring and elevated concentrations of aluminum, iron, and manganese, as well as other inorganic constituents.

In addition to existing concentrations of parameters in the groundwater and potential infiltration from stormwater, the surficial aquifer will receive exfiltration (seepage) from the cooling reservoir. The reservoir will receive infiltration when the reservoir level is lower than the groundwater level and will seep (exfiltrate) to the surficial aquifer when the reservoir level is higher than the groundwater level. A detailed analysis of this process was completed for the initial PPS SCA, and the construction and operation of the Polk 2-5 Conversion Project should not appreciably change the infiltration/exfiltration characteristics of the reservoir.

With the addition of the Polk 2-5 Conversion Project plus the two UIC wells for wastewater disposal, the water quality of the cooling reservoir will change and actually improve; therefore, the water quality of the seepage to the surficial aquifer will also improve. Additionally, to reduce the need for groundwater withdrawals from the Upper Floridan aquifer, Tampa Electric is proposing to use treated reclaimed water from the City of Lakeland as part of its makeup water for the cooling reservoir. Table 6.2.1-1 presents the projected long-term, steady-state cooling reservoir water quality at Outfall D-001 using treated reclaimed wastewater as makeup compared to the primary and secondary drinking water standards. Data in Table 6.2.1-1 indicate that the projected cooling reservoir water quality will meet applicable primary drinking water standards except for arsenic, which only slightly exceeds the standard.

As shown in Table 6.2.1-1, the projected cooling reservoir water quality will also meet applicable secondary drinking water standards except for TDS. The surficial aquifer is not used as a source of drinking water on or in the immediate vicinity of the Site; therefore, no adverse impacts are expected due to the potential exceedances of the primary and secondary standards.

6.3.2.3 Underground Injection Impacts

As previously discussed in Section 4.5.1.5, for the reclaimed water treatment project at the PPS facility, the grey water blowdown from the gasification process and the RO reject water from the process water and reclaimed water treatment systems will be disposed using underground injection wells. Figure 4.5.1-5 shows the proposed onsite injection well locations. Figures 4.5.1-6 and 4.5.1-7 provide construction details for the proposed exploratory well that will eventually be completed as one of two injection wells, plus the associated conceptual details for the dual zone monitoring well.

As illustrated in these figures, the targeted injection zone is the lower unit of the Cedar Keys Formation, Lawson limestone, and Pine Key Formation. Due to their depths (i.e., 4,200 to 8,000 ft bls), limited data are available for these units, but data associated with the KC Industry UIC well in Mulberry, Florida (10 miles north of the Site), plus the drilling of two onsite injections wells were obtained and reviewed.

Limited pressure information is available for the proposed injection zone. Only a single injection well, the Class I KC Industries UIC Well, is completed into the proposed injection interval in Central Florida. This well has injection pressures on the order of 150 pounds per square inch (psi) at the wellhead, with static pressures of approximately 60 psi when injection is not occurring. At an average flowrate of 300 gpm, a specific injectivity index of approximately 3.3 gallons per minute per pound per square inch (gpm/psi) has been observed. Review of the specific injectivity on the KC Industries well showed values of approximately 1 gpm/psi during early operation of the well, increasing to between 2 to 3 a gpm/psi during more recent years.

In June 2011, Tampa Electric's UIC drilling and oversight contractors, Layne and MWH, performed a pressure test of the casing installed at IW-1. The pressure test was successfully completed at 596 psi, which, according to FDEP UIC Class I regulations, would allow the well to operate at maximum pressure of 397 psi (two-thirds of the pressure of the successful pressure test). Furthermore, in February 2012, these same contractors performed an injectivity testing program on IW-1. The results of these injectivity tests provided an average transmissivity value of approximately 570 ft^2/day for the injection interval. Extrapolating these data for a 30-year operational period, MWH concluded that IW-1 should be able to inject up to 800 gpm with a wellhead pressure of 387 psi, below the current acceptable threshold.

Also, ECT had contracted with the University of South Florida (USF) to perform some geochemical modeling of the injection wells at PPS to confirm that the injectate and its reactions within the injection interval would not result in excessive precipitation or plugging of the formation porosity. The USF modeling also provided information related to the change in formation pressure that may result from the planning injection program. It should be noted that change in formation pressure is related to but not the same as wellhead pressure, which may be affected by other friction losses and turbulence in the well casing. Using an injection rate of roughly 0.85 MGD (approximately 590 gpm), the modeling predicted a change (increase) in formation pressure near the top of the injection interval (approximate 4,200-ft depth) of approximately 240 psi (approximately 550 ft) near the injection well and approximately 73 psi (approximately 165 ft) roughly 10 miles away. Therefore, it is believed that the proposed UIC operation at the PPS facility will create a noticeable pressure change at the KC Industries UIC well location, but it is not anticipated to significantly impact or adversely interfere with the current UIC operations at the KC Industries facility in Mulberry, Florida.

As discussed in Sections 1.2.2 and 4.5.1.5, the two injection wells on the PPS Site are being permitted separately under FDEP's UIC program; therefore, the potential impacts of the operation of these wells are not included in this PPSA proceeding.

6.3.3 DRINKING WATER

Section 6.3.2.1 included an updated evaluation of potential impacts due to the Polk 2-5 Conversion Project on the Upper Floridan aquifer, which is the primary drinking water supply source in the region of the Site. Those evaluations are based in part on the detailed groundwater flow model submitted in Appendix 10.1.7 of the 1992 SCA and the aquifer performance test report that was prepared in accordance with COC XXVI.A.22.

Considering there is a net reduction in the withdrawal amount currently being requested as compared to the amount requested in the 1992 SCA, the updated evaluations indicate less drawdown and less potential for impact than previously predicted. These data suggest that the proposed operations associated with the addition of the Polk 2-5 Conversion Project are expected to have no significant effects on the quality or quantity of a drinking water source.

Also, as described in Section 4.5.3, the existing potable water treatment system was designed to handle up to 10,500 gpd. The existing potable water needs for PPS is approximately 4,000 gpd. These potable water needs will be the same with the addition of the proposed Polk 2-5 Conversion Project, since no new employees will be required for its operation. Thus, the existing facility with minor modifications (i.e., extension of the system to cover new safety shower and eyewash stations) will be adequate to supply the drinking water needs at PPS.

Figure 3.3.3-1 provides a map of water use permits located within 5 miles of the Site. Similar to the description provided previously, due to the proposed reduction in withdrawals, the proposed Polk 2-5 Conversion Project operations are expected to have no significant effect on any existing user of groundwater.

Additionally, the existing GWMP for PPS is designed to monitor and document compliance with groundwater quality standards and includes monitoring water quality and water levels in the Upper Floridan aquifer.

With respect to operation of the proposed UIC wells, the depths of these wells are designed to target an injection interval in the Lower Cedar Keys Formation and Lawson limestone. These units are anticipated to occur a depths greater than 4,400 ft bls. The Upper Floridan aquifer extends to a depth of approximately 1,100 to 1,200 ft bls in the proximity of the Site. Thus, the vertical separation between the UIC injection zone and Upper Florida aquifer is greater than 3,000 ft. Furthermore, there are two confining units within this interval: the middle confining unit comprised of the Lake City Limestone Formation and the anhydrite confining beds within the middle unit of the Cedar Key Formation. The presence and characteristics of these confining units will be investigated as part of the testing program included within the UIC well permitting program with FDEP. Finally, as part of the UIC injection well permitting process, Tampa Electric will include a monitoring program in accordance with the applicable regulatory requirements.

6.3.4 LEACHATE AND RUNOFF

The proposed Polk 2-5 Conversion Project does not involve construction or operation of new materials/waste disposal piles or wastewater ponds. Therefore, the Project will not produce potentially contaminated leachate or runoff from such areas.

6.3.5 MEASUREMENT PROGRAMS

Tampa Electric conducts ongoing groundwater and leachate quality monitoring for the existing slag storage area. This monitoring is conducted in accordance with the approved facility GWMP in accordance with applicable requirements.

Also, Tampa Electric will implement an appropriate monitoring program in accordance with the applicable UIC program regulatory requirements for the two injection wells.

6.4 SOLID/HAZARDOUS WASTE DISPOSAL IMPACTS

6.4.1 SOLID WASTE

Section 4.7.1 describes the types of nonhazardous solid wastes and byproducts produced by the Polk 2-5 Conversion Project operations. These wastes consist primarily of increased office wastes, used air filters, and other typical plant maintenance wastes. These wastes will be appropriately collected, temporarily stored, and disposed offsite at an approved facility. No additional onsite solid waste disposal facilities will be needed for the proposed Project. Based on the design of the proposed Polk 2-5 Conversion Project facilities, potential impacts related to solid wastes are expected to be minimal.

6.4.2 HAZARDOUS WASTE

Section 4.7.2 describes the materials with potentially hazardous properties that will be generated during Polk 2-5 Conversion Project operations. The existing PPS facility is classified as a large-quantity generator under applicable RCRA regulations and is appropriately permitted for the handling and temporary storage of hazardous wastes. Similar to Unit 1, hazardous wastes generated during the proposed Project operations will be appropriately managed in accordance with applicable FDEP and EPA regulations as described in the Annex 7 Prevention Measures of Tampa Electric's current ICP. Therefore, no adverse impacts are expected from the hazardous wastes generated during proposed Project operations.

6.5 SANITARY AND OTHER WASTE DISCHARGES

Sanitary wastes will be treated in the existing septic tank and drainfield system. The existing 5,000-gpd system is capable of handling the current employment at PPS of 78 persons. There will be no additional employees as a result of the proposed Project. No modifications to the system will be needed, and no environmental impacts are expected.

Sections 4.5 and 4.6 describe in detail the other waste streams generated during plant operation. The RO reject water from the plant process water and reclaimed water treatment systems will be disposed through the deep well injection system. No impacts to surface water, aquatic biota, or the surficial Floridan aquifers are expected. Any potential impacts to the deep aquifer will be addressed within the deep well injection permitting process.

6.6 AIR QUALITY IMPACTS

6.6.1 IMPACT ASSESSMENT

6.6.1.1 Introduction

Dispersion modeling analyses were conducted to estimate potential Project air quality impacts. These analyses are described in detail in the PSD permit application provided in Appendix 10.2.5 of this SCA. This section presents a summary of the approach used and the results obtained. The results demonstrate that Project operations will not cause or contribute to an exceedance of any PSD increment or AAQS. In addition, the impacts on visibility and nitrogen and sulfur deposition in Class I areas will be insignificant. Finally, other environmental impacts, such as impacts on soils and vegetation, were found to be acceptable.

6.6.1.2 Regulatory Applicability and Overview of Impact Analyses

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. A *major stationary source* is defined as any 1 of 28 named source categories 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. The existing PPS is an existing major stationary source since it falls into one of the named source categories and has the potential to emit 100 tpy of at least one regulated pollutant.

The proposed Polk 2-5 Conversion Project constitutes a major modification to an existing major facility since the Project will have potential emissions greater than one or more of the PSD significant emissions rates listed in Rule 62-212.200(282), F.A.C. Therefore, the Project must undergo PSD review. Furthermore, more than one pollutant is subject to review. Table 6.6.1-1 summarizes the Project proposed annual emissions and compares the projected totals to the significant emissions rate thresholds for PSD review. Project annual emissions rates shown in Table 6.6.1-1 represent the Project's potential to emit per the Rule 62-210.200(252)(d), F.A.C., definition of "projected actual emissions." Since the existing simple cycle CTGs had only limited operations during the past 5 years, the Project annual emissions rates shown in Table 6.6.1-1 do not include consideration of simple cycle CTG baseline and projected actual emissions rates; i.e., the conclusions regarding PSD applicability will not change if simple cycle CTG baseline emissions rates and projected actual emissions are included in the emissions estimates.

Emissions of air pollutants that could impact air quality will result from several emissions sources once the Project becomes operational. These emissions sources include the four CC CTG/HRSG units, cooling tower, and an emergency

Table 6.6.1-1. Project Emissions Compared to PSD Significant Emissions Rates

Pollutant	Project Maximum Annual Emissions (tpy)	PSD Significant Emissions Rate (tpy)	PSD Applicability
CO	935.0	100	Yes
NO_x	744.9	40	Yes
SO_2	192.3	40	Yes
PM (filterable)	188.3	25	Yes
PM_{10} (filterable and condensable)	309.0	15	Yes
$PM_{2.5}$ (filterable and condensable)	308.6	10	Yes
Ozone (as VOC)	137.6	40	Yes
Lead	0.018	0.6	No
Total fluorides	0.61	3	No
H_2SO_4 mist	42.7	7	Yes
Hydrogen sulfide (H_2S)	Not present	10	No
Total reduced sulfur (including H_2S)	Not Present	10	No
Reduced sulfur compounds (including H_2S)	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 sulfide)	Not present	40	No
Municipal solid waste landfill emissions (measures as nonmethane organic compounds)	Not Present	50	No
Mercury	0.0032	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 $\mu g/m^3$, 24-hour average.	N/A	Any amount	No

Sources: Rule 62-210.200(282), F.A.C.
Black & Veatch, 2012.
TEC, 2012.
ECT, 2012.

generator diesel engine. The CTG/HRSG units represent the most significant source of emissions.

The stacks for the existing simple cycle CTGs will be retained to serve as bypass stacks for the HRSGs to allow for simple cycle mode operation. Operation of the CTGs in simple cycle mode is expected to be infrequent and generally confined to periods when the CC HRSGs or STG are unavailable due to maintenance or equipment malfunctions, or when peaking power is required. No changes are planned to simple cycle mode CTG operation with the exception of adding ULSD fuel oil firing capability to CTGs 4 and 5.

PSD review is used to determine whether significant air quality deterioration will result from a new or modified source. Florida PSD review requirements are contained in Chapter 212.400, F.A.C., Prevention of Significant Deterioration. Major sources may be required to undergo the following reviews related to PSD for each pollutant emitted in significant amounts:

- Control technology review.
- Air quality analysis (monitoring).
- Source impact analysis.
- Source information.
- Additional impact analyses.

The control technology review includes determination of BACT for each applicable pollutant. BACT emissions limits cannot exceed applicable emissions standards (e.g., NSPS or NESHAPs). The air quality analysis (monitoring) portion of PSD review may require preconstruction ambient air monitoring data to be collected in the impact area of the proposed source. PSD review includes thorough assessments of potential facility impacts on air quality. The source impact analysis requires demonstration of compliance with federal and state AAQS and allowable PSD increments. Projected ambient impacts on designated nonattainment areas and federally promulgated PSD Class I areas must also be addressed, if applicable. Source information, including process design parameters and control equipment information, must be submitted to the reviewing agencies. Additional analyses of the proposed source's impact on soils, vegetation, and visibility, especially pertaining to PSD Class I areas, must be performed, as well as analysis of impacts due to growth in the area associated with the proposed source. Air quality impact assessments completed for the Project are summarized in the following paragraphs.

6.6.1.3 Analytical Approach

Air Quality Models

The most recent version of the American Meteorological Society (AMS)/U.S. Environmental Protection Agency Regulatory Model Improvement Committee (AERMIC) model (AERMOD) (Version 12060—February 29, 2012), together with 5 years of preprocessed hourly meteorological data obtained from FDEP, were used in the Class II area impact analysis. AERMOD was used to obtain impact predictions for both short-term (i.e., periods equal to or less than 24 hours) and annual averaging periods.

Regulatory agency-recommended procedures for conducting air quality impact assessments are contained in EPA's Guideline on Air Quality Models (GAQM). The GAQM is codified in Appendix W of 40 CFR 51. In the November 9, 2005, Federal Register, EPA approved use of AERMOD as a GAQM Appendix A-preferred model effective December 9, 2005. AERMOD is recommended for use in a wide range of regulatory applications, including both simple and complex terrain. The AERMOD modeling system contains meteorological and terrain preprocessing programs (AERMET and AERMAP, respectively) and the AERMOD dispersion model.

Impacts with respect to the PSD Class I increments were assessed for all Class I areas within 300 km of the Project (i.e., at the Chassahowitzka National Wilderness Area [NWA] and the Everglades National Park [NP]). Assessment of air quality-related value (AQRV) impacts (i.e., sulfur and nitrogen deposition and visibility impacts) were conducted for only the Chassahowitzka NWA since application of the Federal Land Manager's Air Quality Related Values Work Group (FLAG) initial screening criteria shows that Project AQRV impacts at the Everglades NP will be negligible. The Class I impact analysis was performed using the current EPA-approved regulatory version of the CALPUFF Model (Version 5.8, Level 070623, dated June 23, 2007), a transport and puff model that advects *puffs* of material from an emissions source. These puffs undergo various dispersion and transformation simulation processes as they are advected from an emissions source to a receptor of interest. The simulation processes include wet and dry deposition and chemical transformation. CALPUFF typically uses the gridded meteorological data created by the CALMET program. CALPUFF, when used in a screening mode, can also use nongridded meteorological data similar to that used by a steady-state dispersion model such as AERMOD. The distribution of puffs by CALPUFF explicitly incorporates the temporal and spatial variations in the meteorological fields thereby overcoming one of the main shortcomings of steady-state dispersion models. Further technical discussion of the CALPUFF model can be found in Section 2 of the Earth Tech *User's Guide for the CALPUFF Model* dated January 2000.

CALPUFF generates output files consisting of hourly concentrations, deposition fluxes, and data required for visibility assessments for each receptor. These CALPUFF output files are subsequently processed by the POSTUTIL (Version 1.56, Level 070627, dated June 27, 2007) and CALPOST (Version 6.292, Level 110406, dated April 6, 2011) programs to provide impact summaries for the pollutants and averaging periods of interest.

For visibility assessments, background conditions were estimated using *natural* background data (i.e., absent all anthropogenic influences). The CALPOST program was then used to compute background extinction coefficients using the natural background data and the Interagency Workgroup on Air Quality Modeling (IWAQM)-recommended extinction efficiency for each species. CALPOST options selected for the Project Class I impact assessments conform to the recommendations contained in the FLAG Phase I Report – Revised (2010).

Meteorological Data

CALMET is a meteorological model that develops hourly wind and temperature fields on a three-dimensional gridded modeling domain. The meteorological file produced by CALMET for use by CALPUFF also includes two-dimensional parameters such as mixing height, surface characteristics, and dispersion properties. For the Class II modeling performed using AERMOD, meteorological data for use in the ambient air impact analysis was obtained directly from FDEP. Orlando International Airport was selected as the station of choice based on its proximity to the PPS Site and its similar land use. The meteorological data, which was preprocessed by FDEP using the current version of AERMET (Version 11059, February 28, 2011) and AERMINUTE (Version 11325, November 21, 2011), contains both the surface data and the upper air or profile data. Also, as required by the GAQM, 5 consecutive years (2006 through 2010) of data were used in the Class II modeling.

For the modeling performed for the Class I areas using CALPUFF, meteorological data prepared by the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) was used. VISTAS has developed a 3-year (2001 through 2003) CALMET dataset for a fine, 4-km, subregional domain that covers all of Florida and the adjacent Class I areas of interest to Florida. The VISTAS

2001 through 2003 meteorological data were reprocessed by USFWS using the current EPA-approved version of CALMET (Version 5.8, Level 070623). This reprocessed fine-grid CALMET dataset (containing more than 250 gigabytes of data) was obtained from FDEP and was used for the Project Class I impact assessments.

Emissions Source Input Data

In addition to the four CC CTG/HRSG units, the Project Class II modeled emissions sources included the six-cell mechanical draft cooling tower.

During normal operations, the CTG/HRSG units will operate over a range of loads (50 to 100 percent) and ambient temperatures. Appendix B, Table B-1 of the PSD permit application, provides a summary of the CTG/HRSG operating cases evaluated. Plume dispersion and, therefore, ground-level impacts will be affected by these different operating scenarios since emissions rates, exit temperatures, and exhaust gas velocities will change. While the primary fuel for the CTG/HRSG units will be natural gas, the units are also capable of combusting ULSD fuel oil.

For natural gas firing, emissions estimates were developed for 15 scenarios including three CTG loads (100, 75, and 50 percent), three ambient air temperatures (90, 59, and 20°F), and use of inlet air evaporative cooling and duct burner firing. For ULSD fuel oil firing, a total of emissions estimates were developed for 12 scenarios including three CTG loads (100, 75, and 50 percent), three ambient air temperatures (90, 59, and 20°F), and use of inlet air evaporative cooling.

The four CC CTG/HRSG units were first modeled for each operating case using a unit emissions rate of 1.0 gram per second (g/s) and assuming continuous 24/7 operation at each operating case. Model input files were developed for each of the 5 years of meteorology (i.e., 2006 through 2010) and for each fuel type (natural gas and ULSD fuel oil). This modeling approach resulted in five model input files for each fuel type (i.e., one for each year of meteorology) for a total of 10 model input files. Since model-predicted air quality impacts are directly proportional to emissions rates, the initial normalized modeling results were multiplied by the appropriate emissions rate for each operating case.

For NO_x impacts, the modeling results were also adjusted to reflect the Tier 2 ambient ratio method conversion of NO_x to NO_2 (i.e., using multiplier factors of 0.75 and 0.80 for annual and 1-hour average impacts, respectively) and the maximum

CTG/HRSG annual hours of operation for ULSD fuel oil; i.e., 3,000 hr/yr for all four CTG/HRSG units conservatively including startup/shutdown hours. No adjustment was made to the natural gas-firing annual NO_x impacts, since the units are assumed to operate continuously; i.e., 8,760 hr/yr per CTG/HRSG.

For determining 24-hour average impacts when firing ULSD fuel oil, the normalized modeling results were multiplied by the 24-hour average emissions rates associated with the maximum daily hours of ULSD fuel oil operation; i.e., 48 hr/day for all four CTG/HRSG units.

The emergency generator diesel engine, other than during emergency conditions, will only operate approximately 2 hours per week for routine testing and maintenance purposes. Due to its infrequent operation, the contribution of the emergency diesel engine to pollutant impacts will be negligible. Accordingly, the Project emergency diesel generator was not included in the modeled emissions inventory.

With respect to Class I area impacts, Project modeled emissions sources included the four CC CTG/HRSG units. The Project cooling tower emissions source will have minor PM_{10}/$PM_{2.5}$ emissions rates and a relatively low release height. Accordingly, this emissions source will have negligible impacts at the distant Class I areas.

6.6.1.4 Summary of Air Quality Impacts

Class II Area Significant Impact Level Impacts

The EPA AERMOD dispersion modeling results indicate that Project operations will result in ambient air quality impacts that exceed the PSD Class II significant impact levels (SILs) for NO_2 and SO_2 (1-hour average) and $PM_{2.5}$ (24-hour average) (Table 6.6.1-2). Project impacts were below the PSD Class II SILs for all other pollutants and averaging periods. Accordingly, additional cumulative modeling with respect to the PSD Class II increments and NAAQS was required for NO_2 and SO_2 (1-hour NAAQS) and $PM_{2.5}$ (24-hour PSD Class II increment and NAAQS).

Table 6.6.1-2. Project PSD Class II Area SIL Impacts Modeling Results

Pollutant	Averaging Time	Project Impact ($\mu g/m^3$)	PSD SIL ($\mu g/m^3$)
NO_2	Annual	0.12	1
	1-Hour	36.7	7.5
PM_{10}	Annual	0.18	1
	24-Hour	2.8	5
$PM_{2.5}$	Annual	0.18	0.3
	24-Hour	2.5	1.2
SO_2	Annual	0.12	1
	24-Hour	1.4	5
	3-Hour	5.7	25
	1-Hour	8.4	7.8
CO	8-Hour	12.3	500
	1-Hour	26.2	2,000

Note: $\mu g/m^3$ = microgram per cubic meter.

Source: ECT, 2012.

<u>Class II Area PSD Increment and NAAQS Impacts</u>

The SIL modeling analysis indicates that the following Project operating scenarios will have the maximum impacts:

- <u>1-Hour NO_2</u>—Natural gas warm startup and ULSD fuel oil Case CC-20 (four CTG/HRSG units operating at 75-percent load and 20°F ambient air temperature).
- <u>1-Hour SO_2</u>—Natural gas Case CC-9 (four CTG/HRSG units operating at 100-percent load, inlet air evaporative cooling, duct burner firing, and 59°F ambient air temperature).
- <u>24-Hour $PM_{2.5}$</u>—ULSD fuel oil Case CC-26 (four CTG/HRSG units operating at 75-percent load and 59°F ambient air temperature).

Cumulative modeling was therefore conducted for these Project operating scenarios to assess air quality impacts with respect to the PSD Class II increments and NAAQS.

Modeling results with respect to the $PM_{2.5}$ PSD Class II increment show a cumulative 24-hour average impact of 7.3 $\mu g/m^3$, which is below the PSD Class II increment of 9 $\mu g/m^3$.

Cumulative NAAQS modeling that included the Project emissions sources, other PPS emissions sources, and offsite emissions inventories was conducted to obtain 1-hour NO_2, 1-hour SO_2, and 24-hour $PM_{2.5}$ air quality impacts for these emissions sources. The modeling results were then added to representative background concentrations to obtain a total impact for comparison to the NAAQS for each pollutant and averaging period.

The modeling results indicate potential exceedances of the 1-hour average NO_2, 1-hour average SO_2, and 24-hour average $PM_{2.5}$ NAAQS. However, the Project did not have a significant contribution to any of the modeled NAAQS exceedances. Cumulative impacts with respect to the 1-hour NO_2 NAAQS were developed for the two worst-case Project operating scenarios: (a) a warm startup of the CC units while firing natural gas, and (b) ULSD fuel oil-firing for CC Case CC-20 (four CTG/HRSG units operating at 75-percent load and an ambient air temperature of 20°F). Table 6.6.1-3 presents modeling results for the cumulative NAAQS impacts.

Table 6.6.1-3. Cumulative NAAQS Impacts

Pollutant	Averaging Time	Cumulative Impact ($\mu g/m^3$)	Project Contribution ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
NO_2*	1-Hour	251	0.015	188
NO_2†	1-Hour	296	0.00075	188
SO_2	1-Hour	251	0.00073	198
$PM_{2.5}$	24-Hour	42	0.0257	35

*Natural gas warm start.
†ULSD fuel oil Case CC-20.

Source: ECT, 2012.

Class I Area Impacts

Criteria Pollutant Impacts

All Project predicted Class I impacts were less than the PSD Class I SILs at the Chassahowitzka NWA and Everglades NP. Table 6.6.1-4 provides project modeling results for the PSD Class I SIL impacts.

Nitrogen and Sulfur Deposition

Project sulfur and nitrogen deposition impacts at the Chassahowitzka NWA will be below the Federal Land Managers' (FLM's) sulfur and nitrogen deposition analysis threshold (DAT) of 0.01 kilogram per hectare per year (kg/ha/yr). Table 6.6.1-5 provides the Project modeling results for Class I sulfur and nitrogen deposition.

Table 6.6.1-4. Project Class I Area SIL Impacts

Pollutant	Averaging Period	Year of Meteorology	Chassahowitzka NWA Impact (µg/m^3)	PSD SIL (µg/m^3)
NO_2	Annual	2001	0.0030	0.1
		2002	0.0031	
		2003	0.0026	
$PM_{2.5}$	Annual	2001	0.0030	0.06
		2002	0.0034	
		2003	0.0028	
	24-Hour	2001	0.066	0.07
		2002	0.037	
		2003	0.065	
SO_2	Annual	2001	0.0016	0.1
		2002	0.0018	0.2
		2003	0.0016	
	24-Hour	2001	0.039	
		2002	0.022	
		2003	0.035	
	3-Hour	2001	0.17	1.0
		2002	0.12	
		2003	0.11	

Note: µg/m^3 = microgram per cubic meter.

Source: ECT, 2012.

Table 6.6.1-5. Project Class I Area Maximum Sulfur and Nitrogen Deposition Impacts

Pollutant	Annual Averaging Time (kg/ha/yr) Chassahowitzka NWA Impact	DAT
Sulfur	0.0029	0.01
Nitrogen	0.0024	0.01

Source: ECT, 2012.

Visibility

Assessment of Project regional haze impacts was conducted for the Chassahowitzka NWA. The regional haze assessments employed several analytical procedures and the EPA-approved version of the CALPUFF modeling suite.

The Project regional haze assessment evaluated the 98th percentile of the 24-hour average impacts (equivalent to the eighth-highest 24-hour average impact at any receptor). The 24-hour average 98th percentile impact is the metric recommended by the FLMs for the assessment of regional haze impacts under the PSD NSR permitting program. The FLM visibility threshold for concern is not exceeded if the 98th percentile in light extinction is less than 5 percent for each year of meteorology modeled when compared to the annual average natural visibility condition for a particular Class I area.

Table 6.6.1-6 provides project modeling results for Class I impacts. As shown in this table, the increases in 24-hour average 98th percentile natural visibility due to Project emissions are all less than the 5-percent FLM visibility threshold for concern.

Table 6.6.1-6. Project Class I Area Regional Haze Impacts

Metric	Units	Year	Value
Chassahowitzka NWA			
98th percentile Δ B_{ext} (8th highest day, all receptors)	Percent	2001	1.30
		2002	1.10
		2003	0.97
Days with Δ B_{ext} greater than 5 percent	—	2001	0
		2002	0
		2003	0

Source: ECT, 2012.

6.6.1.5 Other Air Quality-Related Impacts

Impacts Due to Associated Growth

The Project will require no additional operational workers at PPS. Thus, no measurable growth in population or any associated air quality impacts are expected to result from Project operations.

A new or expanded industrial facility can also sometimes generate growth in other industrial or commercial operations needed to support the new/expanded facility. Given the PPS site's long-time use for power generation and its proximity to the Tampa metropolitan area, however, the existing commercial infrastructure should be more than adequate to provide any support services that the proposed facility might require. Therefore, no air quality impacts due to associated industrial/commercial growth would be expected.

Impacts on Visibility and on Soils, Vegetation, and Wildlife

No visibility impairment at the local level is expected due to the types and quantities of emissions projected from the Project emissions sources. The opacity of exhaust gases from the Project stacks will typically be low. Emissions of primary particulates and sulfur oxides due to combustion will also be low due to the predominant use of low-sulfur fuels (natural gas and ULSD fuel oil). The contribution of Project emissions to the potential for haze formation in the area is expected to be minimal.

Certain air pollutants in acute concentrations or chronic exposures can impact soils, vegetation, or wildlife resources. Soils impacts can result from SO_2 and NO_x deposition, creating an acidic reaction or lowering of soil pH. In this case, the site soils are naturally acidic, and Project SO_2 and NO_x emissions are not expected to adversely affect soils in the plant vicinity.

Vegetation is sometimes affected by acute exposures to high concentrations of pollutants, often resulting in foliar damage. Lower dose exposure over longer periods of time (chronic exposure) can often affect physiological processes within plants, causing internal and external damage. Based on an evaluation of the literature for effects from SO_2, acid rain (H_2SO_4 mist), NO_x, CO, and combinations of these pollutants (synergistic effects), insignificant impacts to regional vegetation are anticipated due to the Project estimated emissions.

Releases of air pollutants can also affect wildlife through inhalation, exposure through skin, or ingestion. However, based on comparatively low emissions levels and resulting insignificant Project impacts, natural dispersion of emissions, and mobility of wildlife, insignificant impacts to regional wildlife resources are expected.

Based on this assessment, Project emissions are not expected to cause harm to soils, vegetation, or wildlife.

6.6.2 MONITORING PROGRAMS

No monitoring of ambient air quality is planned, nor is ambient monitoring warranted given the low impacts on air quality predicted for the Project.

The existing Project CTGs are subject to NSPS Subpart GG (Stationary Gas Turbines). In accordance with FDEP guidance and EPA's recent proposed revisions to NSPS Subparts GG and KKKK, Tampa Electric requests that all four CC units be regulated under NSPS Subpart KKKK. Having one applicable NSPS instead of three will simplify the monitoring, recordkeeping, and reporting requirements for the CC units. The emergency generator diesel engine will be subject to NSPS Subpart IIII (Stationary Compression Ignition Internal Compression Engines) and NESHAPs Subpart ZZZZ (Stationary Reciprocating Internal Combustion Engines). Emissions monitoring will be performed as required by each of these NSPS and NESHAPs.

The existing Project CTGs are also subject to the requirements of the Acid Rain Program (ARP), Clean Air Interstate Rule (CAIR), and EPA's Mandatory Greenhouse Gas Reporting Rule. Monitoring of emissions will be conducted in accordance with the requirements of these federal programs. Continuous monitoring of NO_x, SO_2, and CO_2 will be conducted in accordance with the provisions of 40 CFR 75, Acid Rain Program.

Initial and periodic compliance testing of pollutants emitted by the Project emissions sources will be conducted pursuant to FDEP requirements as specified in the approved air construction/PSD permit. FDEP compliance test methods are specified in Section 62-297.401, F.A.C.

6.7 NOISE

A qualitative noise assessment was conducted to assess noise impacts during operation as a result of the conversion of the existing simple cycle CTG Units 2 through 5 to CC operation.

The proposed Polk 2-5 Conversion Project involves the addition of four HRSG units to each of the CTGs, one mechanical draft cooling tower, and one STG. The HRSGs utilize the high-temperature CTG exhaust gases to create steam, which is then used in the STG to generate electrical power. The HRSGs are equipped with duct burners for providing supplemental heat. These duct burners are located within the gas path and are fired with natural gas. There are only minor noise sources associated with the operation of the HRSGs such as pumps for fuel flow to the duct burners and ammonia flow to the SCR. These minor noise sources will not contribute significantly to existing noise levels measured at the property line.

A mechanical draft cooling tower will be added to provide cooling for the auxiliary equipment of the Project and Unit 1. The mechanical draft cooling tower will consist of six cells each equipped with a fan for vertical discharge of the air flow. The mechanical draft cooling tower will be located in the same general proximity as the CTGs and, therefore, will not be nearer to any property line. There are two noise sources associated with mechanical draft cooling towers: the cooling tower fans themselves and the recirculating cooling water pumps. These two noise sources will have relatively insignificant impacts when projected to the property line as compared to the operation of the four CTGs operating either in simple cycle or CC modes of operation.

The STG will be located outside with enclosures as necessary to protect it from the elements. The STG generates electrical power by converting the high-pressure, high-temperature steam generated in the HRSG into mechanical power, which turns the turbine generator to produce electrical power. The STG itself is not a combustion source and, therefore, has a relatively lower sound power level as compared to the CTGs. The STG will also be located in the general proximity of the CTGs and will not be any nearer to any property line. The STG will have a relatively minor contribution to the noise levels at the property line as compared to the operation of the four CTGs.

The noise at the property line due to the operation of the proposed Polk 2-5 Conversion Project will be primarily affected by the noise emanating from the gas turbines. Therefore, there will be no significant impacts to existing noise levels during operation of the proposed Project due to the conversion of Units 2 through 5 from simple cycle operation to CC operation.

6.8 CHANGES IN NONAQUATIC SPECIES POPULATIONS

Operational impacts on wildlife may include direct impacts (mortality) and indirect impacts (noise, human presence, air emissions, increased water use, etc.). As stated previously, no significant impacts to onsite 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 the Site.

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

6.9 TRANSPORTATION AND OTHER PLANT OPERATION EFFECTS

The Polk 2-5 Conversion Project operations will not result in the employment of any additional employees at PPS. The plant currently has 78 employees. There will be no additional impacts to the transportation network as a result of the proposed Project.

During the operation of the proposed Project, consumables will be delivered to the Site, creating minimal additional traffic impacts. 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 per day. These additional trips will not lower the functional capacity of roadways to an unacceptable LOS or significantly impact a.m. and p.m. peak hour traffic volumes due to the existing traffic volumes and the excess capacities of the surrounding roadway network.

6.10 ARCHAEOLOGICAL SITES

Based on the results of the cultural resources assessment conducted in 1992 and a confirmation letter from FDHR (see Appendix 10.7.1), no significant archaeological sites are expected to be found on the PPS Site. Therefore, no onsite, postconstruction monitoring is planned or required for the Project. As previously described in Section 5.9, if encountered, the applicant will take appropriate measures to preserve or mitigate potential impacts to archaeological sites after review by a certified archaeologist and consultation with FDHR.

6.11 RESOURCES COMMITTED

The major irreversible and irretrievable commitments of state and local resources due to the operation of the Polk 2-5 Conversion Project are as follows:

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

The proposed use of land for the Project, while irreversible, will be a small impact to Polk County, especially since the land is already used for electrical power generation.

Water evaporated in the cooling reservoir and cooling tower as part of the heat rejection process and wastewaters disposed by deep well injection represents a consumptive use of water. This consumptive use will be minimized by recycling water, to the extent feasible. Also, the use of groundwater will be minimized by the use of reclaimed water for makeup to the cooling reservoir and cooling tower.

The air quality increments consumed by air pollutant emissions from the Project will be negligible. The emissions from the Project will create no impediment to any additional growth in the area, nor will they have significant impacts on the area's air quality.

REFERENCES

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