3.0 SITE AND VICINITY CHARACTERIZATION

To assess the potential impacts a project may have, it is necessary to characterize the environment in which the project will be located. This chapter provides the requisite characterization for the PPS Site and vicinity in Polk County. Following the general site description, the remainder of this chapter presents the results of the detailed characterization of the sociopolitical and biophysical environment. This chapter contains the following sections, per the FDEP draft, *Application Instruction Guide* (FDEP, September 2009):

- 3.1—Site and Associated Facilities Delineation.
- 3.2—Social and Political Environment.
- 3.3—Physical and Biological Environment.

The environmental descriptions in this chapter are based on a combination of information contained in the original SCA for PPS and updated information to reflect current environmental conditions on the Site and its vicinity. As discussed in Section 1.2.1, the previously certified PPS Site originally consisted of 4,348 acres. However, in May 2012, Tampa Electric donated the approximately 1,511-acre portion of the Site located west of SR 37 to the Board of Trustees of the Internal Improvement Trust Fund of the State of Floridaas a wildlife management recreation area. No existing power plant facilities were located on this portion of the Site. With this donation, Tampa Electric is requesting that the western portion of the original Site be removed from the site certification as part of this PPSA proceeding. Thus, the descriptions and analyses presented in this and other chapters of this SCA for the proposed Polk 2-5 Conversion Project focus on the approximately 2,837-acre portion of the Site located east of SR 37.

3.1 SITE AND ASSOCIATED FACILITIES DELINEATION

This section provides an overview of the PPS Site—its location, existing land uses and facilities, adjacent properties, and uses after construction of the proposed Polk 2-5 Conversion Project.

3.1.1 SITE LOCATION

The approximately 2,837-acre PPS Site is located in southwestern Polk County, approximately 11 miles south of the city of Mulberry and 17 miles south of the city of Lakeland. Figures 1.2.1-1 and 1.2.1-2 illustrate the general location of the Site in the west-central Florida region. The Site consists of approximately 2,837 acres and is generally bordered by SR 37 on the west, CR 630 on the north, CR 663 (Fort Green Road) on the east, and inactive phosphate clay settling areas on the south. The Site includes all or portions of Sections 1 through 4 and 9 through 12, Township 32 South, Range 23 East; and Sections 34 and 35, Township 31 South, Range 23 East. Figure 3.1.1-1 illustrates the boundaries of the approximately 2,837-acre eastern portion of the PPS Site on a U.S. Geological Survey (USGS) 1:24,000-scale topographic quadrangle map, and Figure 3.1.1-2 shows the Site boundaries and adjacent areas on an aerial photograph at the same scale.

Prior to Tampa Electric's development of the existing PPS, the majority of the Site consisted of previously mined phosphate lands, including the existing cooling reservoir area. The portion of the Site containing the existing power plant facilities and structures and proposed to contain the proposed Project facilities consists of unmined land. As part of its property purchase agreements with the previous phosphate mining company owners, Tampa Electric assumed responsibility for reclamation of the mined lands and has successfully reclaimed and obtained releases for all mined lands under FDEP mine reclamation requirements (formerly Chapter 16C-16, F.A.C., now Chapter 62C-16, F.A.C.) and Polk County Mining Ordinance 88-19.

3.1.2 EXISTING SITE USES

The PPS Site currently contains five electric generating units and associated facilities. Polk Unit 1 is a nominal 260-MW IGCC facility fired on syngas produced by gasifying coal and other fuels. The Polk Unit 1 generating facilities consist of a nominal 190-MW CTG and nominal 70-MW HRSG and STG. Other existing facilities on the Site associated with Unit 1 include truck delivery facilities for coal and other solid fuels, fuel storage silos and handling facilities, an air separation unit, an oxygen-blown gasifier, a sulfuric acid plant to produce commercial-grade H_2SO_4 byproduct, and a lined slag byproduct storage area used to temporarily store slag from the gasification process prior to being shipped offsite for commercial use or reused within the process. The Site also contains an approximately 755-acre cooling reservoir that was constructed using previously mined-out areas. The cooling reservoir is used for steam condenser and other cooling purposes for

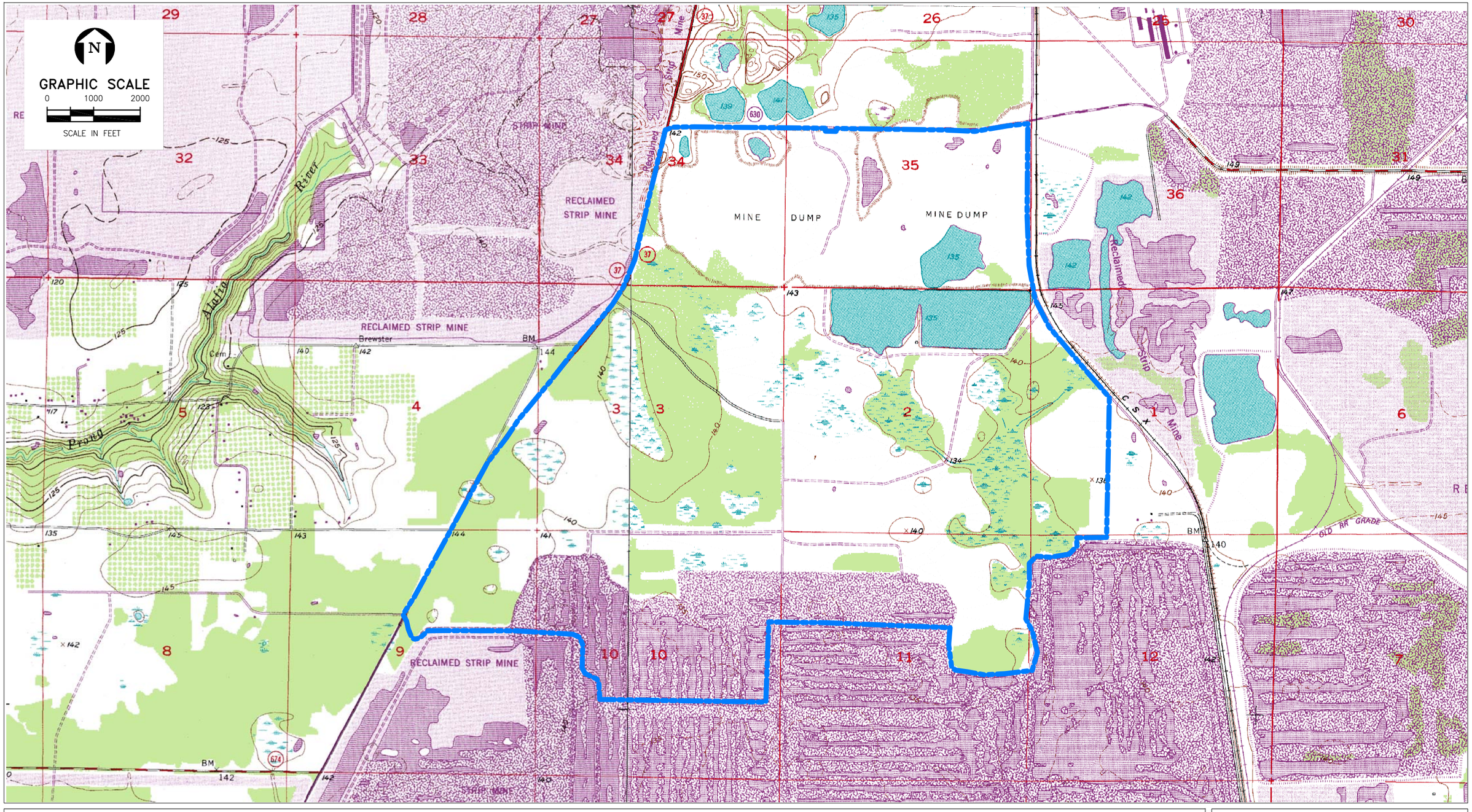


FIGURE 3.1.1-1.

PPS SITE AND VICINITY

Sources: USGS Quads: Duette NE and Baird, FL 1987; ECT, 2012.

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FIGURE 3.1.1-2.

AERIAL PHOTOGRAPH OF PPS SITE

Sources: 2011 Dept. of Revenue Aerials; ECT, 2012.

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Polk Unit 1. Distillate fuel oil is used as backup fuel for Unit 1 and is delivered by tanker truck and stored in a 2.4-million-gallon storage tank with spill containment facilities.

Polk Units 2 through 5 consist of nominal 165-MW, simple cycle CTG units that are primarily fired on natural gas with ULSD fuel oil as backup for Units 2 and 3. Natural gas is provided through a pipeline interconnected with the FGT system, which is located adjacent to the Site.

The existing PPS Site facilities include a substation and four 230-kV transmission line circuits, a CSX railroad spur from the main CSX rail line along CR 663, and four onsite Floridan aquifer groundwater wells used for water supply for the existing power plant process water needs and makeup to the cooling reservoir to replace water lost by evaporation. Potable water is also provided from the onsite wells and treatment facility, and sanitary wastewater is disposed in an onsite septic system. Stormwater runoff from the existing facility areas is collected and appropriately treated prior to routing to the cooling reservoir or to the existing 26-acre stormwater detention pond prior to discharge from the Site. Other onsite facilities to support the existing PPS operations include an administration building, control room, and warehouse. The main entrance road to the PPS Site is from SR 37, and secondary access roads exist from SR 37 located to the north of the main entrance road and from CR 663.

As discussed in Section 1.2.2, two projects that are planned to be constructed on the PPS Site in the near future include the RTI high-temperature syngas cleaning and carbon capture demonstration project and the reclaimed water treatment project. The RTI project facilities will be located in the northern portion of the existing facility area adjacent to the Polk Unit 1 facilities, and the reclaimed water treatment facilities will be located along the southern side of the main entrance road adjacent to the cooling reservoir.

3.1.3 ADJACENT PROPERTIES

As shown in Figure 3.1.1-2, the majority of the properties adjacent to and in the vicinity of the PPS Site have been previously used for phosphate mining and currently consist of undeveloped, reclaimed, and unreclaimed lands. Properties to the south and east of the eastern portion of the Site contain retired clay settling areas. Several areas with low-density, scattered residential uses are located in the vicinity of the Site. These areas are located northwest of the Site along Bethlehem and

Albritton Roads and southwest of the Site along SR 674 in Hillsborough County. The only other areas of residential development in the Site vicinity are located in the unincorporated community of Bradley Junction, approximately 4 miles to the north of the Site.

3.1.4 PROPOSED SITE USES FOR THE POLK 2-5 CONVERSION PROJECT

Figure 3.1.4-1 provides the site layout of the existing facilities (shown in red) on the PPS Site for Units 1 through 5 and the new facilities (shown in purple) to be constructed for the proposed Polk 2-5 Conversion Project overlaid on a recent aerial photograph. As shown in this figure, the site areas that will be impacted by construction of the proposed Project generally consist of open aggregate surfaces or grassed areas in the vicinity of the existing Units 2 through 5. The new mechanical draft cooling tower will be located west of the existing Unit 5 facilities. New and/or expanded intake and discharge structures will be collocated with the existing structures in the cooling reservoir.

The existing Polk Units 1 through 5 facilities cover approximately 78 acres plus the 755-acre reservoir. The general area to be impacted on the Site by construction of the proposed Polk 2-5 Conversion Project facilities is contained within the area of the existing facilities. In addition, approximately 15 acres of the open space areas located to the south and southwest of the proposed new facilities (see Figure 3.1.4-1) will be temporarily used for construction laydown and parking areas during construction of the proposed Project.

3.1.5 FLOOD ZONES

Figure 3.1.5-1 shows the 100-year flood zones on the PPS Site overlaid on an aerial photograph based on available Federal Emergency Management Agency (FEMA) flood insurance rate maps (FIRM). The available FEMA maps reflect the 100-year flood zones prior to phosphate mining of the Site and surrounding lands. Under premining conditions, portions of the Site contained flood zones primarily associated with the headwaters of Little Payne Creek. As shown in Figure 3.1.5-1, the majority of the 100-year flood zones have been significantly altered due to phosphate mining and reclamation activities and development of the existing PPS and cooling reservoir. Therefore, the specific portions of the Site containing the existing power plant facilities and proposed for the new Project facilities are no longer connected to the nearby creek systems.

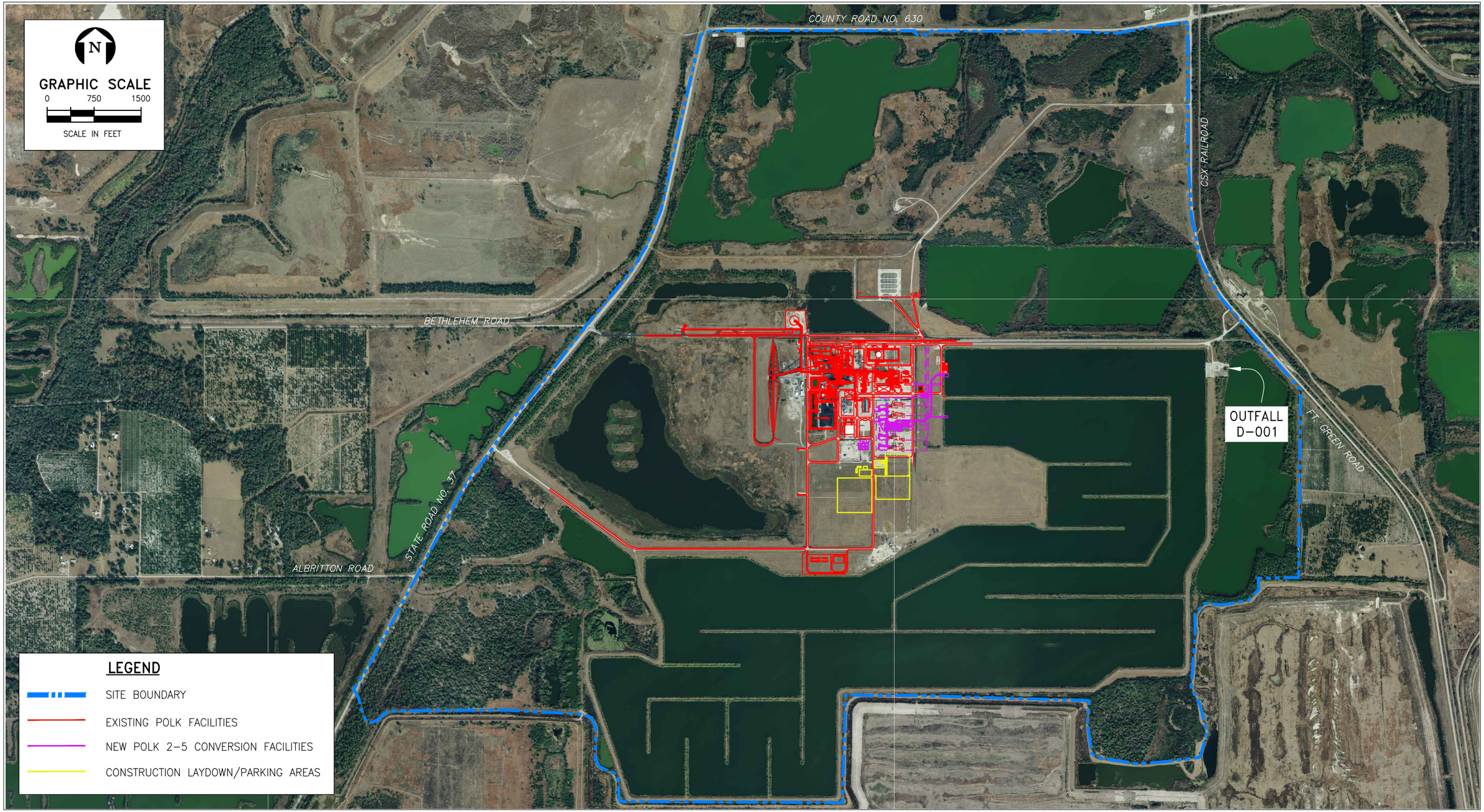


FIGURE 3.1.4-1.

GENERAL LAYOUT OF PPS EXISTING AND PROPOSED POLK 2-5 CONVERSION FACILITIES

Sources: 2011 Dept. of Revenue Aerials; Black & Veatch, 2012; Tampa Electric, 2012; ECT, 2012.

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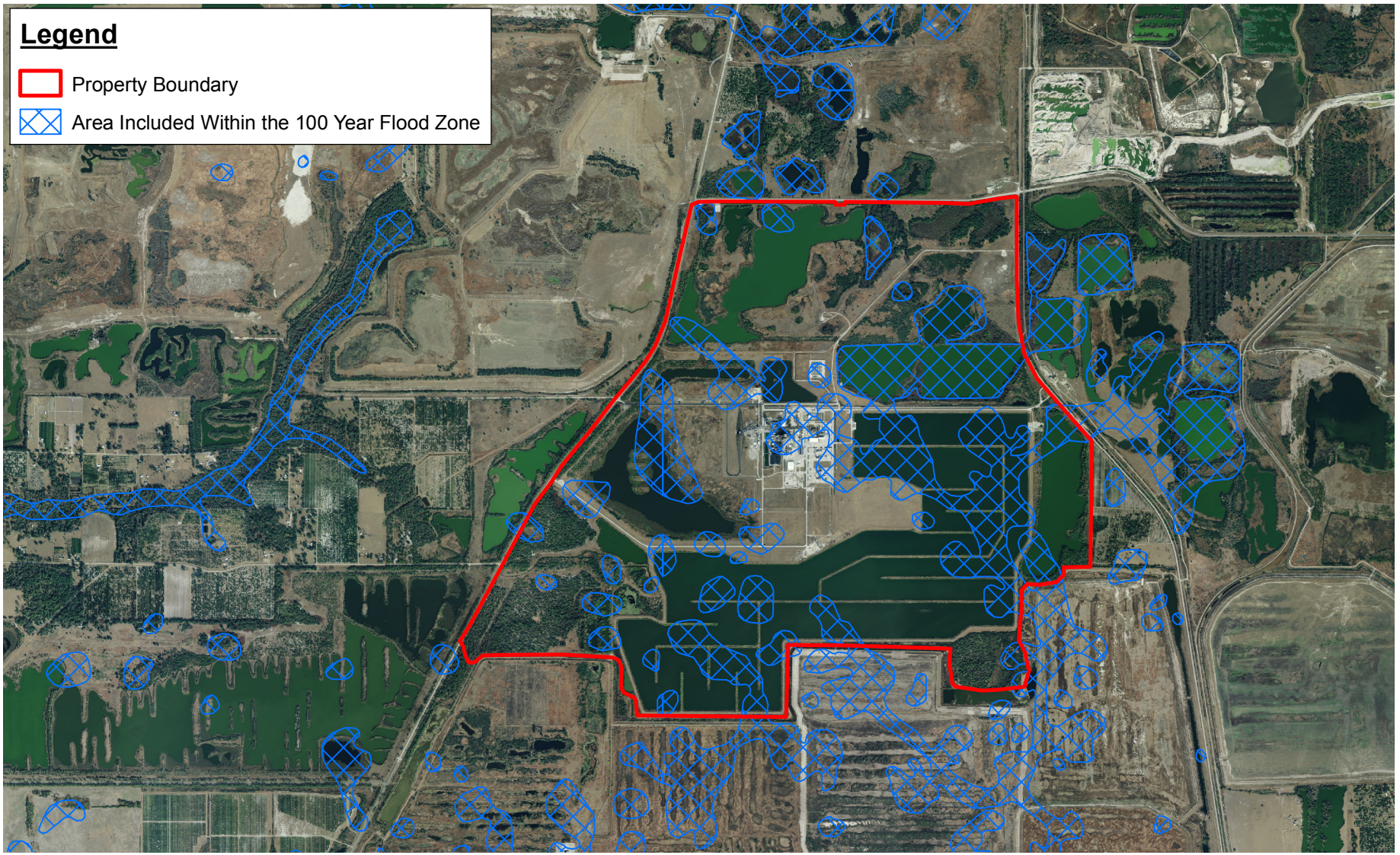


FIGURE 3.1.5-1.
PREMINING 100-YEAR FLOOD ZONES

N
0 2,000 4,000 6,000
Feet

Sources: FEMA, 1996, DOR, 2011; ECT, 2012.

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3.2 SOCIAL AND POLITICAL ENVIRONMENT

The FDEP instruction guide for preparation of an SCA requires an analysis of various land use and socioeconomic baseline conditions and projected impacts in accordance with local government comprehensive plans, zoning ordinances, and/or development regulations. The planning issues relevant to PPS are existing land use; the Polk County Comprehensive Plan; and the relevant development area, overlay districts, infrastructure, cultural resources, aesthetics, and socioeconomics.

Based on the evaluation of existing conditions, consistency with land use plans and ordinances, and sufficient capacity of public facilities, the proposed Polk 2-5 Conversion Project is a compatible development and should result in no significant negative impacts to the sociopolitical environment in the surrounding area.

3.2.1 GOVERNMENTAL JURISDICTIONS

As shown on Figure 3.2.1-1, the PPS Site lies within unincorporated Polk County. The nearest community is unincorporated Bradley Junction, which lies approximately 4.4 miles north of the proposed location of the proposed Project. The nearest incorporated municipality to the Site is the city of Bowling Green, located approximately 10 miles southeast in Hardee County. The nearest incorporated areas in Polk County to the proposed Site are the cities of Fort Meade and Mulberry, which lie approximately 11 miles to the east and north of the site, respectively.

The PPS Site is also within the jurisdiction of the Central Florida Regional Planning Council (CFRPC) and Southwest Florida Water Management District (SWFWMD). No public lands are currently located directly adjacent to or within a 5-mile radius of the Site except for the portion of the originally certified PPS Site that was donated to FDEP.

3.2.2 LAND USE DESIGNATIONS

The current land use designations for the Site are described in the following subsections based on the applicable sections of the Polk County Comprehensive Plan and the Polk County Land Development Code (LDC).

3.2.2.1 Comprehensive Plan

Figure 3.2.2-1 provides the future land use map (FLUM) of the Polk County Comprehensive Plan. The map designates the PPS Site as Phosphate Mining. The purpose of the Phosphate Mining designation is to provide areas for phosphate

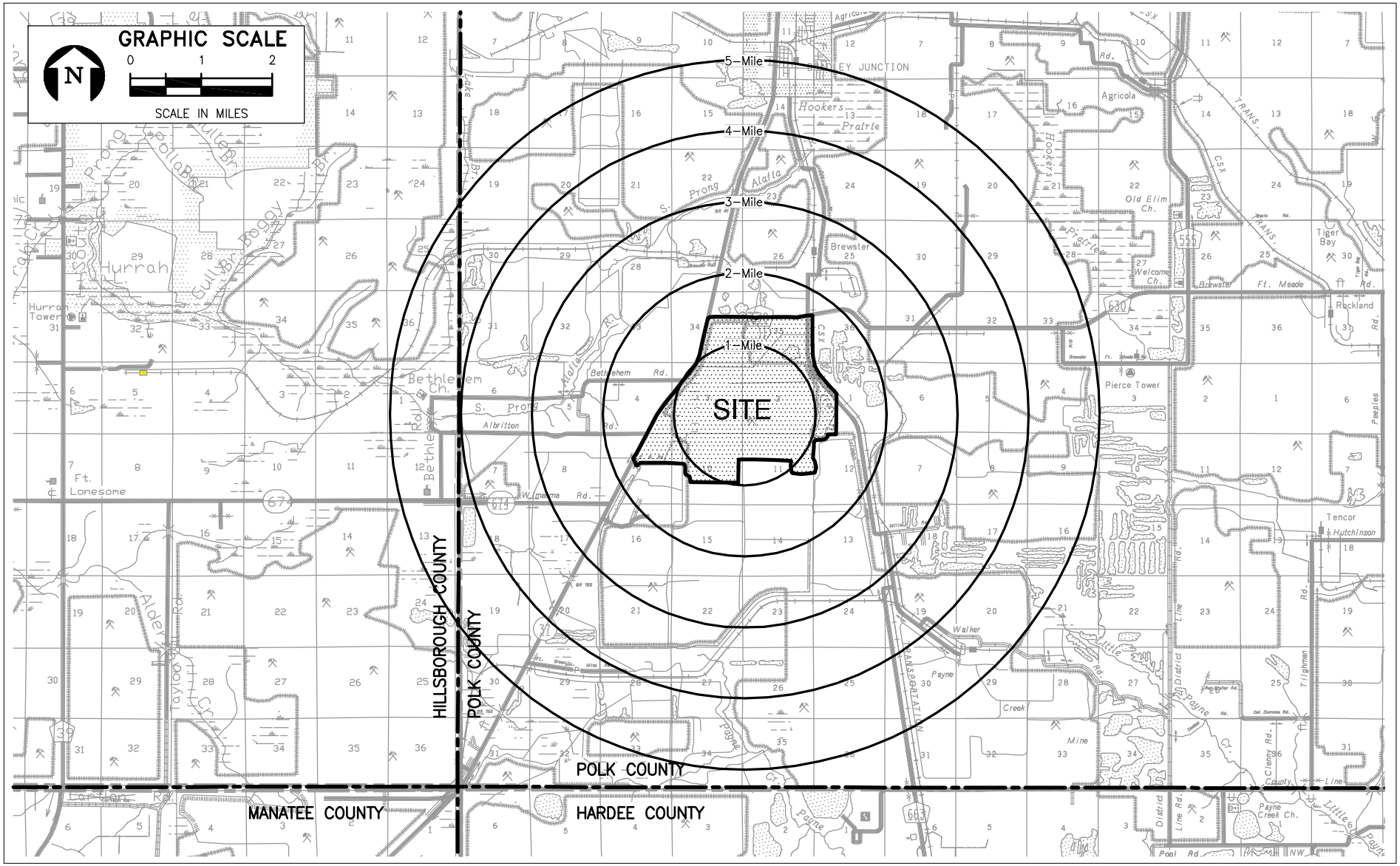


FIGURE 3.2.1-1.

GOVERNMENTAL JURISDICTIONS WITHIN 5 MILES OF THE PPS SITE

Source: FDOT Map, 2000; ECT, 2012.

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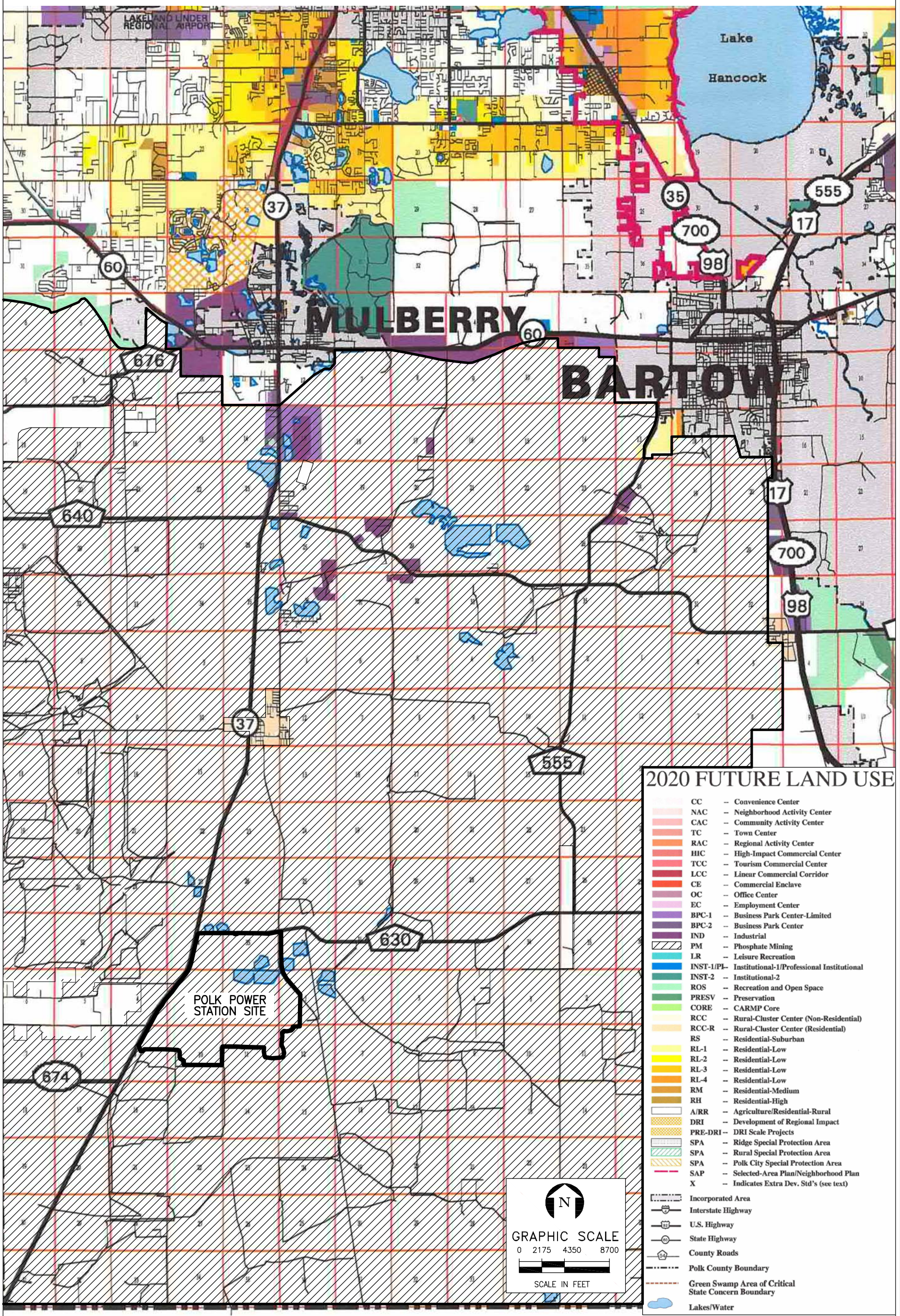


FIGURE 3.2.2-1.

FUTURE LAND USE DESIGNATIONS

Sources: Polk County Planning Division, May 2012; ECT, 2012.

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mining operations, phosphate mining support facilities, and other uses compatible with and related to phosphate mining and its allied uses. All of the immediately surrounding area is also in the Phosphate Mining district. The residential land uses along Albritton and Bethlehem Roads are located in the Agriculture/Residential-Rural designations. The LDC identifies the permitted and conditional uses for the standard land use categories and provides density and dimensional regulations.

A certified power generation facility is allowed in the Phosphate Mining land use category with the approval of a C4 conditional use. The C4 conditional uses are described as involving multiple issues and potential significant offsite impacts. Proposed uses requiring C4 conditional use approval are reviewed by the Polk County Development Review Committee and require public hearings before the Polk County Planning Commission and the Board of County Commissioners (BOCC). Appendix 10.3.1 provides copies of the applicable portions of the Polk County Comprehensive Plan.

The BOCC approved a conditional use permit (CUP) for the PPS Site on June 2, 1992, for electrical power generation (see Appendix 10.3.2).

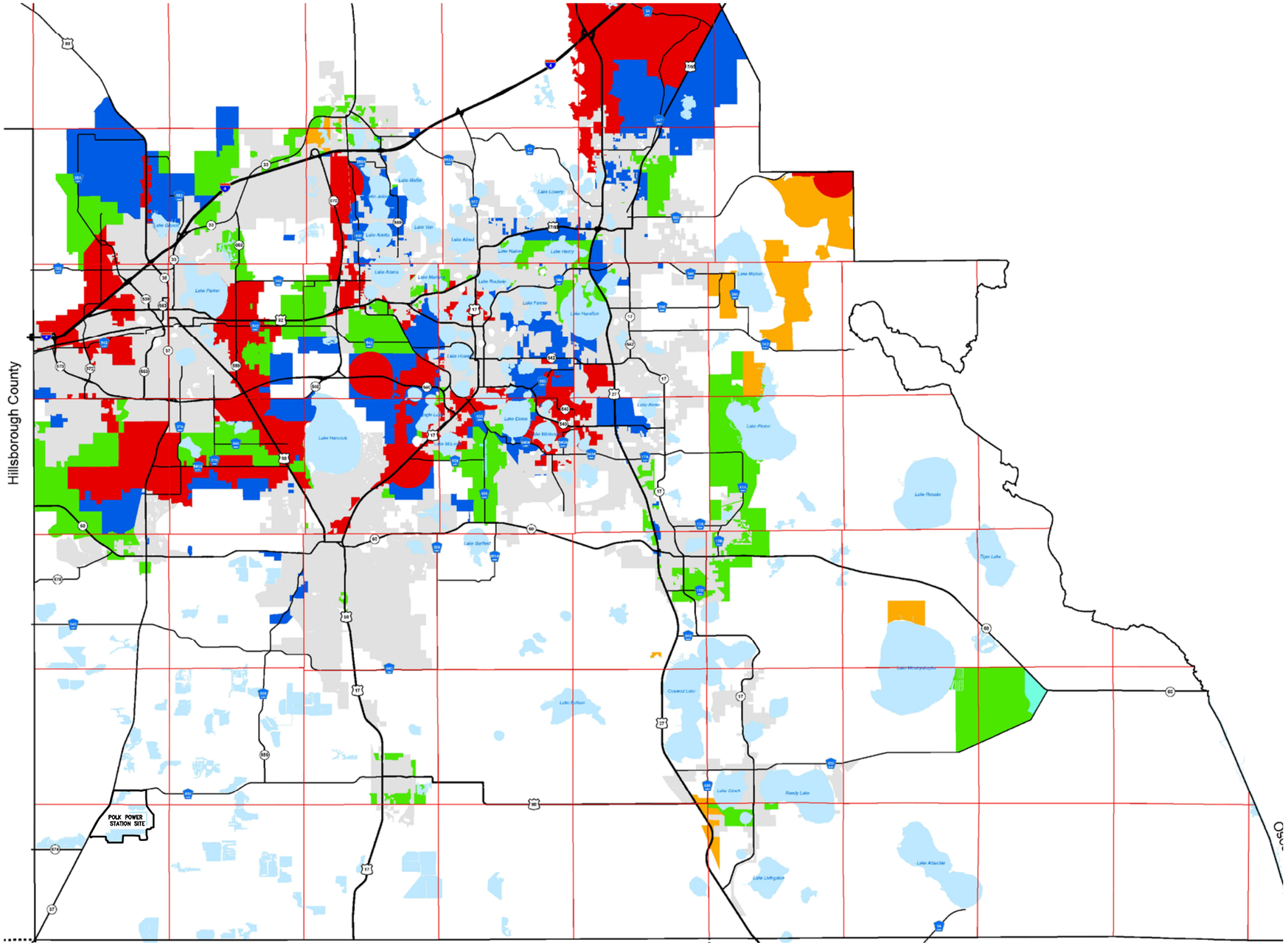
3.2.2.2 Polk County Future Land Use Element

In addition to the land use categories, Polk County has prepared overlay districts that depict development-limitation areas and resource-protection districts. PPS is located in an unincorporated portion of southwestern Polk County. Polk County has six distinct development areas that combine with future land use categories and special-area overlay districts to guide development within unincorporated Polk County. As shown in Figure 3.2.2-2, PPS is located in the Rural Development Area (RDA). Development in the RDA is characterized by large open areas, agricultural use, with scattered development and rural centers. The Phosphate Mining land use category is permitted within the RDA.

As shown in Figure 3.2.2-3, the PPS Site is located in the Floridan Aquifer Vulnerable Aquifer-Protection Areas overlay district. Objective 2.123-D provides protection to high recharge areas to the Floridan aquifer from direct contamination and to the natural function of such areas. Policies 2.123-D1 and D2 establish designation and mapping of the aquifer protection areas, development criteria for development within the overlay district, and LDC regulations addressing development in the overlay district. The development criteria minimize the threat of contamination through restrictions on the storage, generation, and/or use of

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2030 COMPREHENSIVE PLAN MAP SERIES

Development Areas

Legend

- Transit Supportive Development Areas
- Urban Growth Areas
- Suburban Development Areas
- Utility Enclave Areas
- Neighborhood Utility Service Areas
- Rural Development Area

Data Source: Polk County BoCC

- Interstate
- US Highway
- State Highway
- County Highway
- Waterbodies
- Municipalities
- County Boundary
- Township Range

0 5 10 Miles

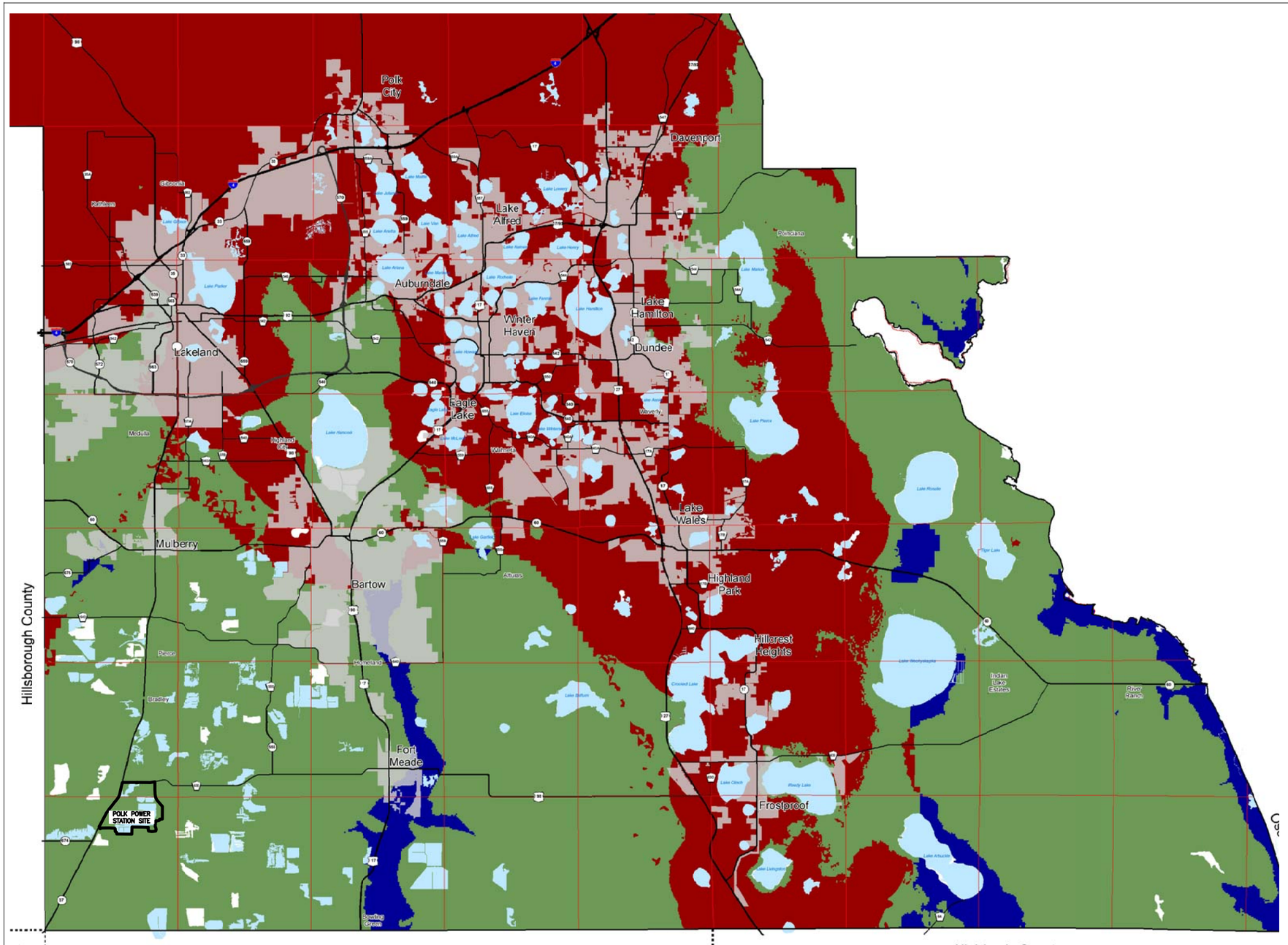
N W E S

FIGURE 3.2.2-2.

POLK COUNTY DEVELOPMENT AREAS

Sources: Polk County Board of County Commissioners, 2010; ECT, 2012.

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2030 COMPREHENSIVE PLAN MAP SERIES

Aquifer-Protection Areas

Legend

Floridan Aquifer Response

- Floridan More Vulnerable *
- Floridan Vulnerable *
- Floridan Less Vulnerable *

Data Source: Florida Department of Environmental Protection
Data Date: 2005

Note * Aquifer Protection Areas:
derived from the Florida Aquifer Vulnerability Assessment (FAVA): Contamination potential of Florida's principal aquifer systems

- Interstate
- US Highway
- State Highway
- County Highway
- Waterbodies
- Municipalities
- County Boundary
- Township Range

0 5 10 Miles

N W E S

FIGURE 3.2.2-3.

SPECIAL-AREA OVERLAY DISTRICTS
DEVELOPMENT-LIMITATION AREAS, AQUIFER-PROTECTION AREAS

Sources: Polk County Board of County Commissioners, 2010; ECT, 2012.

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hazardous waste; require postdevelopment runoff volumes not to exceed predevelopment runoff volumes; require treatment of surface waters and stormwater runoff; and prohibit the reduction of aquifer recharge quality and quantity (volume and rates) in high recharge areas.

The Polk County Comprehensive Plan identifies electrical transmission and distribution facilities, including electrical transmission lines, substations, and related electrical distribution facilities as utility use (see Future Land Use Element Policy 2.125-D1b). Electrical transmission lines are considered a permitted use throughout Polk County in all land use classifications subject to county approval.

Future Land Use Element Policy 2.125-D2 is titled Utilities Development Controls. The policy states, in Part c, that the "development of utility facilities shall be permitted in the RDA, as designated on the FLUM, only when such developments provide regional services, or is incompatible with urban uses, or services the existing needs of the immediate area in which it is located." The proposed Polk 2-5 Conversion Project and associated transmission lines are planned to provide a regional service.

Policy 2.102-A8 addresses public facilities and utilities siting. The policy states that "public facilities and utilities shall be located to:

- Maximize the efficiency of services provided.
- Minimize their cost.
- Minimize their impacts on the natural environment."

As proposed, the Project meets the siting provisions contained in Policy 2.102-A8.

3.2.2.3 Polk County Comprehensive Plan Map Series

A review of the future transportation map series indicates that there are no planned improvements for SR 37 in Polk County. SR 37 is identified as a minor arterial roadway.

Appendix 10.5 provides applicable portions of the Polk County Comprehensive Plan.

3.2.3 DEMOGRAPHY AND ONGOING LAND USE

3.2.3.1 Demography and Existing Population

According to the U.S. Census, the 2010 population of Polk County was 602,095. Table 3.2.3-1 provides population trends for Polk County, Bartow, Lakeland, and the state of Florida.

Table 3.2.3-1. Polk County and Florida Population Trends

Area	Population 1980	Percent Change 1970 to 1980	Population 1990	Percent Change 1980 to 1990	Population 2000	Percent Change 1990 to 2000	Population 2010	Percent Change 2000 to 2010
Polk County	321,652	40.8	405,382	26.0	483,924	19.4	602,095	24.4
Bartow			14,716		15,340	4.1	17,298	12.8
Lakeland			70,576		78,452	10.0	97,422	24.2
Florida	9,746,961	43.5	12,938,07 1	32.7	15,982,400	23.5	18,801,310	17.6

Sources: BEBR Statistical Abstract, 2011.
U.S. Census data.

The population had been growing in Polk County at a rate slightly slower than that for the state from 1980 until 2000, when the rate of growth in the county exceeded that of the state as a whole. Since 1990, the population growth experienced in the unincorporated county has exceeded that of both Bartow and Lakeland. In 2010, Polk County was the 9th most populous of the 67 counties in Florida, and it ranked 19th in population density.

Table 3.2.3-2 provides the medium projections of population prepared by the Bureau of Economic and Business Research (BEBR) at the University of Florida.

Table 3.2.3-2. Medium Projections of Estimates of Population

Area	Population 2010	Population 2015	Population Change 2010 to 2015	Population 2020	Population Change 2010 to 2020	Population 2030	Population 2035
Polk County	602,095	654,600	8.7	713,900	18.6	828,500	881,700
Florida	18,801,310	19,974,400	6.2	21,326,800	13.4	23,877,900	25,017,100

Source: BEBR Statistical Abstract, 2011.

It is anticipated that Polk County will experience a higher growth rate than that of the state as a whole through 2035.

3.2.3.2 Existing Land Use

Existing land use and land cover characteristics, using the Level II categories of the Florida Land Use, Cover and Forms Classification System (FLUCFCS), within the PPS Site and the surrounding area within a 5-mile radius, are shown at a scale of 1 inch equals 1 mile (1:63,360 proportion scale) on Figure 3.2.3-1.

The majority of the PPS Site has been impacted by phosphate mining and has been reclaimed. The existing land use features are an electrical power plant generating facility with a total of five operating units and a large cooling reservoir.

Existing land uses found adjacent to the PPS Site boundaries primarily include reclaimed and unreclaimed phosphate mining areas. From a land use perspective, those reclaimed areas currently function as agricultural land. Approximately 85 homes are located in areas west of SR 37 north of the Site along Albritton and Bethlehem Roads. The Alafia Bible Camp is also located along Bethlehem Road, and the Bethlehem Primitive Baptist Church and Cemetery are located at the western edge of Bethlehem Road. Approximately 15 homes are located southwest of the Site adjacent to SR 674. The only other areas of residential and commercial development found within a 5-mile radius of the Site are located approximately 4 miles to the north in the unincorporated community of Bradley Junction.

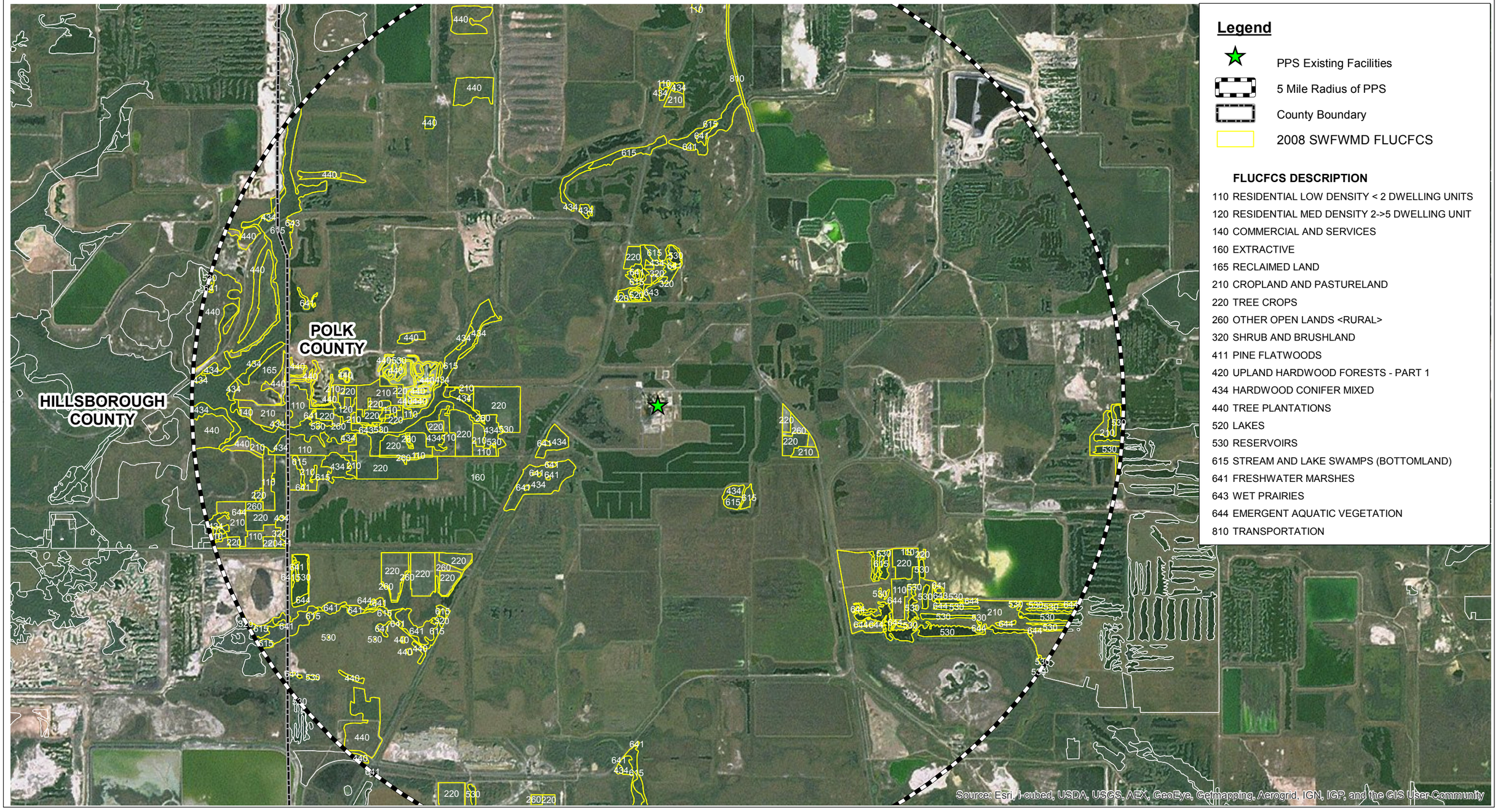
3.2.3.3 Proposed Development

PPS is compatible with mining and utility projects existing in the region. The Hardee Power Station, located at the Polk/Hardee County line, approximately 4 miles to the south, is developed with a 370-MW natural gas- and fuel oil-fired unit. Collocated at this site is the Midulla Generating Station, an 810-MW natural gas-fired power plant with eight generating units. Progress Energy has developed the Hines Energy Complex approximately 5 miles east of the Site. Currently, there are 1,912 MW of electrical generation from four CC units. All of these electrical power generating units have come into commercial operation since 1999.

3.2.4 LEASES, EASEMENTS, TITLE, AGENCY WORKS

The proposed Polk 2-5 Conversion Project will be constructed on property that Tampa Electric owns. No additional easements or right-of-way will be required for the Project. Chapter 9.0 addresses the proposed offsite transmission line corridors.

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Legend

- PPS Existing Facilities
- 5 Mile Radius of PPS
- County Boundary
- 2008 SWFWMD FLUCFCS

FLUCFCS DESCRIPTION

110 RESIDENTIAL LOW DENSITY < 2 DWELLING UNITS
120 RESIDENTIAL MED DENSITY 2->5 DWELLING UNIT
140 COMMERCIAL AND SERVICES
160 EXTRACTIVE
165 RECLAIMED LAND
210 CROPLAND AND PASTURELAND
220 TREE CROPS
260 OTHER OPEN LANDS <RURAL>
320 SHRUB AND BRUSHLAND
411 PINE FLATWOODS
420 UPLAND HARDWOOD FORESTS - PART 1
434 HARDWOOD CONIFER MIXED
440 TREE PLANTATIONS
520 LAKES
530 RESERVOIRS
615 STREAM AND LAKE SWAMPS (BOTTOMLAND)
641 FRESHWATER MARSHES
643 WET PRAIRIES
644 EMERGENT AQUATIC VEGETATION
810 TRANSPORTATION

FIGURE 3.2.3-1.

LAND USE/COVER MAP WITHIN 5 MILES OF POLK POWER STATION SITE

Sources: ESRI/AEX, 2009; SWFWMD, 2008; Tampa Electric, 2012; ECT, 2012.

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Miles

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3.2.5 REGIONAL SCENIC, CULTURAL, AND NATURAL LANDMARKS

There are no onsite regionally significant scenic, cultural, or natural landmarks. The aesthetic character of lands within the boundaries of and adjacent to the PPS Site are largely influenced by present and past mining operations. Because these lands have been previously disturbed by mining operations, there are virtually no areas of aesthetic or visual importance and significance. Neither the CFRPC Strategic Regional Policy Plan (SRPP) nor the Tampa Bay Regional Planning Council SRPP identifies any regionally significant natural resources in proximity to PPS.

The following areas are *not* found within a 5-mile radius of the site:

- National parks.
- National forests.
- National seashores.
- Military lands.
- Roadless area review and evaluation (RARE) areas.
- National wild and scenic rivers.
- Scenic and wild rivers.
- State parks.
- State forests.
- National memorials or monuments.
- Areas of critical state concern.
- National marine and estuarine sanctuaries.
- Native American reservations.

3.2.6 ARCHAEOLOGICAL AND HISTORIC SITES

Correspondence from the Florida Division of Historical Resources (FDHR) stated that one prehistoric site had previously been recorded in the project area. This site is not eligible for listing on the National Register of Historic Places, nor is it considered significant at a regional or local level. Therefore, no adverse impacts to significant cultural resources are expected. FDHR requested that a cultural resources assessment be conducted in Section 4 of Township 32 South, Range 23 East, prior to the initial certification. A cultural resources assessment was conducted in 1991. No archaeological or historic sites and no historical structures were discovered or recorded as part of that assessment.

3.2.7 SOCIAL AND ECONOMIC CHARACTERISTICS AND PUBLIC SERVICES

3.2.7.1 Social and Economic Characteristics

Employment and Income

The Florida Statistical Abstract (BEBR, 2011) provides employment and economic information at the county level. Polk County had an estimated labor force of 275,449 in 2010. Unemployed persons in 2010 totaled 34,546 for an unemploy-

ment rate of 12.5 percent. The unemployment rate in 2009 was 11 percent. The statewide unemployment rate in 2010 was 11.5 percent and 10.2 percent in 2009. The total number of Polk County jobs was 207,774 in 2009, indicating the county exports workers to surrounding counties. Major industries in terms of employment in Polk County in 2010 were as follows:

Industry	Number of Persons Employed	Percent of Total Persons Employed
Accommodation and food services	13,439	9.6
Government	29,332	20.9
Retail trade	23,947	17.1
Administration and support	14,398	10.3
Health care and social assistance	25,055	17.9
Transportation and warehousing	10,680	7.6
Manufacturing	14,117	10.1
Construction	9,385	6.7

Per capita personal income in Polk County in 2009 was $32,336 compared to the Florida and national per capita figures of $38,965 and $39,635, respectively. The relationship between revenue and expenditure per capita is an indicator of the cost of providing services and the economic stability of a local government. For 2008 to 2009, Polk County reported $1,450 per capita for expenditures, compared to $1,353 per capita income from revenues, equating to a deficit of $97 per capita. The comparable amounts for Florida for 2008 to 2009 are $2,083 (expenditures), $2,344 (revenue), and $261 (surplus).

Polk County identified the percentage of acreage of existing land uses in its 2008 evaluation and appraisal report as follows (Polk County, 2011):

Land Use (November 2007)	Percentage of Total Acreage
Residential	10.51
Commercial/service	1.15
Industrial/warehousing	1.48
Phosphate areas	13.39
Agricultural	37.87
Preservation/open space	14.18
Institutional	0.58
Development of regional impact	2.12
Professional institutional, office center, and employment center	0.16
Lakes	6.63
Cities	11.92
Total (acres)	1,286,134.10

Housing

The 2010 U.S. Census indicates that there were 227,485 occupied housing units in Polk County. Of these, 160,442 were owner-occupied (70.5 percent), and 67,043 were renter-occupied. In 2010, there were 53,729 vacant housing units, of which 12,562 were for rent and 7,283 were for sale. The persons-per-household multiplier was 2.58 in 2010. In 2011, there were 350 apartment buildings with a total of 21,092 units, three rooming houses with 23 total units, 3,219 rental condominiums (6,186 total units), and 34 transient apartment buildings with 1,048 total units. Countywide housing permit activity for 2010 was 1,145 single-family units and 154 multifamily units. There were 1,087 single-family housing construction starts and 103 multifamily housing units construction starts in 2010. For the year 2009 to 2010, there were 47,250 mobile home tags sold in Polk County, the largest number by county in the state. Of the single-family homes and multifamily units permitted in 2010, 61.6 percent of the single-family home and none of the multifamily unit permits were for the unincorporated area.

The median value of owner-occupied housing in Polk County in 2010 was $141,900 compared to the statewide median value of $205,600.

3.2.7.2 Area Public Service and Utilities

Transportation Facilities

Transportation facilities servicing the PPS Site include roadways and rail. No public or private airport facilities are located within a 5-mile radius of the PPS Site. Figure 3.2.1-1 shows the regional transportation facilities.

Major roadways within a 5-mile radius of the Site include SR 37, SR 674, and CR 630. Those within a 10-mile radius include CR 640, CR 39, and SR 62, while major roadways outside of a 10-mile radius include SR 60, U.S. Highway 17 (U.S. 17), U.S. Highway 98 (U.S. 98), Interstate Highway 4 (I-4), and Interstate Highway 75 (I-75).

The PPS Site is provided with direct rail access by the CSX Railroad via an existing north-south rail line adjacent to the east along Fort Green Road. Additional regional CSX rail lines traverse the northwest from Bradley Junction through unincorporated Keysville in Hillsborough County through unincorporated Brandon west to Tampa and east from Brandon to northeast through Lakeland and Winter Haven.

As previously stated, no public or private aviation facilities are located within a 5-mile radius of the Site. The nearest private airports to the PPS power block include the Circle K Airport (approximately 14.5 miles to the north) and the Anderson Airport (approximately 18 miles to the west along SR 674 in Hillsborough County). The closest public airports to the Site include the Wauchula Airport approximately 17.5 miles to the southeast, Lakeland Municipal Airport approximately 18 miles to the north, and Bartow Municipal Airport approximately 19.5 miles to the northeast. Tampa International Airport lies more than 37 miles to the west-northwest.

Traffic Volumes

The PPS Site is bordered by SR 37 to the west, CR 630 to the north, and partially by Fort Green Road to the east. SR 37 is a two-laned highway classified as a minor arterial that currently functions at level of service (LOS) B from SR 640 to CR 640, based on 2012 traffic counts of 4,800 annual average daily traffic (AADT) trips. SR 674 is also a two-laned highway classified as a rural major collector currently functioning at LOS C from the Hillsborough County line to SR 37 with 1,800 AADT trips (2012). CR 630 from SR 37 to the east is a two-laned highway functionally classified as a minor arterial currently functioning at LOS B with 3,300 AADT trips. Fort Green Road/CR 663, a two-laned highway identified as a rural major collector, is currently functioning at LOS A, with an estimated 2012 AADT trips of 1,400. The county minimum LOS standard for rural arterial and collector roads is LOS D.

Educational Facilities

According to the Polk County School Board Web site, there are 66 elementary schools, 4 elementary/middle schools, 18 middle schools, 3 middle/high schools, 18 high schools, 2 technical career centers, 2 adult schools, 11 alternative education facilities, 24 charter schools, 5 Department of Juvenile Justice sites, and 3 off-campus Head Start sites serving an estimated student population of more than 94,000.

The nearest Polk County schools are in Mulberry and Fort Meade. There are two elementary schools, a middle school, and a high school located in Mulberry. There are three elementary schools and a middle-senior high school located in Fort Meade. No public schools are located in unincorporated Bradley Junction; school-aged children in Bradley Junction attend Mulberry schools.

Medical Facilities

The nearest hospital to the Site is Bartow Regional Medical Center located in Bartow approximately 16 miles to the northeast. Bartow Regional Medical Center is a for-profit hospital. The hospital is equipped with emergency rooms. Persons requiring emergency trauma center services would be sent to Lakeland Regional Hospital, located approximately 17 miles to the north, or would be air-lifted to Tampa General Hospital, which is an approximately 20-minute helicopter flight from PPS.

Polk County has seven hospitals totaling 1,658 general hospital beds (October through December 2010) at a ratio of 363 general hospital beds per 100,000 population. The emergency medical services (EMS) facilities that would respond to PPS are located at the Fort Meade Fire Station. These facilities include advanced life support. The Fort Meade Fire Station EMS response time is estimated to be 20 to 30 minutes.

Fire Protection

The nearest fire station to the PPS Site within Polk County is the Bradley Station (Polk Company 750), located approximately 4.4 miles to the north, in Bradley Junction. This station is manned by three fulltime firefighters 24 hours per day, 7 days per week, and four volunteer firefighters. This facility is a primary response unit and is equipped with a pumper truck (approximately 750 gallons per minute [gpm]), tanker truck, and brush truck. Estimated response times range from 8 to 12 minutes for responses by fulltime firefighters. The next nearest facility is the Fort Meade Station, which is a city rather than county facility, manned by 15 to 20 volunteers, at an estimated response time of 20 to 25 minutes. This station is equipped with three full-sized pumper trucks (greater than 1,000-gpm capacity) and a tanker truck. Additional county stations are located in Mulberry, Willow Oak, and Highland City.

Police Protection

PPS lies in unincorporated Polk County and would receive police services from the Polk County Sheriff's Department. Deputies patrolling this area are based out of the Southwest Regional Substation, located at 2105 East Lakewood Drive in south Lakeland. A total of approximately 84 sworn officers are located at the southwest district. Responses are prioritized according to urgency, with an average estimated response time of 10 to 15 minutes for a routine response, with a considerably shorter time expected for high-priority emergencies. Because PPS lies in unincorporated Polk County and is more than 10 miles from the nearest

municipality, responses by city police departments under most circumstances are not expected (Polk County Sheriff's Department, 2012).

Potable Water, Sanitary Sewer, and Solid Waste

The PPS Site is located in rural Polk County, an area not provided with public potable water supply or sanitary sewerage service. Because this rural area is not provided with municipal service, relevant system capacities are not applicable in this area. The applicant will be its own provider for most utilities required by the project and its employees. Electricity, potable water, and sanitary sewage treatment/disposal services will be provided by onsite facilities appropriately designed to meet these expected service demands.

Currently, potable water is supplied from an onsite 10-inch diameter well approximately 900 feet (ft) deep. This well is capable of supplying 432,000 gallons per day (gpd), which is treated onsite. The approximate current potable water demand is approximately 2,300 gpd for the existing workforce of 78 employees. The existing potable water treatment system has a design capacity of 10,500 gpd.

Sanitary wastewater is currently disposed in an onsite septic tank and drain field. The septic tank has a capacity of 5,000 gpd. The average current wastewater generation is approximately 2,300 gpd.

The north-central landfill, located on Highway 540 between Lakeland and Winter Haven, is currently the only operating landfill in Polk County. Domestic, construction, and certain industrial solid waste disposal services will be provided by contracted services with an approved, licensed contractor serving the region. According to a spokesperson with the Polk County Solid Waste Department, there are approximately 65 years of estimated capacity based on projected landfilling rates.

Recreation and Open Space

No recreational areas, open space, or public lands are currently located adjacent to, or in the immediate vicinity of, the PPS Site except for the portion of the originally certified Site that was donated to FDEP. The nearest recreational facility to the Site is the Bradley Junction Recreational Park, located at the extreme northern perimeter of the 5-mile study area, within Section 11 of Township 31 South, Range 23 East. This 1.5-acre neighborhood park is located on Pine Street between Whidden and 1st Streets and contains a baseball/softball field, basketball court, and small playground. This facility has no restrooms, showers, concessions, shel-

ters, or electric service and is not manned by a county attendant. A community park is shown on the Polk County Parks map approximately 8.5 miles to the northeast.

Tampa Electric's donation of the portion of the originally certified Site located west of SR 37 to FDEP as a wildlife management/recreation area is the closest public lands area to the Site.

3.3 PHYSICAL AND BIOLOGICAL ENVIRONMENT

3.3.1 GEOLOGY AND HYDROLOGY

3.3.1.1 Geological Description of the Site and Area

Regional Stratigraphy

The PPS Site and surrounding region contain surficial layers of unconsolidated sand and clay underlain by a thick sequence of sedimentary rocks. A summary of the shallow and deep hydrogeologic framework for the Central Florida phosphate district of west-central Florida is presented in Table 3.3.1-1 and illustrated on Figure 3.3.1-1.

In the vicinity of the Site, the Upper Cretaceous Pine Key Formation is present at the approximate well completion depth of 8,000 feet below land surface (ft bls) for the two onsite deep underground injection wells, IW-1 and IW-2. The Upper Cretaceous Lawson limestone (which may correlate to the Upper Pine Key Formation) occurs above this and is present between roughly 4,600 to 4,800 ft bls. Overlying this stratigraphic unit is the lower unit of the Cedar Keys Formation, which is still of the Late Cretaceous age and present between depths of 4,200 to 4,600 ft bls. The lower unit of the Cedar Keys lies above the Lawson Formation. The Upper and Middle units of the Paleocene Cedar Keys Formation overlie the Late Cretaceous units, and these strata are anticipated to occur at depths equal to or greater than approximately 2,700 ft.

Above these Cretaceous-age units is the Eocene Series, which includes the Oldsmar Formation, Avon Park Limestone, and Ocala Group. The Avon Park Limestone is the lower of two highly productive units of the upper Floridan aquifer. The Ocala Group crops out in the area of the Green Swamp of northern Polk County and increases in depth toward the south.

The Suwannee Limestone of Oligocene age overlies the Ocala Group. The Suwannee Limestone ranges in thickness from approximately 80 ft to more than

Table 3.3.1-1. Hydrogeological Framework for West-Central Florida

System	Series	Stratigraphic Unit		General Lithology	Major Lithologic Unit	Hydrogeological Unit	
Quarternary	Holocene and Pliestocene	Undifferentiated surficial deposits		Predominantly fine quartz sand; shell interbedded clay, marl, peat, dolostone, sandstone, and phosphorite	Sand	Surficial aquifer system	
		Fort Thompson Formation		Shelly quartz sand, unfossiliferous quartz sand, and thin limestone beds			
		Caloosahatchee Formation		Shelly quartz sand; thin, shelly limestone beds, and marl	Clastic	Confining unit	Intermediate aquifer system
Tertiary	Pliocene	Tamiami Formation		Sandy limestone, clayey and pebbly sand; clay, marl, shell, phosphatic			
	Miocene	Hawthorn Group	Peace River Formation*	Clayey, phosphatic, sandy beds; silty and sandy phosphatic clay beds, and clayey phosphatic quartz sand	Carbonate and clastic	Aquifer	
			Arcadia Formation†	Dolomite and clay, and limestone, silty, phosphatic		Confining unit	
	Oligocene	Suwannee Limestone		Limestone, sandy limestone, fossiliferous	Carbonate	Floridan aquifer system	
	Eocene	Ocala Group		Limestone, chalky, foraminiferal, dolomitic, near bottom			
		Avon Park Formation		Limestone and hard brown dolomite; intergranular evaporite in lower part in some areas		Upper Floridan aquifer Middle confining unit Lower Floridan aquifer	
		Oldsmar Formation		Dolomite and limestone, with intergranular gypsum in most areas			
	Paleocene	Cedar Keys Formation		Dolomite and limestone with beds of anhydrite	Carbonate with evaporites	Sub-Floridan confining unit	

*Peace River Formation includes Bone Valley Member and undifferentiated deposits.
†Arcadia Formation includes undifferentiated deposits, Tampa Member, and Nocatee Member.

Sources: Ryder, 1985.
Johnson, 1989.

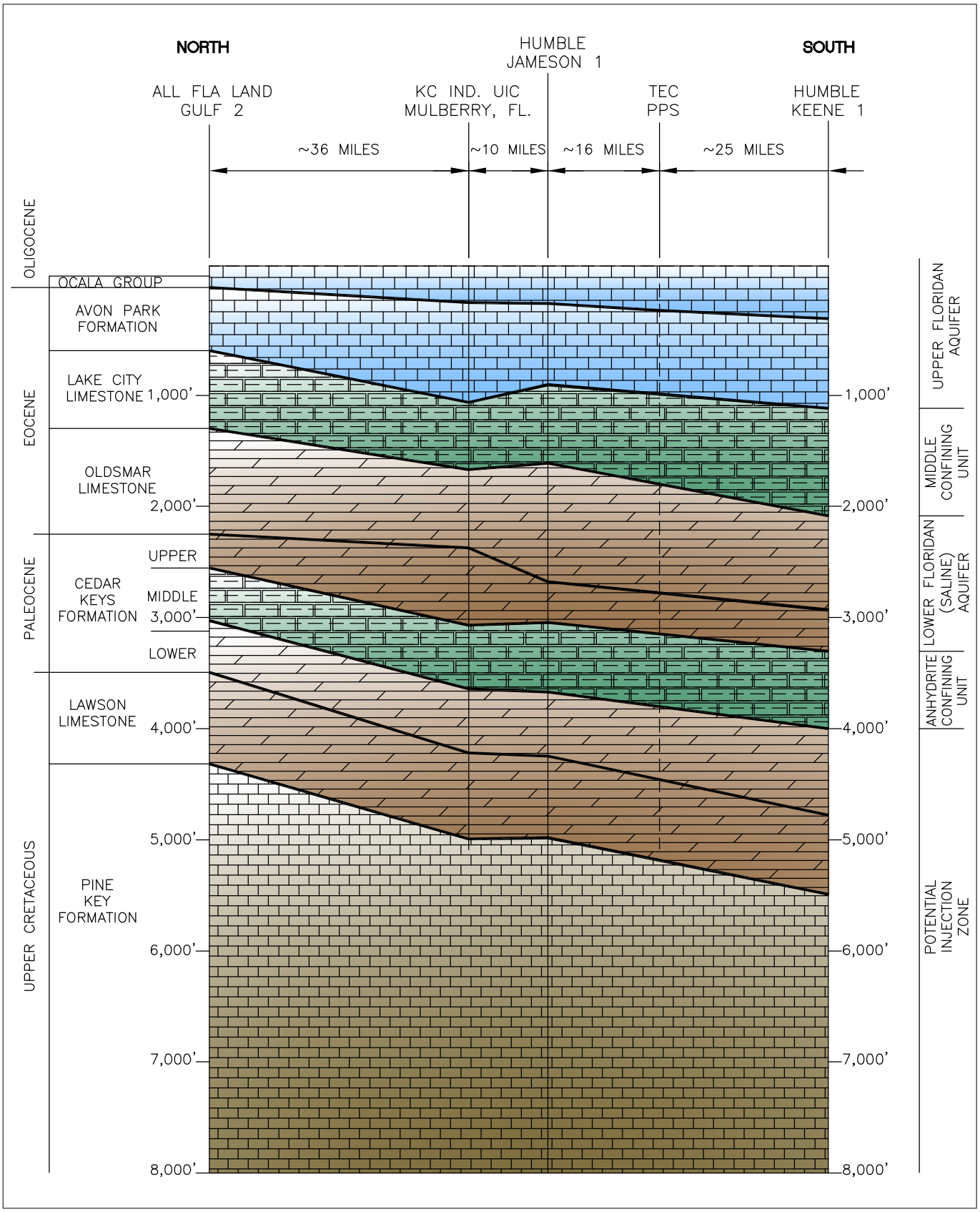


FIGURE 3.3.1-1.

DEEP HYDROGEOLOGIC FRAMEWORK FOR WEST-CENTRAL FLORIDA

Source: Kaiser, 1972; ECT, 2012.

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250 ft. In Polk County, the Suwannee Limestone pinches out to the north and east. The Suwannee Limestone is the top of two highly productive units of the upper Floridan aquifer and is overlain by strata comprising the Hawthorn Group.

The Hawthorn Group consists of the Arcadia Formation and the Peace River Formation, in ascending order. The Arcadia Formation contains, in ascending order, the Nocatee and Tampa Members plus an unnamed member. The Arcadia Formation consists of dolomite, sand, clay, and silty, phosphatic limestone. The Peace River Formation is comprised of clayey phosphatic sand beds (Scott, 1986). The thickness of the Hawthorn Group ranges from very thin to approximately 300 ft.

The Tamiami Formation, Caloosahatchee Marl, and Fort Thompson Formation generally occur west and south of the site location near the Gulf Coast. Near the PPS Site, these formations are discontinuous, and the Bone Valley member dominates. The Bone Valley member of the Peace River Formation ranges from 20 to 60 ft in thickness and is the primary ore zone for phosphate pebble mining.

The most recent deposits are undifferentiated sands and terrace deposits, which may range in thickness from 0 to 70 ft.

Site Area Stratigraphy

Stratigraphic data were collected from a wire-line core at Monitor Station GW-1 (see Figure 3.3.1-2) plus detailed lithologic and geophysical logging during the drilling of the two onsite injection wells. Injection well IW-1 was drilled to a depth of 8,000 ft bls.

Based on these data, the undifferentiated surficial sand deposits ranged in thickness from 15 to 28 ft. For the Hawthorn Group, the Peace River Formation ranged in thickness from 16 to 40 ft, and the Arcadia Formation was approximately 225 ft thick. The Suwannee Limestone was encountered at a depth of approximately 285 ft. Although this unit was not fully penetrated during initial site development and drilling of the water supply wells, subsequent investigations for the injection well installation included drilling to depths of 8,000 ft as mentioned previously. The carbonate sequence encountered included the Suwannee Limestone, Ocala Group, Avon Park Formation, Lake City Limestone, Oldsmar Limestone, Cedar Keys Formation, Lawson Limestone, and Pine Key Formation extending to depths of roughly 8,000 ft. The Lake City Limestone plus the upper and middle

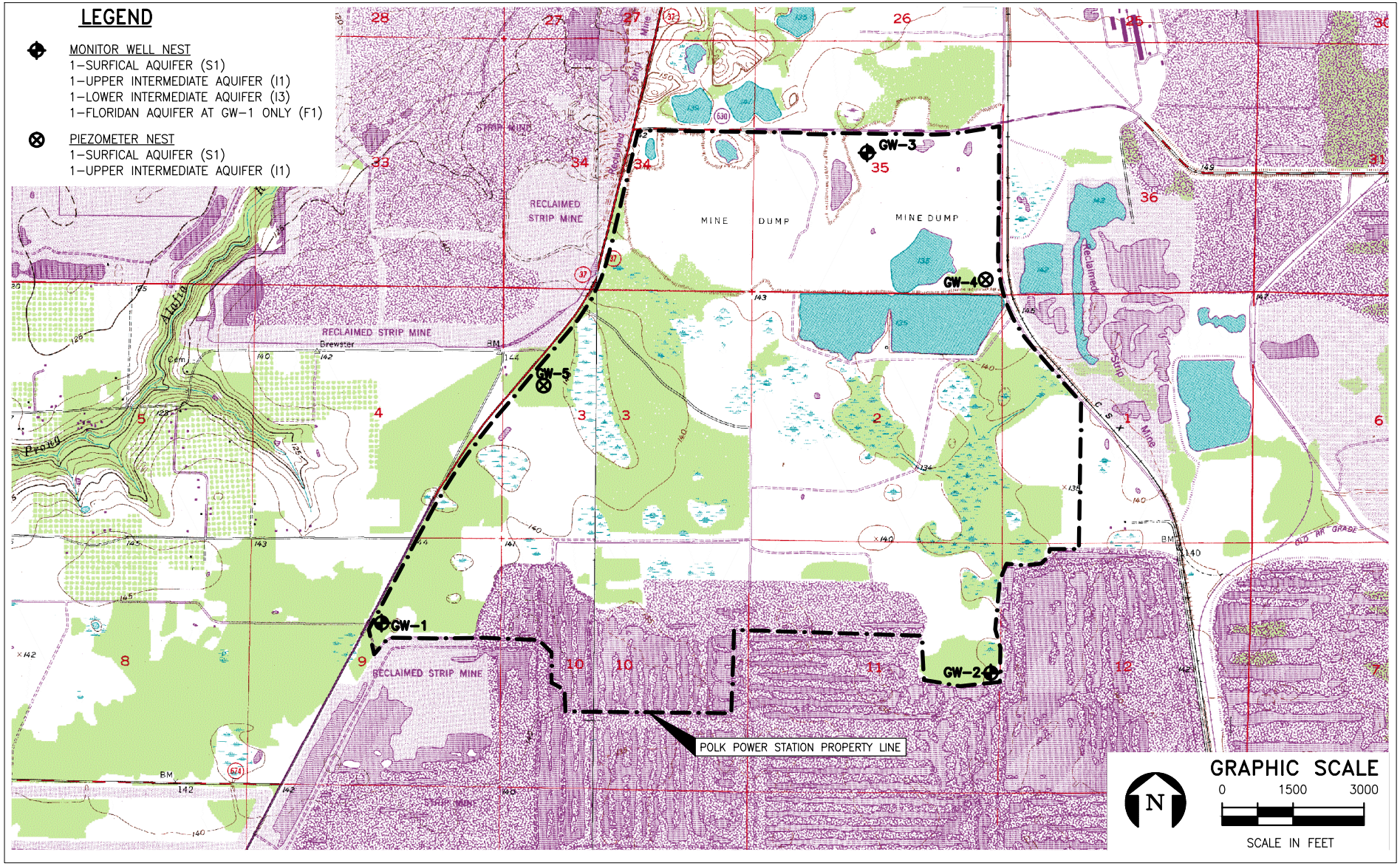


FIGURE 3.3.1-2.

GROUNDWATER MONITORING STATION LOCATION MAP (1992 SCA)

Sources: USGS Quads: Duette NE, FL, 1987; Baird, Fl, 1987; ECT, 2012.

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units of the Cedar Keys Formation act as confining units separating these deeper formations.

Site Area Structure

Three features influenced the depositional environments and geologic setting of southwest Central Florida (Figure 3.3.1-3). These features are the Peninsular Arch, Ocala Uplift, and South Florida Basin.

The main axis of the Peninsular Arch is located east of the site area, trends generally north-northwestward, and is estimated to be 275 miles long. The trend of the arch is approximately south 35 degrees (°) east, and extends from south-central Georgia to slightly northeast of Lake Okeechobee (Applin and Applin, 1965). The arch is thought to be an anticlinal fold of late Paleozoic and early Mesozoic time, which caused differential subsidence of the overlying strata (Faulkner, 1970).

The Ocala Platform, or Ocala Uplift, is an additional geologic feature that parallels the Peninsular Uplift to the southwest. The Ocala Platform trends approximately north 25° west and covers an elliptical area approximately 230 miles long and 70 miles wide (Vernon, 1951). This feature extends from the vicinity of Dunellin to Otter Springs in Levy County and affects the Eocene and younger stratigraphic units. The Ocala Platform is not a true uplift, but rather an anomalous buildup of carbonates (Winston, 1976). A southern extension of this platform is the Central Florida Platform, which underlies much of the Central Florida Phosphate District (Hall, 1983). The PPS Site is located near the approximate center of the Central Florida Platform.

A third structural feature is the South Florida Basin. This basin is a broad, relatively flat, synclinal feature that trends approximately south 45° west and extends nearly 200 miles across the Florida peninsula. The maximum depositional thickening occurred during the Jurassic and Lower Cretaceous periods in the South Florida Basin.

No major faulting has been identified within the immediate vicinity of the PPS Site.

Site Area Physiography

The site area falls in the geomorphic province known as the Polk Upland (White, 1970). The majority of the PPS Site occurs on the Okefenokee Terrace (Sunderland Terrace) with an altitude range of +100 to +170 feet above mean sea level

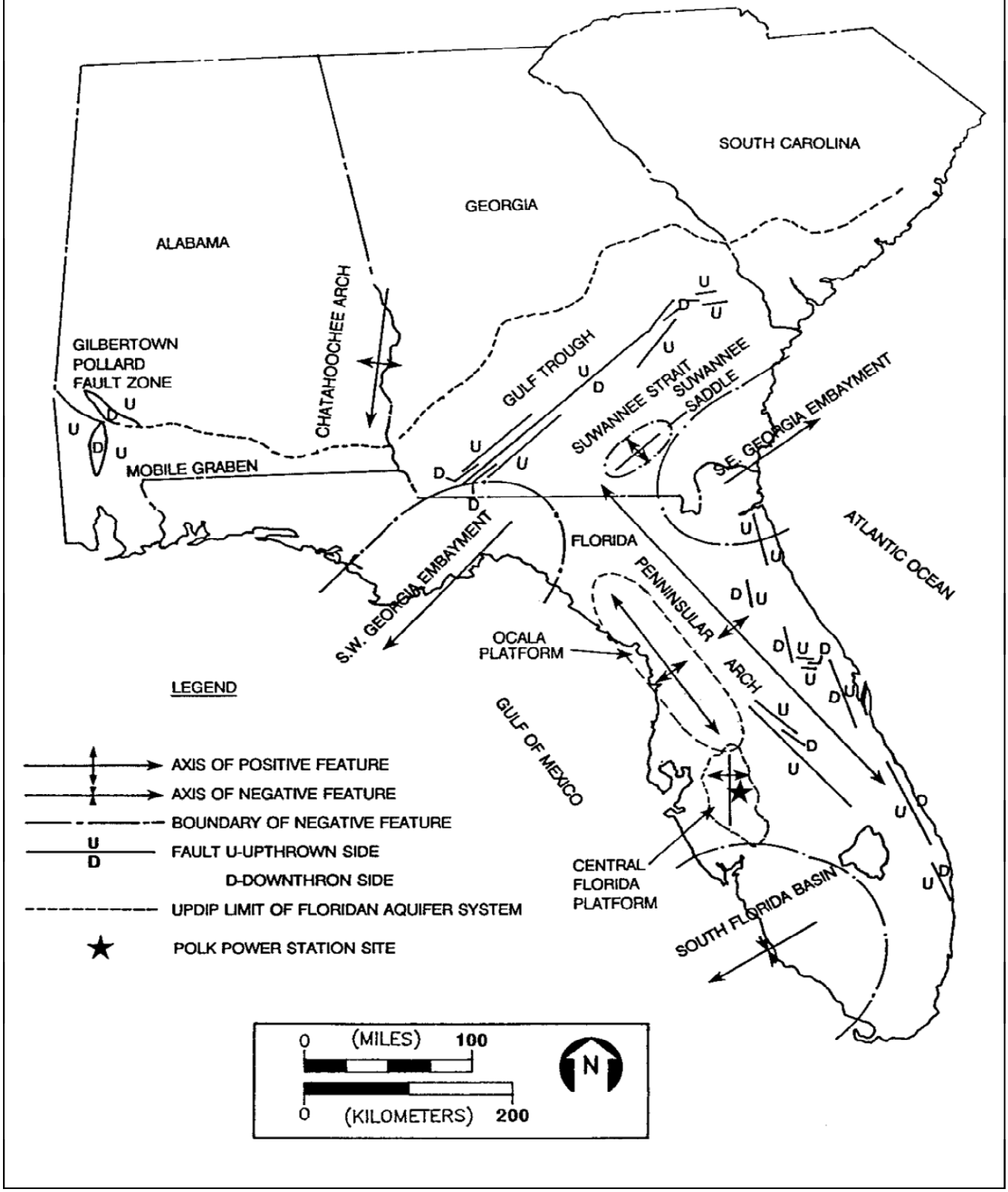


FIGURE 3.3.1-3.

STRUCTURAL AND GEOLOGIC FEATURES OF FLORIDA

Sources: Modified Miller, 1986. Hall, 1983.

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(ft-msl) and a shoreline altitude at +170 ft-msl. The Polk Upland is bordered by the DeSoto Plain on the south and the Lake Henry or Lake Wales Ridge on the east (Campbell, 1986) (Figure 3.3.1-4). The topography of the Polk Upland is flat and underlain by a veneer of sands. Only geomorphic features associated with remnants of ancient shorelines mark the land form as it slopes gently toward the south (Campbell, 1986).

Prior to mining activities in the 1980s, the land surface elevations ranged from approximately 130 to 200 ft-msl. The low elevation occurs at the southeast corner of the Project Site. Mine tailings mounds (from the early 1900s) in the northeast portion of the Site range between approximately 170 to 200 feet per National Geodetic Vertical Datum of 1927 (ft-NGVD) adjacent to Fort Green Road. The land surface elevation along SR 37 ranges from approximately 145 to 150 ft-NGVD. West of SR 37 the Site elevation ranges from approximately 150 to 110 ft-NGVD. Prior to the mining activities, the land surface was relatively flat with shallow slopes. The two exceptions are the old mine tailings mounds (northeast corner) and adjacent to the South Prong Alafia River (west-northwest corner). Several circular depressions are visible on soils and topographic maps and aerial photographs. These features may predate mining activities and will be further discussed in Section 3.3.2.2.

3.3.1.2 Detailed Site Lithologic Description

Detailed site-specific lithologic descriptions were developed based on regional information (Campbell, 1986; Chen, 1965; and Stewart, 1966) plus numerous site-specific subsurface investigations. The formations in the site area are summarized here in ascending order:

- Taylor Formation—Limestones, soft, chalky, with some anhydrite.
- Lawson Formation—Dolomites, coarse crystalline, hard, porous to very porous.
- Cedar Keys Formation—**Lower unit**: dolomites, fine crystalline, oolitic, and slightly gypsiferous in places, also porous in places; **Middle unit**: interbedded anhydrites and gypsiferous dolomites; **Upper unit**: dolomites, fine crystalline, hard, and slightly porous to porous.
- Oldsmar Formation—Limestones and dolomites with evaporites, soft to hard, chalky zones, occasional fine honeycomb, abundant nodules, and nests of nodules of gypsum altered from anhydrite.

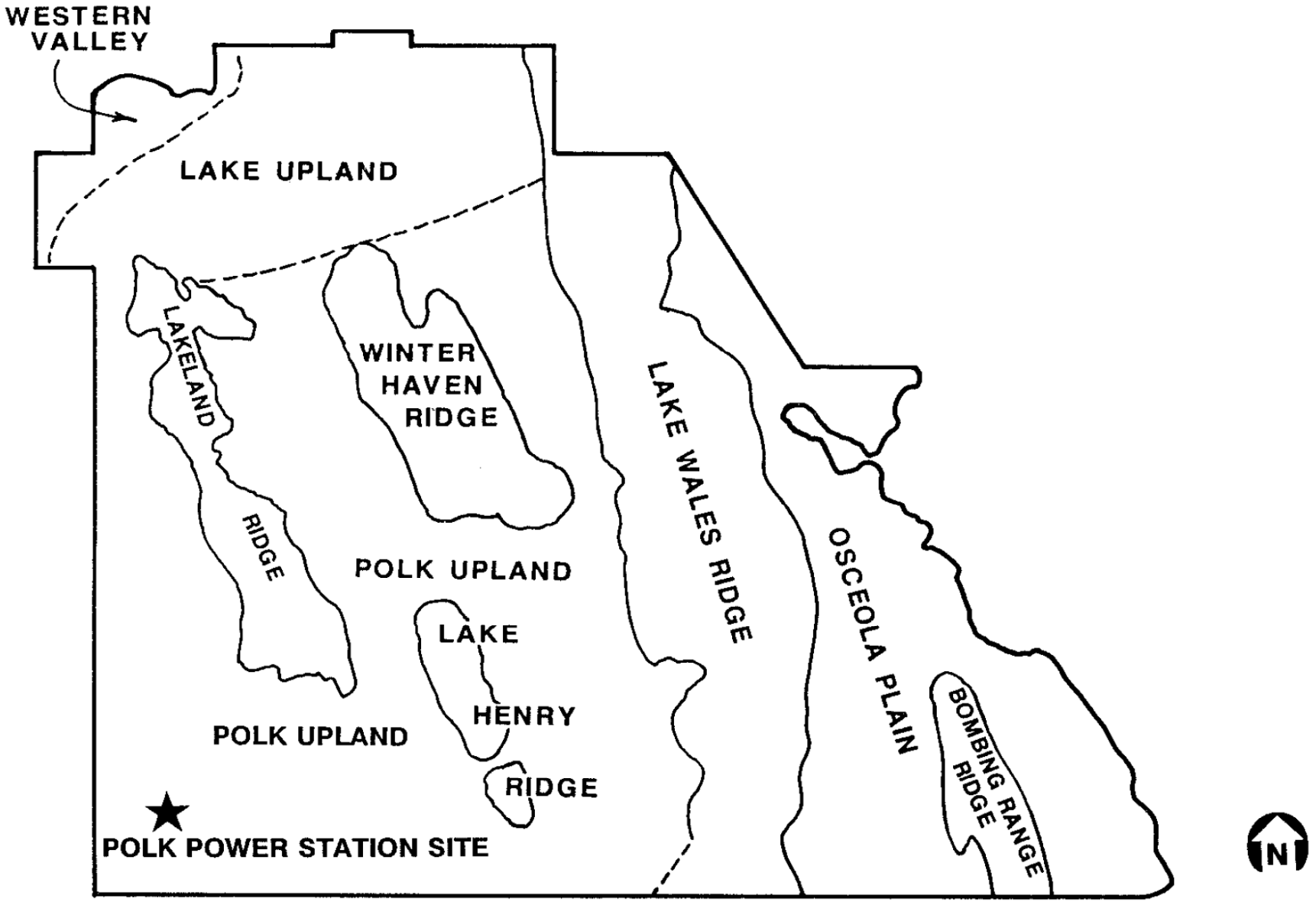


FIGURE 3.3.1-4.

PHYSIOGRAPHIC MAP OF POLK COUNTY

Sources: Modified Campbell, 1986. ECT, 1992.

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- Avon Park Formation—Limestone, chalky, nodular, oolitic, fragmental, intergranular anhydrite and gypsum, very fossiliferous, cream or white to dark brown; commonly dolomite zones in middle park, dense to finely crystalline, yellow to grayish brown. Lower dolomite unit massive, dense to finely crystalline or sucrosic, some coarsely crystalline, pale yellow and brown to dark brown and gray, mottled (Wilson, 1977).
- Ocala Group—Limestone, chalky, nodular, granular, fragmental, some oolitic, generally very fossiliferous, cream, white, some buff; occasional dolomite in lower part, dense and cherty, white, cream to dark brown, and gray.
- Suwannee Limestone—Limestone, nodular, granular, chalky, some fragmental, some oolitic, usually very fossiliferous, cream to white, occasionally some clear quartz grains.
- Hawthorn Group-Arcadia Formation—**Nocatee member**: sand, fine- to coarse-grained, clean to silty, limey, grayish green; and clay, silty, sandy, marly, gray to pale green, and hard, waxy, dark green to black, marly; minor limestone. **Tampa member**: limestone, massive or thick-bedded, hard, dense, cherty, fossiliferous, phosphatic, white to gray and brown; minor thin bedded sand and clay. Where underlying sand and clay unit is absent, equivalent beds are limestone, predominantly sandy, fossiliferous, gray, cherty; in places marly, soft, pebbly. **Undifferentiated member** (Hawthorn Carbonate unit): predominantly marl, dolomite and limestone; soft, chalky, fine-grained to sandy or pebbly; abundant brown or black phosphorite grains or pebbles; minor thin-bedded sand and clay. Generally the uppermost limestone in the section is less clastic than the underlying sand and clay unit, phosphatic throughout.
- Hawthorn Group-Peace River Formation—**Undifferentiated member**: interbedded sands, clays, and dolomite with varying phosphate content. **Bone Valley member**: clayey sand and sandy clay, fine-grained, calcareous to noncalcareous; abundant phosphorite nodules up to pebble size, white to gray in upper part, amber or black in lower part; includes beds of clean phosphatic sand and sand and gravel.
- Undifferentiated Surficial Deposits—Sand, clayey, very fine- to medium-grained, predominantly fine-grained; white to brown; trace of phosphate in lower part, minor thin beds of limestone and bluish gray clayey sand and clay.

Following approval of the original SCA and construction of the facility, Tampa Electric installed a series of new monitoring wells associated with the conditions of certification pertaining to the groundwater monitoring plan (GWMP) for the facility. The locations of the current monitoring wells used for the GWMP are illustrated in Figure 3.3.1-2 and will be discussed and described in more detail in Section 3.3.2

3.3.1.3 Geologic Maps

Soil types have been mapped by the U.S. Department of Agriculture in cooperation with the Polk County Soil Conservation Services (SCS) (1990).

The PPS Site is situated primarily on Smyrna-Myakka, Arents-Water, and Ona soil types (Figure 3.3.1-5). Seventeen other soil types occur across the Site but cover significantly less area.

The Smyrna-Myakka soil complex consists primarily of fine sands that cover broad areas of flatwoods. These soils are somewhat poorly drained with slopes that are smooth to concave at 0 to 2 percent. The water table within these soils is typically 0 to 1 ft bls for 1 to 4 months in most years. The Smyrna soils have an organic matter content of 1 to 5 percent, and the Myakka soils have an organic matter content of 2 to 5 percent (SCS, 1990). This soil complex has only a slight erosional risk.

The Arents-Water complex is a soil type resulting from mining activities. The Arents consists of piles (various slopes) of soil material and overburden that originally overlaid the phosphate matrix. The water part of this classification forms after the ore has been mined.

The Ona fine sands are also found in broad areas of flatwoods. The Ona soils are somewhat poorly drained with shallow slopes of 0 to 2 percent. The water table within this soil unit is typically 0 to 1 ft bls for 1 to 4 months in most years. The Ona sand has only a slight erosional risk.

The geology for Polk County and West-Central Florida have been mapped by Campbell (1986) and Brooks (1981), respectively. Figure 3.3.1-6 illustrates the surficial geology for West-Central Florida. As illustrated, the Bone Valley member of the Peace River Formation is the predominant surficial geologic unit in the study area.

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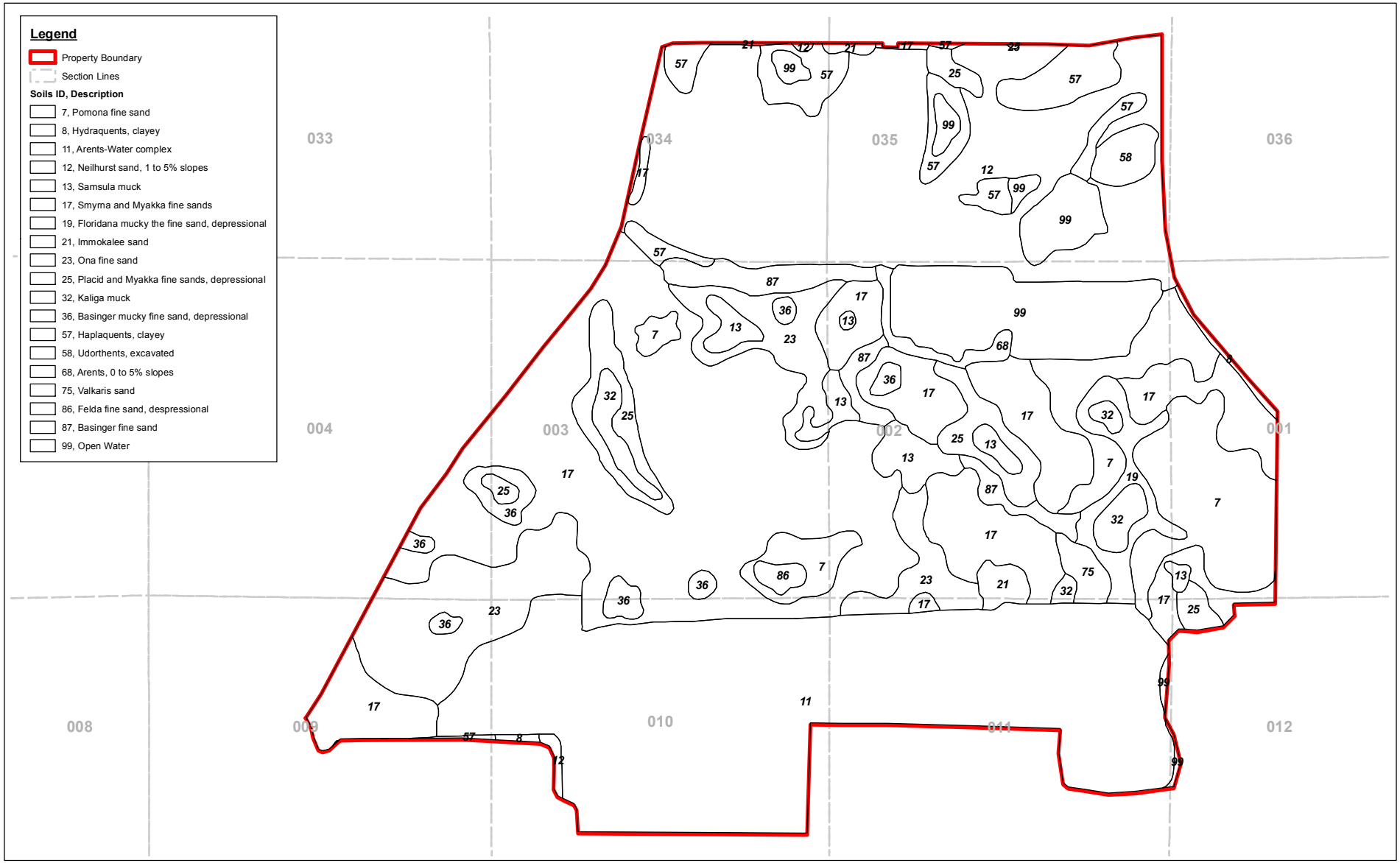


FIGURE 3.3.1-5.
SOIL TYPE DISTRIBUTION MAP

0 0.5
Miles

N

Sources: FGDL, 2006; ECT, 2012.

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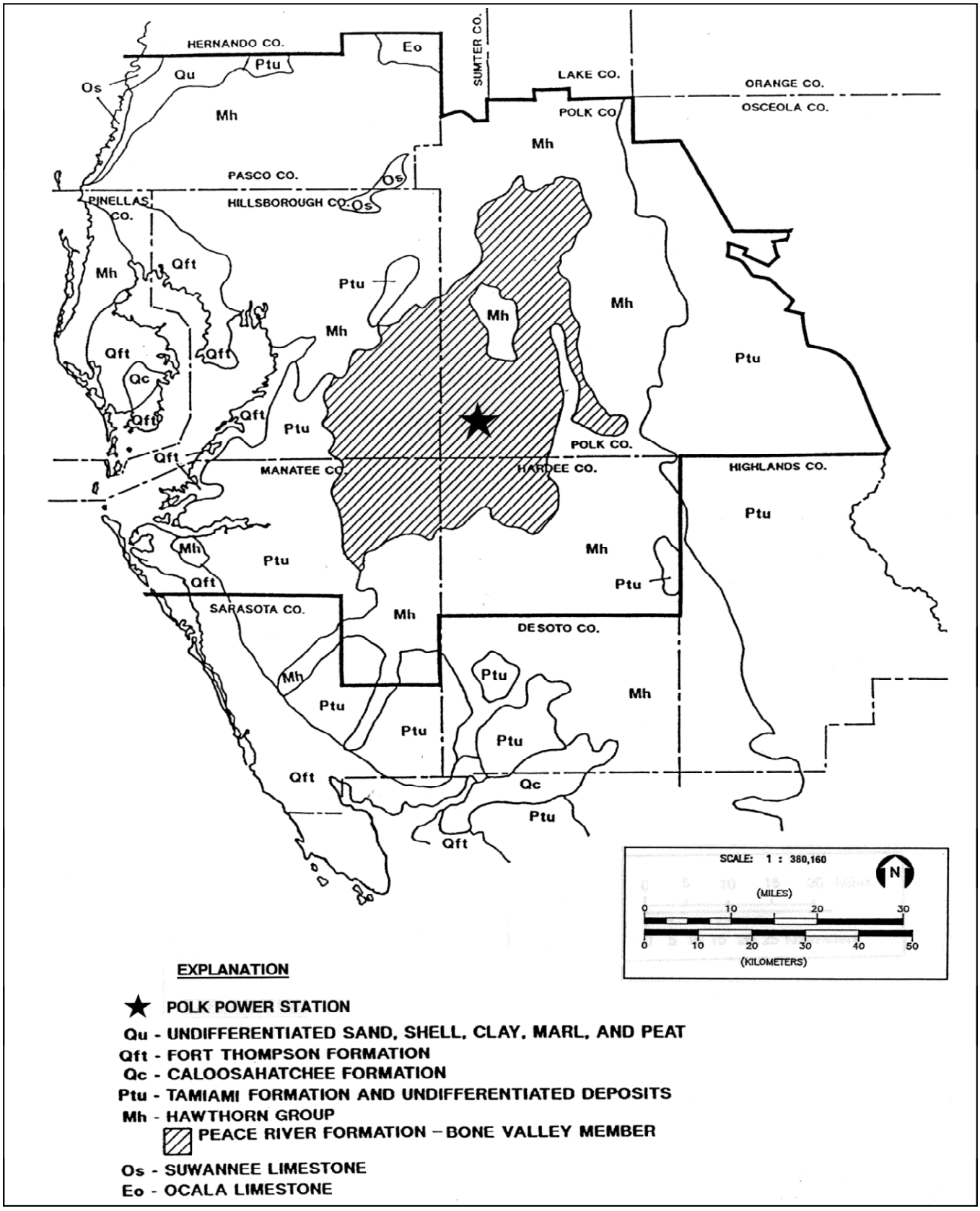


FIGURE 3.3.1-6.

SURFICIAL GEOLOGY OF WEST-CENTRAL FLORIDA

Sources: Modified from Brooks, 1981. ECT, 1991.

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Distinguishing the undifferentiated surficial sands from the Bone Valley member is based on a change in the clay content. The mine cuts, pits, and ditches from recent mining may penetrate most of the surficial sands and Bone Valley member. The first confining unit generally encountered would be the calcareous clay/mudstone or calcareous cemented strata of the Hawthorn Group.

3.3.1.4 Bearing Strength

Prior to construction of the initial plant in 1992 and subsequent construction of any new large plant structure, a detailed foundation analyses was performed, and the bearing strength of the subsurface materials was tested and analyzed. Based on testing completed as part of the 1992 SCA investigation in the unmined/undisturbed portions of the site, existing Units 1 through 5 were constructed and have operated for more than 15 years without any foundation problems or bearing strength issues. While some of the shallow unconsolidated soils may have limited strength, the underlying carbonate strata, which starts within the Hawthorn Group, are relatively strong.

Power plant structures typically have rigid settlement requirements but apply a relatively light load. Due to the compressible surficial deposits, it is expected that foundations for any additional major building structures will be supported on either driven displacement piles (with predrilling) or auger cast piles. Either pile type will be placed into competent carbonate strata within the Hawthorn Group.

For smaller facility structures with less stringent settlement requirement and smaller loads, it is anticipated that shallow spread footings will likely be used.

To supplement the baseline data previously obtained, additional geotechnical and drilling programs will be completed in the vicinity of the new plant features prior to construction. These new data, along with any previously obtained geotechnical data from past soil boring programs, will be evaluated for final foundation designs for the proposed Polk 2-5 Conversion Project facilities.

3.3.2 SUBSURFACE HYDROLOGY

The groundwater aquifer systems in Polk County include, in descending order, the surficial aquifer (usually unconfined), intermediate aquifer (usually semiconfined to confined), plus the Upper and Lower Floridan aquifers (usually confined). The confining units of the intermediate aquifer system separate the two intermediate

and Upper Floridan aquifers from one another. In southwest Polk County, the surficial aquifer and upper intermediate are hydraulically interconnected as are the lower intermediate and Upper Floridan aquifers. However, the two upper aquifers are not in good hydraulic connection to the three underlying and lower aquifers.

3.3.2.1 Subsurface Hydrological Data for the Site

Shallow Aquifer

The surficial aquifer is composed of the undifferentiated sands and clays plus the upper sandy section of the Bone Valley member of the Peace River Formation. The precipitation at the Site is approximately 53 inches per year. The amount of recharge entering the surficial aquifer is affected by runoff and evapotranspiration. Runoff and evapotranspiration may account for more than 90 percent of the precipitation received. The surficial aquifer is typically in hydraulic communication with the streams and lakes within southwestern Polk County.

A network of five locations was established as part of PPS's FDEP-approved GWMP to monitor the groundwater quality in the surficial, upper intermediate, lower intermediate, and Upper Floridan aquifers. Figure 3.3.1-2 illustrates the locations of the monitoring wells. All of the monitoring wells are constructed of 4-inch diameter polyvinyl chloride (PVC). The surficial aquifer monitoring wells range from 20 to 25 ft bls with either 15 to 21 ft of screened interval (GW-1S to GW-5S).

Groundwater levels data collected across the Site in accordance with the approved GWMP between 2002 and 2007 ranged from approximately 132 to 144 ft-NGVD. The water table fluctuation has been approximately 3 to 6 ft from the end of the dry season to the end of the wet season. The hydrograph presented in Figure 3.3.2-1 shows the time-dependent surficial aquifer water level fluctuations from the five observation wells. Figure 3.3.2-2 shows the groundwater contours for the surficial aquifer in May 2006. Table 3.3.2-1 summarizes the groundwater level measurements for all observation wells and aquifers monitored. Permeability tests (short duration pump and recovery tests) were conducted on all 4-inch diameter monitoring wells within the surficial and intermediate aquifer systems during the original 1992 SCA investigations; the hydraulic conductivity data for the surficial aquifer ranged from 5 to 11 feet per day (ft/day).

Groundwater flow in the surficial aquifer is toward two surface water features and forms a groundwater divide near SR 37. Groundwater east and south of the divide flows toward the Little Payne Creek (south and southeast). Hydraulic gradients

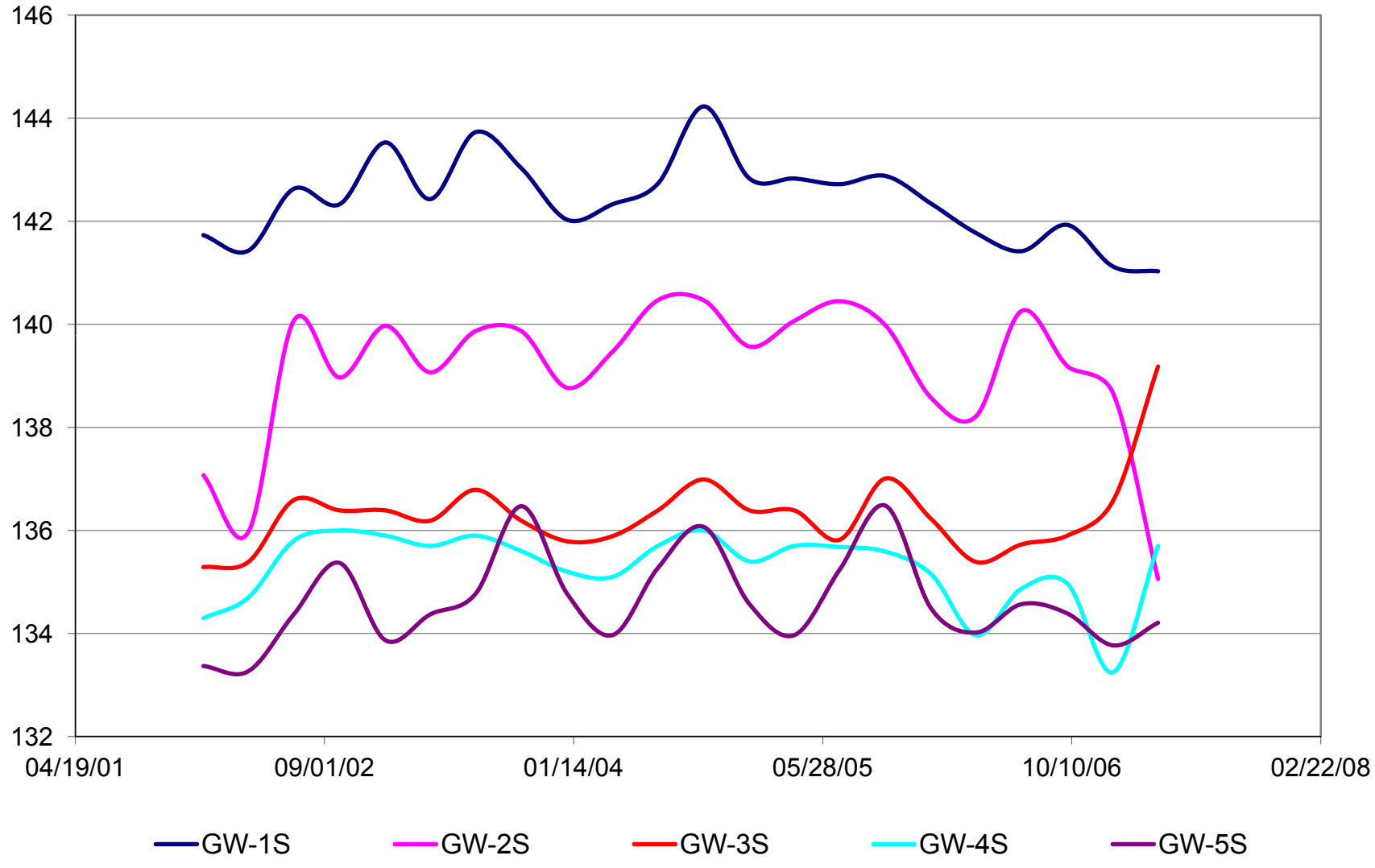


FIGURE 3.3.2-1.

HYDROGRAPHS FOR SURFICIAL AQUIFER MONITORING WELLS

Sources: TEC, 2007. ECT, 2007.

TECO TAMPA ELECTRIC

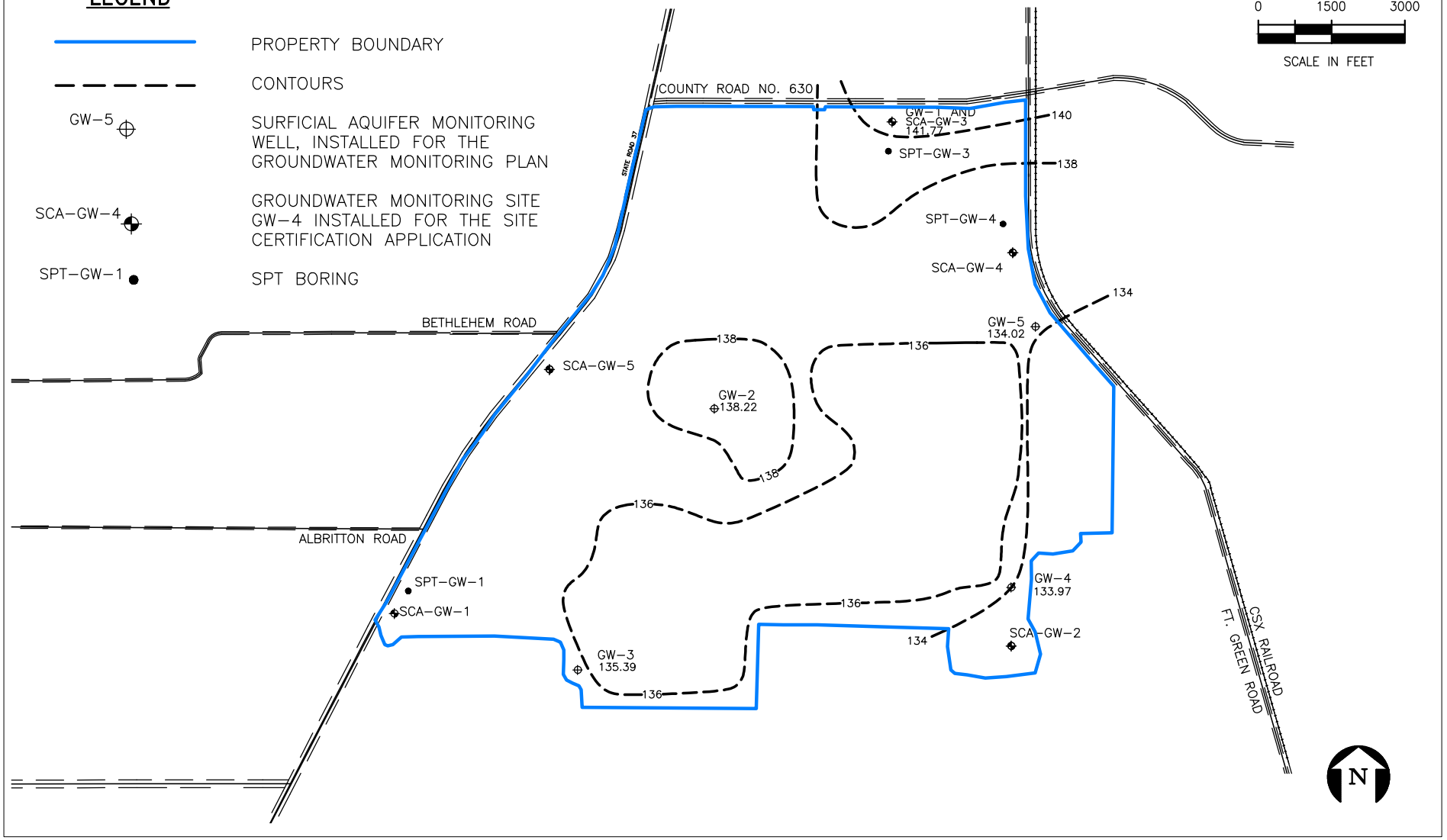


FIGURE 3.3.2-2.

GROUND WATER CONTOURS SURFICIAL AQUIFER - MAY 2006

Source: ECT, 2012.

TECO TAMPA ELECTRIC

Table 3.3.2-1. Summary of Ground Water Level Measurements (2002 to 2007)

Current Well Designation	SCA Well Designation	Aquifer Monitored	Location/Purpose	Jan 2002	Apr 2002	Jul 2002	Oct 2002	Jan 2003	Apr 2003	Jul 2003	Oct 2003	Jan 2004	Apr 2004	Jul 2004	Oct 2004
GW-1S	SCA GW-3	Surficial aquifer	Upgradient/background	141.73	141.43	142.63	142.33	143.53	142.43	143.73	143.03	142.03	142.33	142.73	144.23
GW-2S	GW-A (proposed)	Surficial aquifer	Slag storage/compliance	137.07	135.97	140.07	138.97	139.97	139.07	139.87	139.87	138.77	139.47	140.47	140.47
GW-3S	GW-B (proposed)	Surficial aquifer	SW reservoir/compliance	135.29	135.39	136.59	136.39	136.39	136.19	136.79	136.19	135.79	135.89	136.39	136.99
GW-4S	GW-C (proposed)	Surficial aquifer	SE reservoir/compliance	134.3	134.7	135.8	136	135.9	135.7	135.9	135.6	135.2	135.1	135.7	136
GW-5S	NA	Surficial aquifer	N reservoir/compliance	133.37	133.27	134.37	135.37	133.87	134.37	134.77	136.47	134.77	133.97	135.27	136.07
GW-1UI	SCA GW-3	Upper Intermediate aquifer	Upgradient/background	135.4	134.9	135.6	136.1	137.7	136.9	138	138	136.9	136.8	136.8	138.9
GW-2UI	GW-A (proposed)	Upper Intermediate aquifer	Slag storage/compliance	130.84	130.24	130.84	132.04	133.24	132.94	133.44	133.54	132.34	132.84	132.84	134.04
GW-3UI	GW-B (proposed)	Upper Intermediate aquifer	SW reservoir/compliance	132.91	132.41	132.31	133.81	135.11	134.71	135.51	135.51	134.41	134.21	134.01	136.31
GW-4UI	GW-C (proposed)	Upper Intermediate aquifer	SE reservoir/compliance	131.99	132.29	132.39	133.19	133.89	133.59	134.09	133.79	133.19	132.99	133.09	133.89
GW-1LI	SCA GW-3	Lower Intermediate. aquifer	Upgradient/background	90.45	85.15	86.75	96.05	99.65	72.79	74.19	74.69	69.79	64.89	66.59	82.29
GW-2LI	GW-A (proposed)	Lower Intermediate. aquifer	Slag storage/compliance	56.67	50.07	60.47	70.97	76.77	70.97	73.07	73.57	68.47	64.37	65.17	81.67
GW-2-F	GW-A (proposed)	Upper Floridan aquifer	Slag storage/compliance	56.17	49.57	59.97	70.27	73.97	70.27	72.97	73.07	67.77	63.87	64.67	81.37

Current Well Designation	SCA Well Designation	Aquifer Monitored	Location/Purpose	Jan 2005	Apr 2005	Jul 2005	Oct 2005	Jan 2006	Apr 2006	Jul 2006	Oct 2006	Jan 2007	Apr 2007
GW-1S	SCA GW-3	Surficial aquifer	Upgradient/background	142.83	142.83	142.72	142.88	142.34	141.77	141.42	141.93	141.12	141.03
GW-2S	GW-A (proposed)	Surficial aquifer	Slag storage/compliance	139.57	140.07	140.45	139.98	138.57	138.22	140.26	139.19	138.66	135.06
GW-3S	GW-B (proposed)	Surficial aquifer	SW reservoir/compliance	136.39	136.39	135.82	137.01	136.22	135.39	135.73	135.9	136.58	139.18
GW-4S	GW-C (proposed)	Surficial aquifer	SE reservoir/compliance	135.4	135.7	135.68	135.59	135.15	133.97	134.87	134.97	133.25	135.7
GW-5S	NA	Surficial aquifer	N reservoir/compliance	134.57	133.97	135.24	136.48	134.48	134.02	134.57	134.39	133.77	134.21
GW-1UI	SCA GW-3	Upper Intermediate aquifer	Upgradient/background	138	137.8	137.76	137.75	137.45	136.26	135.38	136.19	135.39	133.45
GW-2UI	GW-A (proposed)	Upper Intermediate aquifer	Slag storage/compliance	137.14	133.74	133.8	133.89	133.18	132.46	131.86	132.86	132.31	132.46
GW-3UI	GW-B (proposed)	Upper Intermediate aquifer	SW reservoir/compliance	135.41	135.51	135.48	136.17	135.31	134.36	133.45	134.62	134	133.93
GW-4UI	GW-C (proposed)	Upper Intermediate aquifer	SE reservoir/compliance	133.09	133.59	133.4	133.58	132.82	132.31	132	132.57	131.98	132.1
GW-1LI	SCA GW-3	Lower Intermediate. aquifer	Upgradient/background	74.59	73.29	77.22	77.83	74.84	61.13	65.92	74.77	70.76	61.15
GW-2LI	GW-A (proposed)	Lower Intermediate. aquifer	Slag storage/compliance	72.97	73.07	75.74	76.82	73.74	60.86	63.53	72.76	69.23	59.4
GW-2-F	GW-A (proposed)	Upper Floridan aquifer	Slag storage/compliance	72.67	72.77	75.52	76.4	73.05	59.69	62.82	72.52	68.65	58.83

Sources: Tampa Electric, 2007.
ECT, 2007.

within the surficial aquifer ranged from approximately 0.0005 to 0.002 feet per foot (ft/ft). The linear groundwater flow velocities for the surficial aquifer at the Site may range from approximately 0.012 to 0.2 ft/day.

Average aquifer characteristics from ten surficial aquifer tests within a 15-mile radius of the Site were obtained from SWFWMD (SWFWMD, 1988) and summarized in Table 3.3.2-2. For the surficial aquifer, average values of transmissivity and specific yield are 1,223 square feet per day (ft^2/day) and 0.11 or 11 percent, respectively. The ratio of horizontal to vertical hydraulic conductivities may range from approximately one to two orders of magnitude (10 to 100).

Table 3.3.2-2. Summary of Regional Aquifer Characteristics (within 15-Mile Radius)

Aquifer	Minimum	Maximum	Average
Surficial (10 tests)			
Transmissivity (ft^2/day)	254	2,393	1,223
Specific yield (nondimensional)	5×10^{-3}	0.20	0.11
Intermediate (9 tests)			
Transmissivity (ft^2/day)	160	3,837	808
Storage coefficient (nondimensional)	4.0×10^{-5}	3×10^{-4}	1.3×10^{-4}
Leakance (ft^3/day/ft^3)	8.0×10^{-7}	3×10^{-4}	1.5×10^{-4}
Floridan (10 tests)			
Transmissivity (ft^2/day)	103,610	735,294	292,850
Storage coefficient (nondimensional)	4.0×10^{-4}	3×10^{-3}	1×10^{-3}
Leakance (ft^3/day/ft^3)	1.0×10^{-5}	3×10^{-4}	2.1×10^{-4}

Note: ft^3/day/ft^3 = cubic foot per day per cubic foot.

Source: SWFWMD, 1988.

The groundwater quality of the surficial (water table) aquifer is classified as G-II and is dependent on the chemical constituents within the rainfall and surface activities. Based on the ambient groundwater quality monitoring program by

SWFWMD (SWFWMD, 1988), several regional trends are presented for background quality:

- Total dissolved solids (TDS), less than 250 milligrams per liter (mg/L).
- Total hardness, less than 25 mg/L.
- Chlorides, less than 25 mg/L.
- Sulfates, less than 25 mg/L.

Additional background groundwater quality data for Polk County was obtained from the groundwater quality monitoring program and reported in the initial 1992 SCA for PPS. Following the initial site certification, site-specific groundwater quality data from the surficial aquifer has been collected in accordance with the approved GWMP. Table 3.3.2-3 summarizes the results of groundwater quality data from the surficial aquifer between 2002 and 2007. Review of the analytical data presented for the surficial aquifer over this 5-year period indicates that the pH values (4.6 to 6.4 standard units [s.u.]) are typically lower than the regulatory criteria. This is not an uncommon phenomenon in the surficial aquifer, and even the background monitoring well routinely exhibits this occurrence. Additionally, several inorganic/metal constituents such as aluminum, arsenic, boron, iron, manganese, thallium, and vanadium occasionally exceed their applicable groundwater quality standards. From review of these surficial groundwater quality data, it appears that the frequency of exceedance was lower (or decreased) when the groundwater samples were analyzed using inductively coupled plasma mass spectrometry (ICP-MS) methodology. In proximity to the slag pad/storage area, the regulatory criteria exceedance of pH, aluminum, iron, and thallium were documented in the 2001 GWMP report as being constituents of concern at GW-2S.

Intermediate Aquifer

The intermediate aquifer system consists of portions of the Peace River and Arcadia Formations of the Hawthorn Group. At the PPS Site, this aquifer has two producing zones that are separated by confining units. The primary recharge to the upper intermediate aquifer is leakage from the surficial aquifer system. The amount of recharge received by the upper intermediate aquifer system ranges from zero to greater than 10 inches per year (SWFWMD, 1988). The rate of recharge into and through the intermediate aquifer is dependent on the potential head difference between the aquifers (or producing zones) and the thickness and conductivity of the confining units within the intermediate system. The intermediate aquifer is typically in hydraulic communication with the larger rivers in southwestern Polk County.

Table 3.3.2-3. Summary of Surficial Aquifer Groundwater Quality Data (2002 to 2007)

Analyte	Unit	Standard *	Regulatory Criteria	Average Concentration Detected	Maximum Concentration Detected	Minimum Concentration Detected	Number of Samples	Number of Exceedances
Metal/Inorganic Parameters								
Aluminum	µg/L	S	200	523.10	4,014	72	82	56
Aluminum by ICP-MS	µg/L	S	200	113.51	1,370	26.5	40	1
Antimony	µg/L	P	6	5.33	6	4	82	0
Antimony by ICP-MS	µg/L	P	6	1.57	4.1	0.1	40	0
Arsenic	µg/L	P	10	6.78	12	4	82	2
Arsenic by ICP-MS	µg/L	P	10	4.85	7.7	1.6	40	0
Barium	µg/L	P	2,000	4.96	37	0.7	82	0
Barium by ICP-MS	µg/L	P	2,000	2.77	11.8	0.34	40	0
Boron	µg/L	G	4	18.24	35	0.012	116	21
Cadmium	µg/L	P	5	0.97	1.5	0.5	82	0
Calcium	mg/L	C	NA	16.30	35.5	0.767	122	0
Chloride, by ion chromatography	mg/L	S	250	13.78	31	1.1	122	0
Chromium	µg/L	P	100	5.44	21	1	82	0
Chromium by ICP-MS	µg/L	P	100	2.09	3.7	0.3	40	0
Cobalt	µg/L	G	140	2.18	3.7	1	17	0
Cobalt by ICP-MS	µg/L	G	140	0.39	0.9	0.1	8	0
Copper	µg/L	S	1,000	3.80	10	2	17	0
Copper by ICP-MS	µg/L	S	1,000	3.25	3.3	3.2	11	0
Fluoride, by ion chromatography	mg/L	P/S	2	0.44	1.58	0.02	122	0
Iron	µg/L	S	300	7,936.83	38,057	52	122	99
Lead	µg/L	P	15	2.00	2	2	82	0
Lead by ICP-MS	µg/L	P	15	0.70	0.7	0.7	40	0
Magnesium	mg/L	C	NA	7.57	20.8	0.701	122	0
Manganese	µg/L	S	50	23.66	88.4	1.7	82	15
Manganese by ICP-MS	µg/L	S	50	24.59	65.6	2.3	40	8
Molybdenum	µg/L	G	35	5.33	11	1	71	0
Molybdenum by ICP-MS	µg/L	G	35	3.56	13.9	0.2	40	0
Nickel	µg/L	P	100	18.47	62	1	71	0
Nickel by ICP-MS	µg/L	P	100	4.81	20.5	0.6	40	0
Nitrate/nitrite (NO_x) (calc.) by IC	mg/L	P	10	0.06	0.08	0.04	5	0
Nitrogen, ammonia (as N) Nessler	mg/L	P	NA	1.12	2.25	0.13	122	0
Nitrogen, nitrate (as N), by IC	mg/L	P	10	0.12	0.4	0.03	120	0
Potassium	mg/L	C	NA	2.28	3.19	2	122	0
Selenium	µg/L	P	50	4.14	8	2	82	0
Selenium by ICP-MS	µg/L	P	50	2.90	4.1	2.1	40	0
Silver by ICP-MS	µg/L	S	100	0.10	0.1	0.1	11	0
Sodium	mg/L	P	160	10.95	28.5	1.1	122	0
Strontium	µg/L	C	4,200	9.82	27.9	0.6	5	0
Thallium	µg/L	P	2	5.50	6	5	73	2
Thallium by ICP-MS	µg/L	P	2	0.31	0.7	0.1	42	0
Tin	µg/L	G	4,200	4.00	4	4	25	0
Vanadium	µg/L	G	49	79.42	190.9	1.2	17	8
Vanadium by ICP-MS	µg/L	G	49	52.78	104.9	2	11	4
Zinc	µg/L	S	5,000	6.78	19	3	17	0
Zinc by ICP-MS	µg/L	S	5,000	20.98	38.4	10.3	11	0
Other Miscellaneous Parameters								
Color, apparent	pcu	S	15	115.14	1,000	5	123	25
Fecal coliforms, membrane filter	CFU/100 mL	S	0	7.05	69	1	116	5
Residue, filterable, at 180 (TDS)	mg/L	S	500	141.24	345	28	122	0
Sulfate, by ion chromatography	mg/L	S	250	6.92	33.2	0.12	122	0
Surfactants (foaming agents)	mg/L	S	0.5	0.07	0.078	0.062	5	0
Threshold odor consistent series	TON	S	3	3.33	4	2	5	1
Alkalinity, total (pH=4.5)	mg/L as $CaCO_3$	C	NA	66.45	152	1.5	122	0
Bicarbonate alkalinity (as $CaCO_3$)	mg/L	C	NA	66.90	152	1.5	121	0
Organic Parameters								
1,1-Dichloroethane	µg/L	P	70	1.20	1.2	1.2	5	0
1-Methylnaphthalene	µg/L	G	28	0.36	0.36	0.36	68	0
cis-1,2-Dichloroethylene	µg/L	P	70	1.50	1.5	1.5	5	0

Table 3.3.2-3. Summary of Surficial Aquifer Groundwater Quality Data (2002 to 2007) (Continued, Page 2 of 2)

Analyte	Unit	Standard	Regulatory Criteria	Average Concentration Detected	Maximum Concentration Detected	Minimum Concentration Detected	Number of Samples	Number of Exceedances
Field Parameters								
Dissolved oxygen, field	mg/L		NA	0.74	2.4	0.1	110	0
pH, field	s.u.	S	6.5 to 8.5	5.62	6.4	4.6	110	110
Specific conductance, field	µmhos/cm		NA	212.69	457	54.6	110	0
Temperature, field	°C		NA	23.76	26	21.5	110	0
Turbidity, nephelometric	NTU		NA	414.50	498	331	2	0
Turbidity, nephelometric, field	NTU		NA	8.85	81.6	0.5	109	0
Water level, NGVD	ft		NA	137.53	144.23	133.25	110	0

Note:
µg/L = microgram per liter.
mg/L = milligram per liter.
pcu = platinum-cobalt unit.
CFU/100 mL = coliform-forming units per 100 milliliters.
TON = threshold odor number.
$CaCO_3$ = calcium carbonate.
s.u. = standard unit.
µmhos/cm = micromhos per centimeter.
°C = degree Celsius.
NTU = Nephelometric turbidity unit.

* C = selected cations.
G = guidance concentration.
P = primary drinking water standard.
P/S = primary/secondary drinking water standard.
S = secondary drinking water standard.

Source: Environmental Consulting & Technology, Inc. (ECT), 2007.

A network of five locations was established as part of PPS's FDEP-approved GWMP to monitor the groundwater quality in the surficial, upper intermediate, lower intermediate, and Upper Floridan aquifers. Figure 3.3.1-2 illustrates the locations of the monitoring wells. All of the monitoring wells are constructed of 4-inch diameter PVC. The upper intermediate aquifer monitoring wells range between 90 to 108 ft bls with 7 ft of screened interval (GW-1UI to GW-4UI). The lower intermediate aquifer monitoring wells range between 230 to 242 ft bls with either 6 or 15 ft of screened interval (GW-1LI to GW-2LI).

Between 2002 and 2007, the potentiometric surface of the upper intermediate aquifer across the PPS Site ranged from approximately 130 to 140 ft-NGVD. During that period the potentiometric surface fluctuated approximately 2 to 4 ft from the end of the dry season to the end of the wet season. The potentiometric surface of the lower intermediate aquifer has ranged from approximately 60 to 80 ft-NGVD across the Site. The potentiometric surface has fluctuated approximately 12 to 15 ft from the end of the dry season to the end of the wet season. Table 3.3.2-1 provides a summary of the groundwater level measurements taken on the upper and lower intermediate aquifers. The hydrographs illustrated in Figures 3.3.2-3 and 3.3.2-4 show the time-dependent fluctuations of the potentiometric surfaces for the intermediate aquifer systems.

Some published regional potentiometric surface maps (May and September 2001) of the upper intermediate aquifer indicate that the potentiometric surface ranges from 100 ft to 120 ft-msl for the dry season (Figure 3.3.2-5) and wet season (Figure 3.3.2-6), respectively. The groundwater flow direction for the intermediate aquifer system is radially outward from beneath the Site. Permeability tests were conducted on the 4-inch monitoring wells completed into the upper and lower intermediate aquifers, and their results were reported in the initial 1992 PPS SCA.

Hydraulic gradients within the intermediate aquifer system ranged from approximately 0.0007 to 0.001 ft/ft. Linear groundwater flow velocities for the intermediate aquifer system range between 0.005 to 0.01 ft/day.

Nine aquifer tests for the intermediate aquifer (SWFWMD, 1988) were performed within a 15-mile radius of the site. The average aquifer characteristics from these tests were determined and are summarized in Table 3.3.2-2. For the intermediate aquifer, average values of transmissivity, storage coefficient, and leakance are 808 ft^2/day, 0.00013 cubic foot per day per cubic foot (ft^3/day/ft^3), and

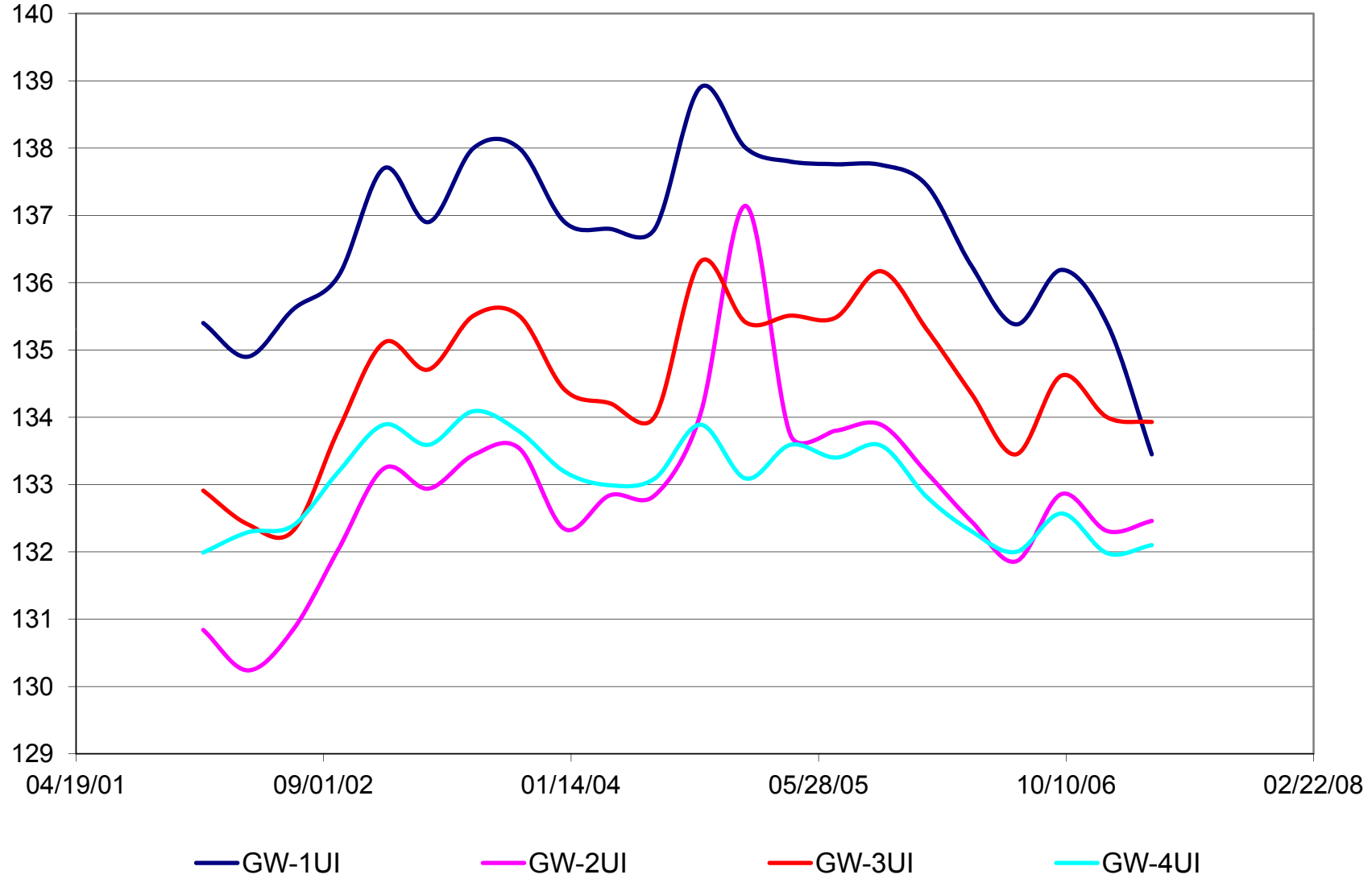


FIGURE 3.3.2-3.

HYDROGRAPHS FOR UPPER INTERMEDIATE AQUIFER MONITORING WELLS

Sources: TEC, 2007. ECT, 2007.

TECO TAMPA ELECTRIC

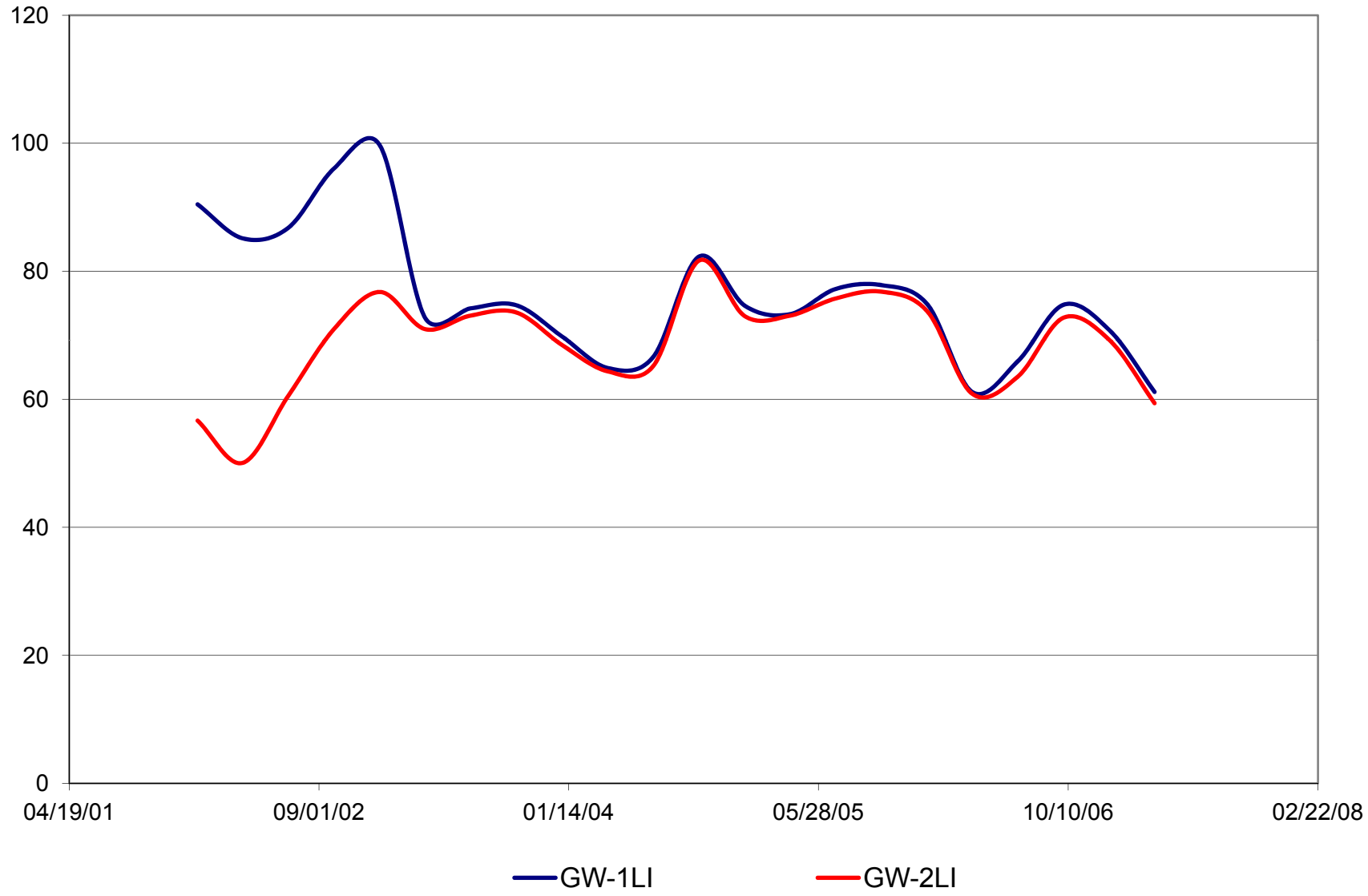


FIGURE 3.3.2-4.

HYDROGRAPHS FOR LOWER INTERMEDIATE AQUIFER MONITORING WELLS

Sources: TEC, 2007. ECT, 2007.

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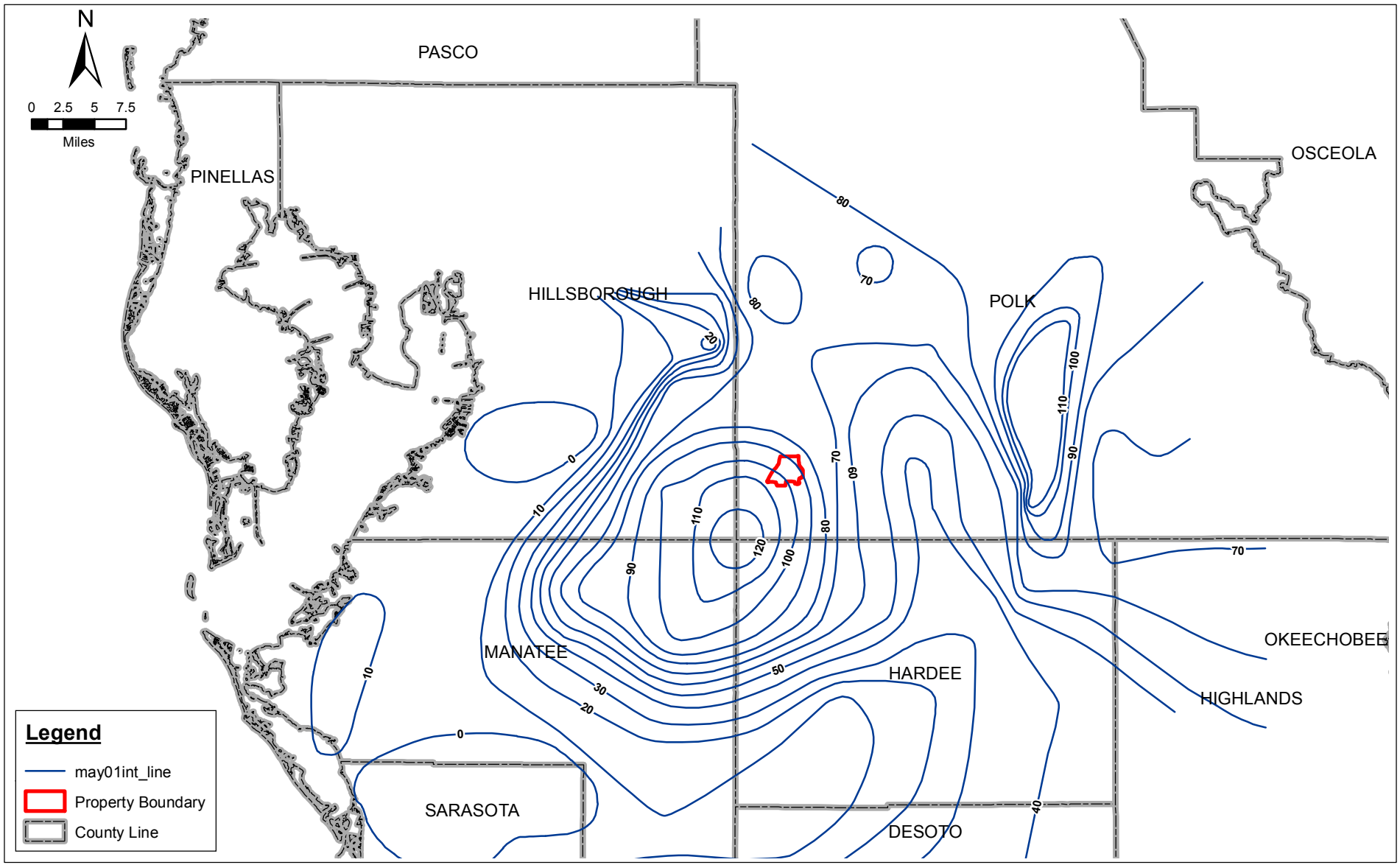


FIGURE 3.3.2-5.
GROUNDWATER CONTOURS - UPPER INTERMEDIATE AQUIFER MAY 2001

Sources: FGDL, 2006; ECT, 2012.

TECO TAMPA ELECTRIC

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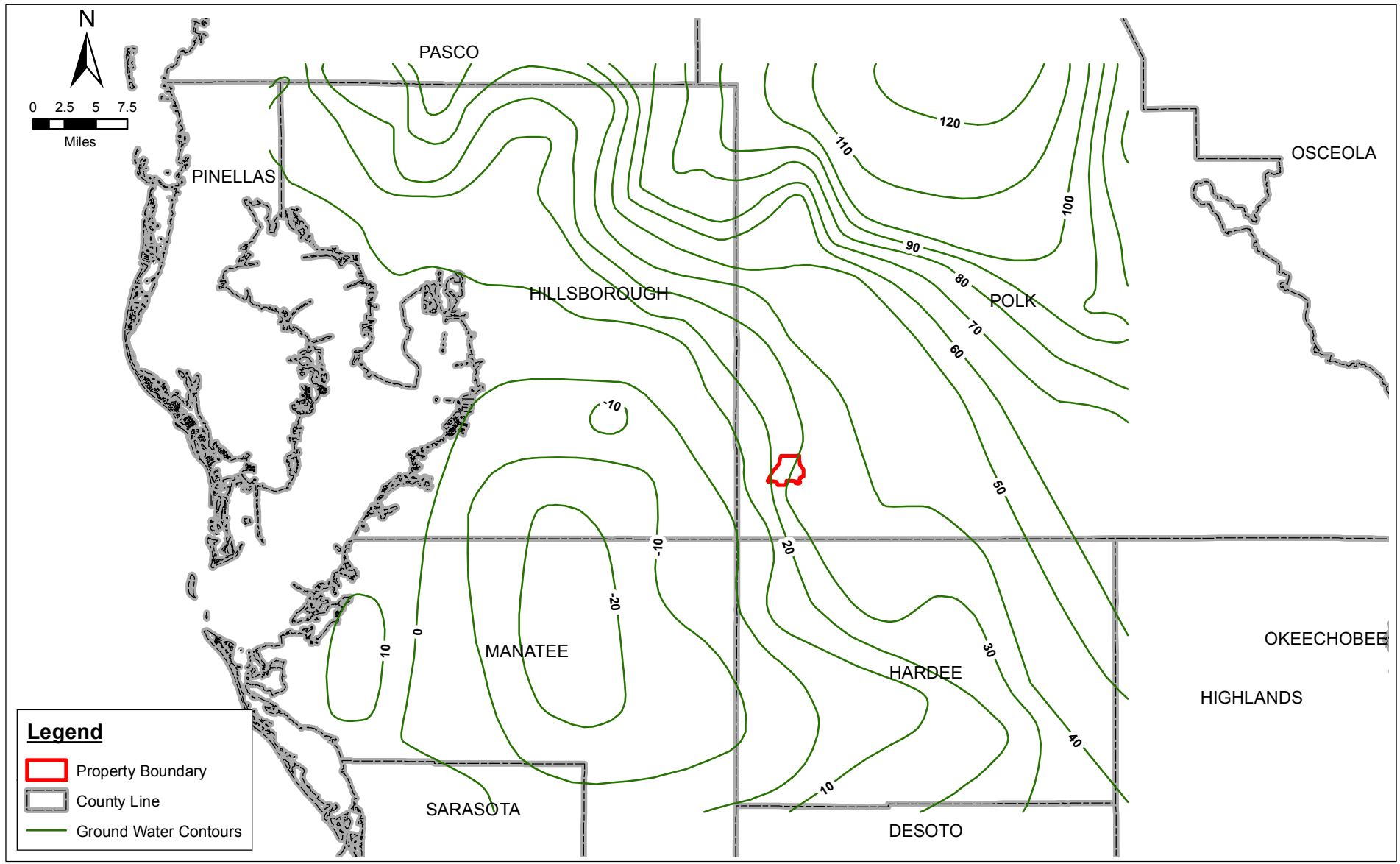


FIGURE 3.3.2-6.
GROUNDWATER CONTOURS - UPPER INTERMEDIATE AQUIFER SEPTEMBER 2001

Sources: FGDL, 2006; ECT, 2012.

TECO TAMPA ELECTRIC

0.00015 $ft^3/day/ft^3$, respectively. The ratio of horizontal to vertical hydraulic conductivity may range between two to three orders of magnitude (100 to 1,000).

The groundwater quality of the intermediate aquifer system is generally classified as G-II. The water quality of the intermediate aquifer is dependent on the chemical constituents of the aquifer matrix and the quality of the surficial aquifer. The ambient groundwater quality monitoring program of SWFWMD (1988) presents the following regional trends:

- TDS, 200 to 300 mg/L.
- Total hardness, less than 120 mg/L.
- Chlorides, less than 25 mg/L.
- Sulfates, less than 25 mg/L.

Additional background groundwater quality data for Polk County was obtained from the groundwater quality monitoring program and reported in the initial PPS 1992 SCA. Site-specific groundwater quality data were collected in accordance with the approved GWMP from the upper and lower intermediate aquifers between 2002 and 2007. Tables 3.3.2-4 and 3.3.2-5 summarize the groundwater quality data results for the upper and lower intermediate aquifer systems for this period, respectively. Review of the analytical data presented for the upper and lower intermediate aquifer over the past 5 years indicates that the pH values (7.1 to 12.3 s.u.) are typically within or above the regulatory criteria. These data suggest that the carbonate aquifer system exhibits a high buffering capacity. Additionally, several inorganic/metal constituents such as aluminum, arsenic, boron, and iron occasionally exceed their applicable groundwater quality standards. Similar to the observations made for the surficial groundwater quality data, it appears that the frequency of exceedances for these intermediate aquifer systems was lower (or decreased) when the groundwater samples were analyzed using the ICP-MS methodology.

Upper Floridan Aquifer

The Upper Floridan aquifer includes the Suwannee Limestone, Ocala Group, Avon Park Formation, and a portion of the Oldsmar Formation. At the PPS Site, the Upper Floridan aquifer has two highly transmissive and producing zones: the Suwannee Limestone and Avon Park Formation. Primary recharge to the Upper Floridan aquifer comes from the physiographic ridge areas to the north and east of the Site. Recharge from the intermediate aquifer system to the Upper Floridan aquifer ranges from zero to greater than 10 inches per year (SWFWMD, 1988).

Table 3.3.2-4. Summary of Upper Intermediate Aquifer Groundwater Quality Data (2002 to 2007)

Analyte	Unit	Standard *	Regulatory Criteria	Average Concentration Detected	Maximum Concentration Detected	Minimum Concentration Detected	Number of Samples	Number of Exceedances
Metal/Inorganic Parameters	µg/L	S	200	893.46	11,935	37	58	25
Aluminum	µg/L	S	200	190.50	3,591	8.7	32	4
Aluminum by ICP-MS	µg/L	P	6	0.57	0.9	0.1	32	0
Antimony by ICP-MS	µg/L	P	10	11.00	15	9	58	4
Arsenic	µg/L	P	10	7.74	11	1.7	32	3
Arsenic by ICP-MS	µg/L	P	2,000	10.24	44.2	5.9	58	0
Barium	µg/L	P	2,000	11.36	25.6	4.3	32	0
Barium by ICP-MS	ug/l	G	4	22.44	46	0.021	86	19
Boron	µg/L	P	5	2.21	8.8	0.4	58	1
Cadmium	µg/L	P	5	1.40	1.4	1.4	32	0
Cadmium by ICP-MS	mg/L	C	NA	39.77	140	22.3	90	0
Calcium	mg/L	S	250	13.32	21.4	7.2	90	0
Chloride, by ion chromatography	µg/L	P	100	9.71	45	2	58	0
Chromium	µg/L	P	100	6.30	20.9	0.4	32	0
Chromium by ICP-MS	mg/L	P/S	2	0.94	1.19	0.03	90	0
Fluoride, by ion chromatography	µg/L	S	300	221.73	3719	7	90	14
Iron	µg/L	P	15	3.50	5	2	58	0
Lead	µg/L	P	15	1.40	2.2	0.6	32	0
Lead by ICP-MS	mg/L	C	NA	18.72	71.6	11.2	90	0
Magnesium	µg/L	S	50	4.58	54	0.7	58	1
Manganese	µg/L	S	50	4.62	26.5	1.4	32	0
Manganese by ICP-MS	µg/L	G	35	2.91	6	1	49	0
Molybdenum	µg/L	G	35	2.06	4.8	0.4	32	0
Molybdenum by ICP-MS	µg/L	P	100	4.00	12	1	49	0
Nickel	µg/L	P	100	2.01	7.3	0.7	32	0
Nickel by ICP-MS	mg/L	P	10	0.07	0.14	0.02	4	0
Nitrate/nitrite (NO_x) (calc.) by IC	mg/L	P	NA	0.20	0.64	0.11	90	0
Nitrogen, ammonia (as N) Nessler	mg/L	P	10	0.09	0.16	0.02	88	0
Nitrogen, nitrate (as N), by IC	mg/L	C	NA	3.72	13.1	1.85	90	0
Potassium	µg/L	P	50	2.75	6	2	58	0
Selenium	mg/L	P	160	17.67	29.2	11.2	90	0
Sodium	µg/L	C	4,200	109.73	135.3	96.5	4	0
Strontium	µg/L	P	2	0.18	0.3	0.1	32	0
Thallium by ICP-MS	µg/L	S	5,000	13.25	17.6	11.2	4	0
Zinc by ICP-MS								
Other Miscellaneous Parameters								
Color, apparent (platinum-cobalt)	pcu	S	15	12.00	35	5	91	3
Fecal coliforms, membrane filter	CFU/100 mL	S	0	29.91	200	1	88	7
Residue, filterable, at 180 (TDS)	mg/L	S	500	237.77	279	198	90	0
Sulfate, by ion chromatography	mg/L	S	250	2.43	8.66	0.08	90	0
Surfactants (foaming agents)	mg/L	S	0.5	0.14	0.39	0.04	4	0
Threshold odor consistent series	TON	S	3	1.00	1	1	4	0
Total coliform, membrane silter	CFU/100 mL	S	<1 (<5%)	200.00	200	200	2	1
Alkalinity, total (pH=4.5)	mg/L as $CaCO_3$	C	NA	166.16	209	1	90	0
Bicarbonate alkalinity (as $CaCO_3$)	mg/L	C	NA	167.71	209	129	90	0
Organic Parameters								
1-Methylnaphthalene	µg/L	G	28	0.20	0.2	0.2	90	0
Napthalene	µg/L	G	14	0.15	0.15	0.15	52	0
Field Parameters								
Dissolved oxygen, field	mg/L		NA	1.18	2.9	0.4	88	0
pH, field	s.u.	S	6.5 to 8.5	7.69	8.6	7.1	88	5
Specific conductance, field	µmhos/cm		NA	352.63	410	288	88	0
Temperature, field	°C		NA	24.01	25.5	22	88	0
Turbidity, nephelometric, field	NTU		NA	13.56	129	0.2	88	0
Water level, NGVD	ft		NA	134.29	138.9	130.24	88	0

* C = selected cations.
G = guidance concentration.
P = primary drinking water standard.
P/S = primary/secondary drinking water standard.
S = secondary drinking water standard.

Source: ECT, 2007.

Table 3.3.2-5. Summary of Lower Intermediate Aquifer Groundwater Quality Data (2002 to 2007)

Analyte	Unit	Standard *	Regulatory Criteria	Average Concentration Detected	Maximum Concentration Detected	Minimum Concentration Detected	Number of Samples	Number of Exceedances
Metal/Inorganic Parameters								
Aluminum	µg/L	S	200	250.55	711	46	28	12
Aluminum by ICP-MS	µg/L	S	200	84.89	288.8	5.5	16	3
Antimony by ICP-MS	µg/L	P	6	0.53	0.8	0.3	16	0
Arsenic	µg/L	P	10	7.50	11	4	28	1
Arsenic by ICP-MS	µg/L	P	10	1.73	1.9	1.6	16	0
Barium	µg/L	P	2,000	219.43	1,095	7.7	28	0
Barium by ICP-MS	µg/L	P	2,000	24.68	41.4	9.3	16	0
Boron	ug/l	G	4	38.74	95	0.034	42	23
Calcium	mg/L	C	NA	106.40	693	2.24	44	0
Chloride, by ion chromatography	mg/L	S	250	20.37	31	9.66	44	0
Chromium	µg/L	P	100	3.13	5	1	28	0
Chromium by ICP-MS	µg/L	P	100	1.94	2.5	0.5	16	0
Fluoride, by ion chromatography	mg/L	P/S	2	1.46	2.06	0.15	44	2
Iron	µg/L	S	300	104.28	355	4	44	3
Lead by ICP-MS	µg/L	P	15	0.60	0.6	0.6	16	0
Magnesium	mg/L	C	NA	13.11	22.5	0.03	44	0
Manganese	µg/L	S	50	2.15	4.5	0.3	28	0
Manganese by ICP-MS	µg/L	S	50	2.40	2.6	2.2	16	0
Molybdenum	µg/L	G	35	3.42	18	1	24	0
Molybdenum by ICP-MS	µg/L	G	35	2.39	7.1	0.5	16	0
Nickel	µg/L	P	100	2.00	2	2	24	0
Nickel by ICP-MS	µg/L	P	100	1.14	1.4	0.8	16	0
Nitrogen, ammonia (as N) Nessler	mg/L	P	NA	0.22	0.67	0.1	44	0
Nitrogen, nitrate (as N)	mg/L	P	10	0.08	0.076	0.076	1	0
Nitrogen, nitrate (as N), by IC	mg/L	P	10	0.07	0.16	0.03	43	0
Nitrogen, nitrate-nitrite comb.	mg/L	P	10	0.08	0.076	0.076	1	0
Potassium	mg/L	C	NA	17.05	93.9	2.2	44	0
Selenium	µg/L	P	50	2.25	3	2	28	0
Sodium	mg/L	P	160	23.37	39	16.6	44	0
Strontium	µg/L	C	4,200	296.10	377.2	230	3	0
Thallium by ICP-MS	µg/L	P	2	0.10	0.1	0.1	16	0
Zinc by ICP-MS	µg/L	S	5,000	16.75	17	16.5	2	0
Other Miscellaneous Parameters								
Color, apparent (platinum-cobalt)	pcu	S	15	6.25	10	5	45	0
Fecal coliforms, membrane filter	CFU/100 mL	S	0	11.43	44	1	42	4
Residue, filterable, at 180 (TDS)	mg/L	S	500	373.73	1,534	170	44	4
Sulfate, by ion chromatography	mg/L	S	250	5.90	60.9	2.2	44	0
Surfactants (foaming agents)	mg/L	S	0.5	0.46	0.46	0.46	2	0
Threshold odor consistent series	TON	S	3	2.00	2	2	2	0
Alkalinity, total (pH=4.5)	mg/L as $CaCO_3$	C	NA	321.86	1,770	93	44	0
Bicarbonate alkalinity (as $CaCO_3$)	mg/L	C	NA	113.17	192	0	44	0
Organic Parameters								
1,2-Dichloroethane	ug/l	P	3	0.16	0.16	0.16	5	0
Benzene	µg/L	P	1	0.39	0.39	0.39	49	0
bis(2-Ethylhexyl)phthalate	µg/L	P	6	0.63	0.63	0.63	1	0
m&p-Xylene	µg/L	S	20	0.30	0.3	0.3	22	0
Methyl t-butyl ether (MTBE)	µg/L	G	20	0.30	0.3	0.3	1	0
Methyl tert-butyl ether	µg/L	G	20	0.30	0.3	0.3	24	0
o-Xylene	µg/L	S	20	0.13	0.13	0.13	22	0
Tetrachloroethene	µg/L	P	3	0.08	0.082	0.082	1	0
Toluene	µg/L	P/S	1,000/40	5.54	15	0.61	49	0
Xylene	µg/L	S	20	0.43	0.43	0.43	24	0
Field Parameters								
Dissolved oxygen, field	mg/L		NA	2.64	6.2	0.6	44	0
pH, field	s.u.	S	6.5 to 8.5	8.83	12.3	7.5	44	14
Specific conductance, field	µmhos/cm		NA	1,154.93	7,880	248	44	0
Temperature, field	°C		NA	24.66	26	23.5	44	0
Turbidity, nephelometric, field	NTU		NA	9.21	41.6	0.1	44	0
Water level, NGVD	ft		NA	72.39	99.65	50.07	44	0

* C = selected cations.
G = guidance concentration.
P = primary drinking water standard.
P/S = primary/secondary drinking water standard.
S = secondary drinking water standard.

Source: ECT, 2007.

A network of five locations was established as part of PPS's FDEP-approved GWMP to monitor the groundwater quality in the surficial, upper intermediate, lower intermediate, and Upper Floridan aquifers. Figure 3.3.1-2 illustrates the locations of the monitoring wells. All of the monitoring wells are constructed of 4-inch diameter PVC. The Floridan Aquifer monitoring well was completed at a depth of 336 ft bls, and it has a 14-ft screened interval (GW-2F).

Between 2002 and 2007, the potentiometric surface of the Floridan aquifer at the PPS Site ranged from approximately 50 to 80 ft-NGVD. The potentiometric surface has fluctuated approximately 5 to 15 ft from the end of the dry season to the end of the wet season. Table 3.3.2-1 provides a summary of the groundwater level measurements taken from the Floridan aquifer. The hydrograph illustrated as Figure 3.3.2-7 presents the time-dependent fluctuation of the potentiometric surface for the Floridan aquifer. Some published regional potentiometric surface maps (May and September 2006) of the Floridan aquifer indicate that the potentiometric surface ranges from 40 to 75 ft for the dry season (Figure 3.3.2-8) to wet season (Figure 3.3.2-9), respectively. The groundwater flow direction for the Floridan aquifer is from the northeast toward the southwest. Hydraulic gradients for this aquifer range from approximately 0.0005 to 0.001 ft/ft.

Table 3.3.2-2 summarizes the results of ten aquifer tests for the Floridan aquifer performed within a 15-mile radius of the Site. The average aquifer characteristics for the Floridan aquifer are a transmissivity value of approximately 293,000 ft^2/day, a storage coefficient of 0.001 (nondimensional), and a leakance value of approximately 0.00021 ft^3/day/ft^3.

Based on the SWFWMD ambient groundwater quality monitoring program, several background trends are presented (SWFWMD, 1988):

- TDS, 200 to 300 mg/L.
- Total hardness, less than 120 mg/L.
- Chlorides, less than 25 mg/L.
- Sulfates, 25 to 250 mg/L.

Additional background water quality data obtained from the groundwater quality monitoring program were reported in the initial 1992 SCA. Site-specific groundwater quality from the upper Floridan aquifer was measured in accordance with the GWMP between 2002 and 2007. Table 3.3.2-6 summarizes the groundwater quality data for this aquifer during this period. Review of the analytical data presented for the Upper Floridan aquifer over this 5-year period indicates that several

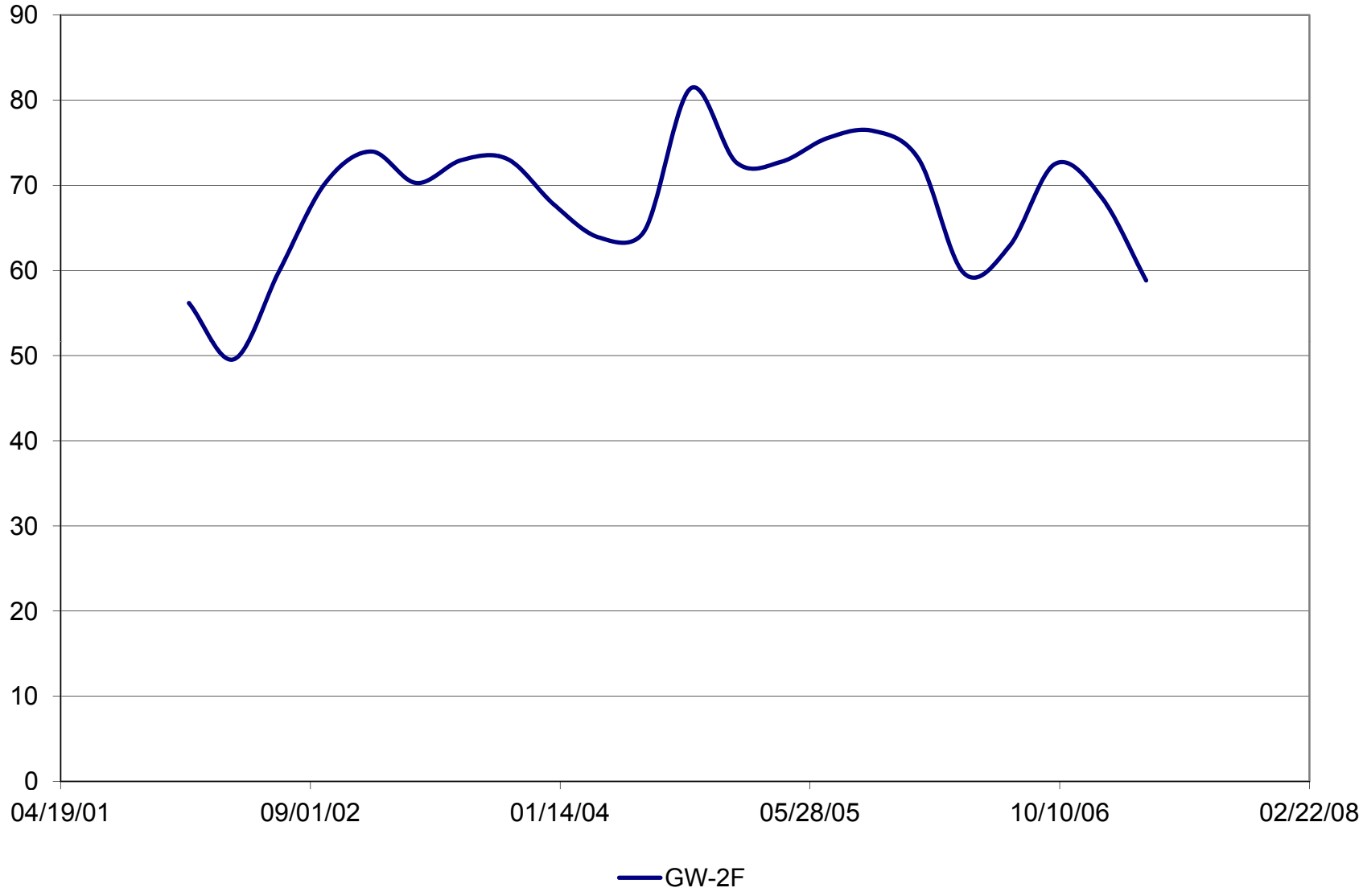


FIGURE 3.3.2-7.

HYDROGRAPHS FOR UPPER FLORIDAN AQUIFER MONITORING WELLS

Sources: TEC, 2007. ECT, 2007.

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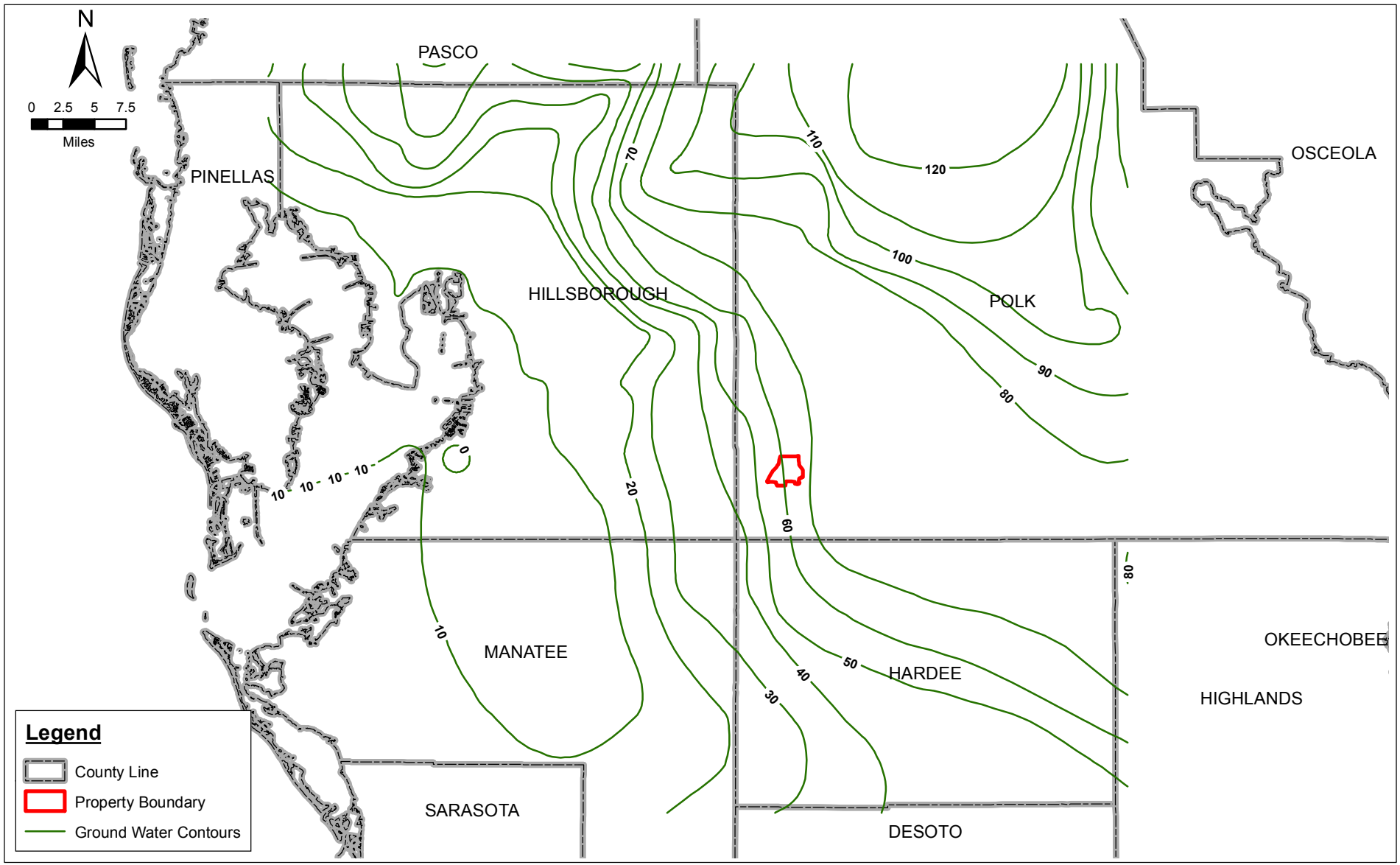


FIGURE 3.3.2-8.
GROUNDWATER CONTOURS - UPPER FLORIDAN AQUIFER MAY 2005

Sources: FGDL, 2006; ECT, 2012.

TECO TAMPA ELECTRIC

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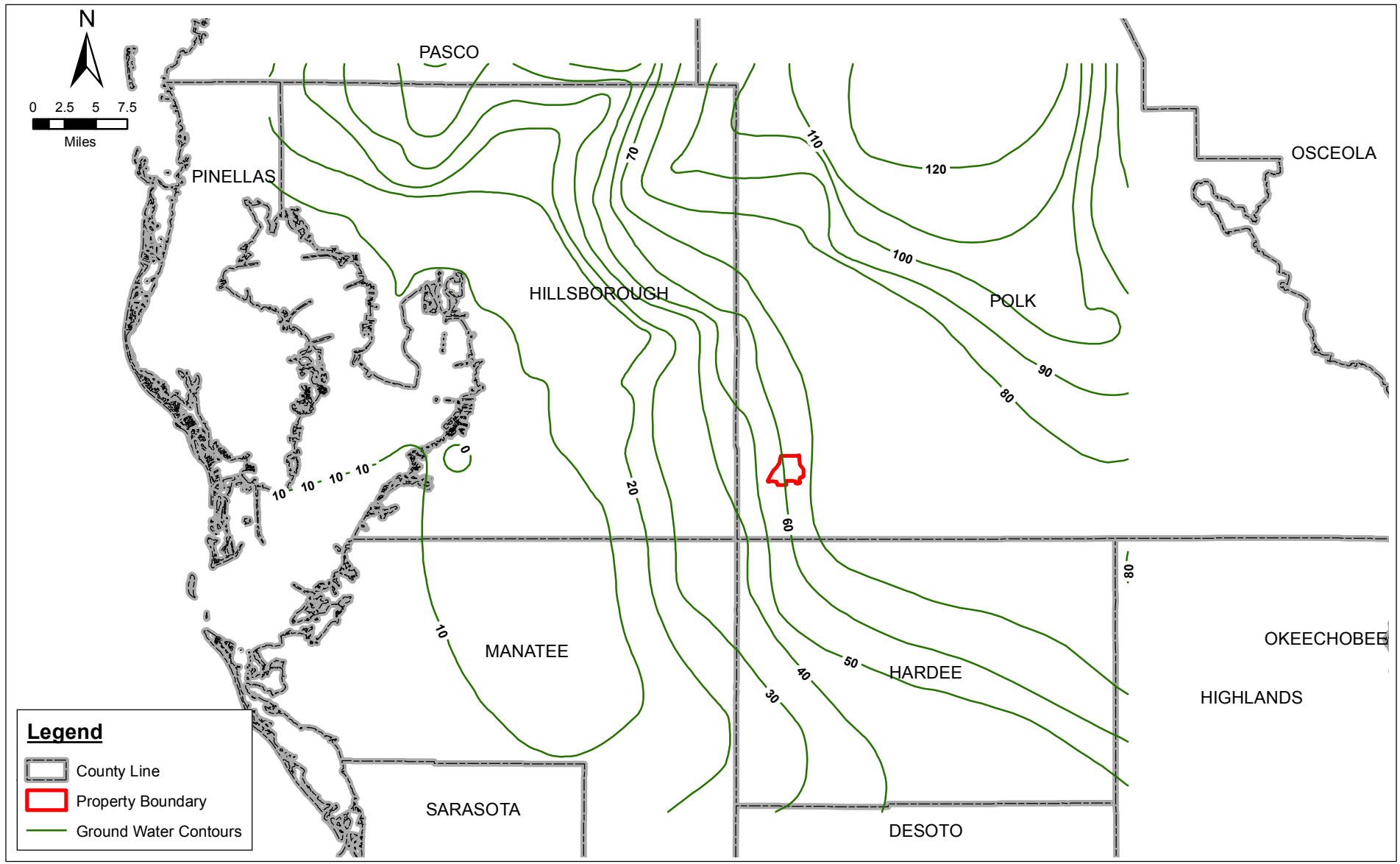


FIGURE 3.3.2-9.
GROUNDWATER CONTOURS - UPPER FLORIDAN AQUIFER SEPTEMBER 2005

Sources: FGDL, 2006; ECT, 2012.

TECO TAMPA ELECTRIC

Table 3.3.2-6. Summary of Upper Floridan Aquifer Water Quality Data (2002 to 2007)

Analyte	Unit	Standard	Regulatory Criteria	Average Concentration Detected	Maximum Concentration Detected	Minimum Concentration Detected	Number of Samples	Number of Exceedances
Metal/Inorganic Parameters								
Aluminum	µg/L	S	200	469.57	2,271	36	15	3
Aluminum by ICP-MS	µg/L	S	200	125.58	452.5	8.6	8	2
Antimony by ICP-MS	µg/L	P	6	0.47	0.7	0.2	8	0
Arsenic	µg/L	P	10	5.75	7	4	15	0
Arsenic by ICP-MS	µg/L	P	10	3.40	4.3	1.7	8	0
Barium	µg/L	P	2,000	24.11	37.1	20.6	15	0
Barium by ICP-MS	µg/L	P	2,000	24.28	28.7	22.3	8	0
Boron	ug/l	G	4	27.34	41	0.03	22	7
Cadmium by ICP-MS	µg/L	P	5	0.50	0.5	0.5	8	0
Calcium	mg/L	C	NA	46.39	79	41.4	23	0
Chloride, by ion chromatography	mg/L	S	250	16.38	18.5	13.9	23	0
Chromium	µg/L	P	100	9.50	14	5	15	0
Chromium by ICP-MS	µg/L	P	100	1.60	2.9	0.3	8	0
Fluoride, by ion chromatography	mg/L	P/S	2	1.15	1.3	1	23	0
Iron	µg/L	S	300	105.36	1,237	13	23	2
Lead	µg/L	P	15	8.00	8	8	15	0
Lead by ICP-MS	µg/L	P	15	1.30	1.3	1.3	8	0
Magnesium	mg/L	C	NA	19.13	24.8	17.2	23	0
Manganese	µg/L	S	50	4.29	18.5	1.4	15	0
Manganese by ICP-MS	µg/L	S	50	3.26	6.1	1.9	8	0
Molybdenum	µg/L	G	35	11.92	18	3	13	0
Molybdenum by ICP-MS	µg/L	G	35	6.49	13.7	0.9	8	0
Nickel	µg/L	P	100	5.00	7	3	13	0
Nickel by ICP-MS	µg/L	P	100	2.75	4.2	1.3	8	0
Nitrogen, ammonia (as N) Nessler	mg/L	P	NA	0.25	1.27	0.1	23	0
Nitrogen, nitrate (as N), by IC	mg/L	P	10	0.06	0.06	0.06	23	0
Potassium	mg/L	C	NA	2.58	3	2	23	0
Selenium	µg/L	P	50	3.00	4	2	15	0
Sodium	mg/L	P	160	15.57	17.6	13.4	23	0
Strontium	µg/L	C	4,200	642.80	642.8	642.8	1	0
Thallium by ICP-MS	µg/L	P	2	0.20	0.3	0.1	8	0
Zinc by ICP-MS	µg/L	S	5,000	17.50	17.5	17.5	1	0
Other Miscellaneous Parameters								
Color, apparent (platinum-cobalt)	pcu	S	15	7.50	15	5	24	0
Fecal coliforms, membrane filter	CFU/100 mL	S	0	1.50	2	1	22	2
Residue, filterable, at 180 (TDS)	mg/L	S	500	478.57	5,280	238	23	1
Sulfate, by ion chromatography	mg/L	S	250	6.97	12.5	2.36	23	0
Alkalinity, total (pH=4.5)	mg/L as $CaCO_3$	C	NA	181.83	198	164	23	0
Bicarbonate alkalinity (as $CaCO_3$)	mg/L	C	NA	173.65	198	0	23	0
Organic Parameters								
Fluorene	µg/L	G	280	100.00	100	100	6	0
Toluene	µg/L	P/S	1,000/40	38.97	69	5.9	27	2
Field Parameters								
Dissolved oxygen, field	mg/L		NA	1.14	1.8	0.2	22	0
pH, field	s.u.	S	6.5 to 8.5	7.62	7.9	7.4	22	0
Specific conductance, field	µmhos/cm		NA	396.27	432	357	22	0
Temperature, field	°C		NA	24.66	25.5	23.5	22	0
Turbidity, nephelometric, field	NTU		NA	3.13	22.3	0.2	22	0
Water level, NGVD	ft		NA	68.04	81.37	49.57	22	0

* C = selected cations.
G = guidance concentration.
P = primary drinking water standard.
P/S = primary/secondary drinking water standard.
S = secondary drinking water standard.

Source: ECT, 2007.

inorganic/metal constituents such as aluminum, boron, and iron infrequently exceed their applicable groundwater quality standards.

As rainwater percolates through the aquifer systems, the groundwater becomes mineralized as constituents are dissolved into solution. Therefore, the groundwater quality varies between the three aquifer systems (Figure 3.3.2-10). The groundwater quality of the intermediate and Floridan aquifer systems are similar, with the exception that lower concentrations of magnesium occur in the Floridan aquifer. Additionally, elevated sulfate concentrations occur in certain areas of Polk County associated with the deep upper Floridan aquifer. The groundwater within the Floridan aquifer system is considered to be of good quality.

Lower Floridan Aquifer (Base of Underground Source of Drinking Water)

Additionally, during the recent drilling of both deep injection wells IW-1 and IW-2, the Lower Floridan aquifer, which is a slightly saline aquifer, was penetrated. The top of this aquifer was encountered at beneath the middle confining unit (equivalent to Lake City Limestone Formation) at a depth of 1,960 ft bls, and the vertical position of the bottom of the Lower Floridan aquifer (and underground source of drinking water) was determined to be located at a depth of approximately 2,850 ft bls.

Characteristic Confining Units

As previously discussed, the intermediate aquifer system is divided and bordered on top and bottom by confining units near the PPS Site. Figure 3.3.2-11 depicts the locations of two hydrogeologic cross-sections, and Figures 3.3.2-12 and 3.3.2-13 provide the two hydrogeologic cross-sections. From these hydrogeologic cross-sections, the approximate thicknesses of the calcareous mudstone/clay confining units within the intermediate aquifer system can be determined as follows:

- Top confining unit, 20 to 30 ft thick.
- Middle confining unit, 40 to 60 ft thick.
- Bottom confining unit, 15 to 50 ft thick.

These figures also illustrate the heterogeneous nature of the intermediate confining units in southwest Polk County.

Recharge between the surficial and intermediate aquifer is classified as no recharge (0 inch per year) to moderate recharge (10 inches per year). Recharge between the intermediate and Floridan aquifers is also classified as no recharge to moderate recharge. At monitor station GW-1, a soil sample was obtained from the

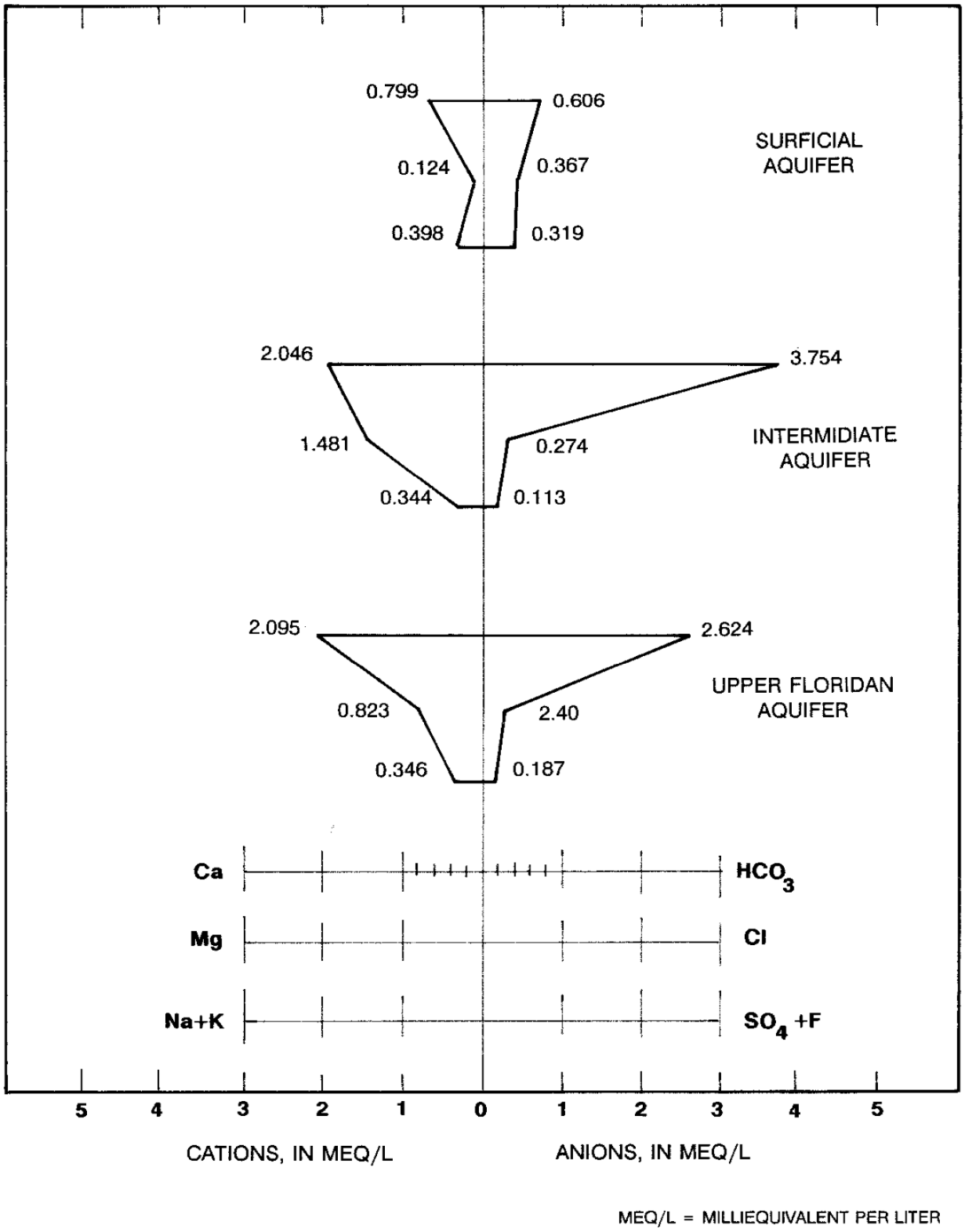


FIGURE 3.3.2-10.

MEDIAN GROUND WATER QUALITY OF SURFICIAL, INTERMEDIATE, AND FLORIDAN AQUIFER SYSTEMS

Source: Hutchinson, 1978.

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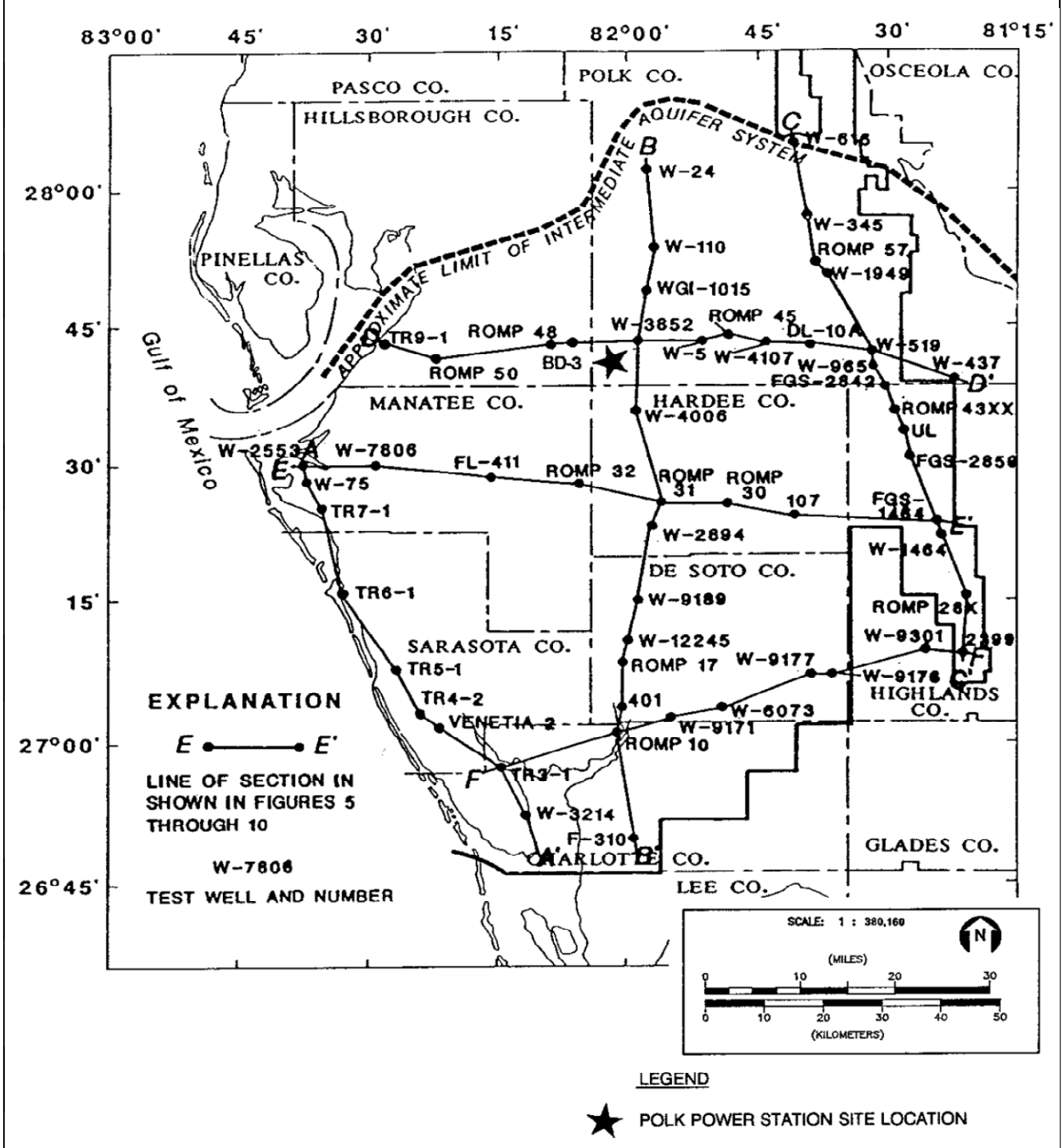


FIGURE 3.3.2-11.

HYDROGEOLOGIC CROSS-SECTION LOCATION MAP

Sources: Modified from Duerr, 1988 (Fig. 6). ECT, 1992.

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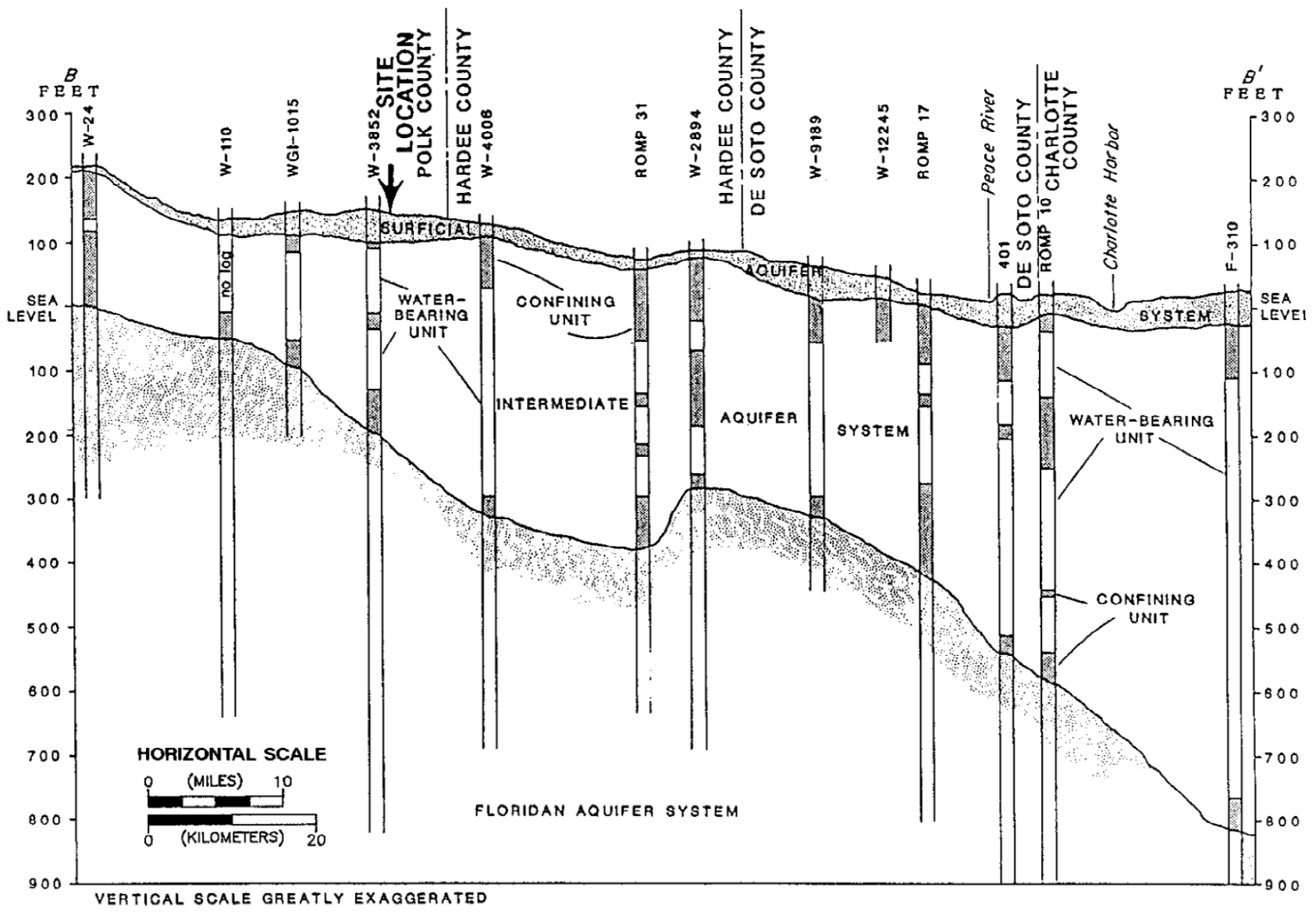


FIGURE 3.3.2-12.

HYDROGEOLOGIC CROSS-SECTION B-B'

Sources: Modified from Duerr, 1988 (Fig. 6). ECT, 1992.

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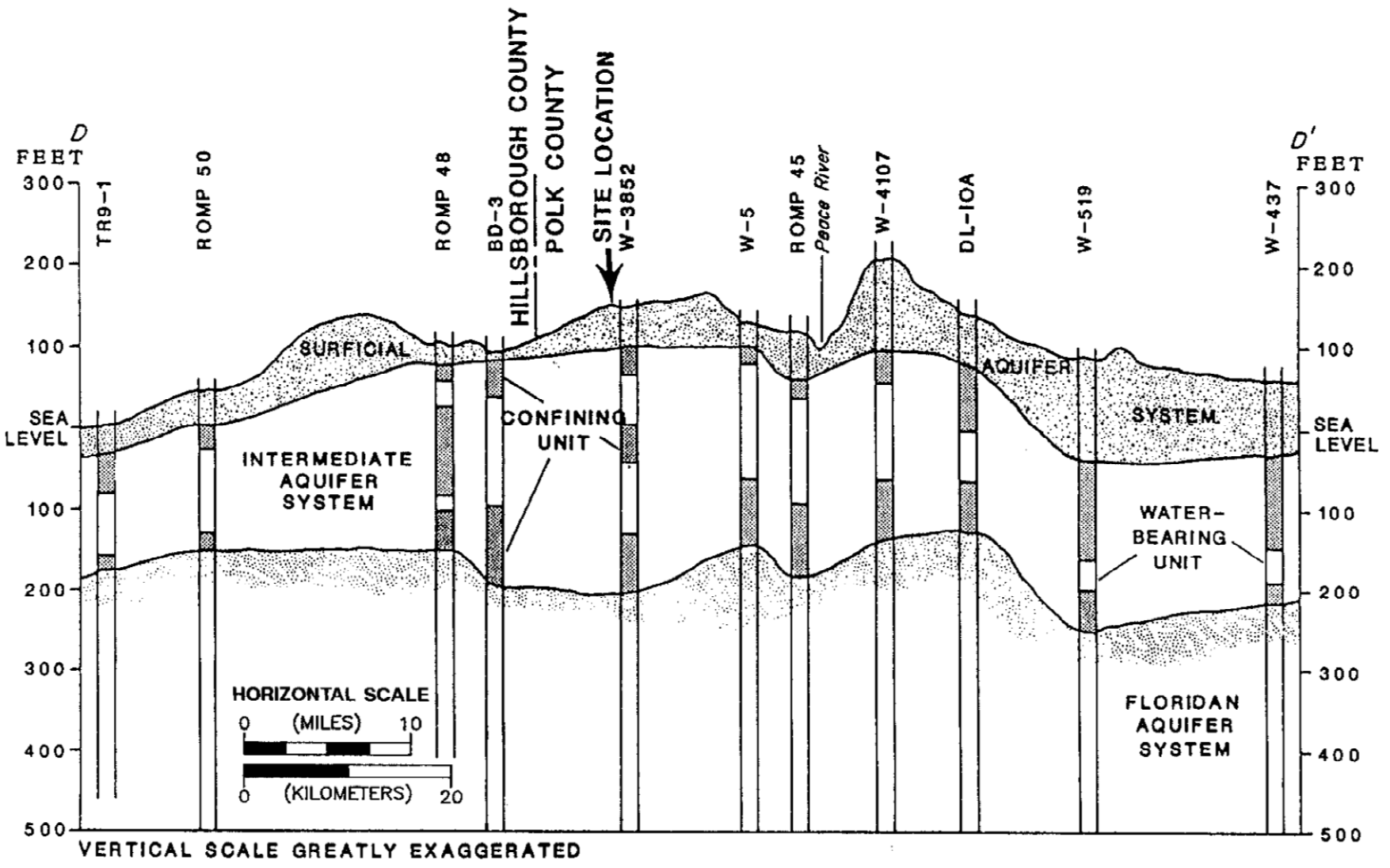


FIGURE 3.3.2-13.

HYDROGEOLOGIC CROSS-SECTION D-D'

Sources: Modified from Duerr, 1988 (Fig. 6). ECT, 1992.

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Tampa Clay of the Nocatee member of the Arcadia Formation at a depth of approximately 270 ft bls. A laboratory permeability test on this sample indicated a low permeability of 3×10^{-7} centimeters per second (cm/sec) (8.5×10^{-4} ft/day).

Injection Zone Confining Unit (Upper and Middle Cedar Keys Formation)

The Upper and Middle units of the Cedar Keys Formation, along with the lowermost portion of the overlying Oldsmar Formation, are encountered between 2,900 and 4,200 ft bls and comprise the primary wastewater injection zone confining unit exceeding 1,300 ft in thickness. The majority of the pore space within these Cedar Keys units is filled with anhydrite, and these units also include numerous layers of strata that are predominantly anhydrite. With the anhydrite filling the pore space, the vertical permeability and total porosities will be reduced, as is evident from the test results performed on several core samples. Vertical permeability testing performed on core samples collected from the confining unit during the drilling of injection well IW-1 indicated low permeabilities ranging from 1.8×10^{-8} to 5.6×10^{-9} cm/sec (1.6×10^{-5} to 6.2×10^{-6} ft/day) (Ardaman, 2010). Additionally, the average total porosity of the cores tested from the confining unit was 3.5 percent with an average effective porosity, measured by a helium pyncometer, of 0.132 percent (Ardaman, 2010). The substantial thickness (greater than 1,300 ft) and extremely low vertical permeability would provide a suitable seal against the potential upward vertical migration of injected wastewater.

3.3.2.2 Karst Hydrogeology

The entire state of Florida is underlain by an extensive thickness of carbonate strata. These sedimentary rocks are subject to dissolution by the percolation of naturally occurring and slightly acidic recharge from rainfall. Over time, this process will develop solution cavities and features (secondary porosity) within the rock sequence as recharge infiltrates through the carbonate strata. The irregular surface that eventually results from this process is called *karst topography*. Karst topography is usually recognizable on topographic maps by a high number of circular features, often containing water.

One of the more notable features of such terrain is sinkholes. The circular depressions caused by sinkhole formation are found throughout Florida, including Polk County. Sinkholes may provide an avenue for the surface water, groundwater from an overlying aquifer, and pollutants to rapidly infiltrate into lower stratigraphic units and aquifers. Generally, karst activity occurs at a slow rate, resulting in the gradual subsidence of the land surface over a large area. This slow dissolutioning process of the carbonate strata has been estimated to result in sub-

sidence of as much as 1 ft every 5,000 to 6,000 years (Sinclair *et al*., 1985). The types of sinkholes that develop in Florida are controlled by the geology and hydrogeology of the region. The three major types of sinkholes common throughout Florida include solution, cover-collapse, and cover-subsidence sinkholes. These sinkholes are readily distinguishable by their mode of formation.

The thickness and type of cover that overlies the carbonate strata has a significant influence on the susceptibility and type of karst topography that develops. The presence of a thick clay sequence or other less permeable material with high artesian pressure reduces the recharge potential. Hence, this type of cover results in less susceptibility to the development of karst features and sinkholes. Figure 3.3.2-14 depicts the various zones of the different type of sinkholes for west-central Florida. The PPS Site is located in Zone 7, where sinkhole development is rare, but some cover-collapse sinkholes are known to occur (Sinclair *et al*., 1985).

The PPS Site is located in the southwest corner of Polk County, which appears to have undergone some karst deformation. Through review of two USGS 7.5-minute topographic quadrangles (Duette Northeast and Baird), several closed surface depressions were detected within the site boundaries. Review of the data obtained from the onsite drilling program conducted in support of the original PPS licensing efforts indicates that the surficial depressions investigated have little correlation to the underlying stratigraphy. Thus, it is unlikely that these depressions represent active karst conditions. Much of the area surrounding the Site has undergone phosphate mining throughout the 1900s. The mining and reclamation activities have caused irregular landscapes with numerous tailings mounds, clay settling ponds, drainage ditches, and ponds. These activities limit the usefulness of the topographic maps, so old aerial photographs were also reviewed. The number of sinkholes and circular depressions increases toward the north and northeast of the Site approaching the topographic ridges. These topographic ridges and the gaps between them are believed to be the surface expression of former shoreline terraces and underlying structural features. The clay and dense carbonate sequence of the Hawthorn Group is approximately 250 ft thick beneath the site location. The presence of this thick, relatively impermeable, stratigraphic sequence limits the local recharge to the Floridan aquifer and reduces the potential for sinkhole development.

Significant sea level fluctuations occurred during the Pleistocene epoch at the site location, making karst activity possible. The various sea level and shoreline elevations include the Okefenokee shoreline (150 ft-NGVD), Wicomico shoreline

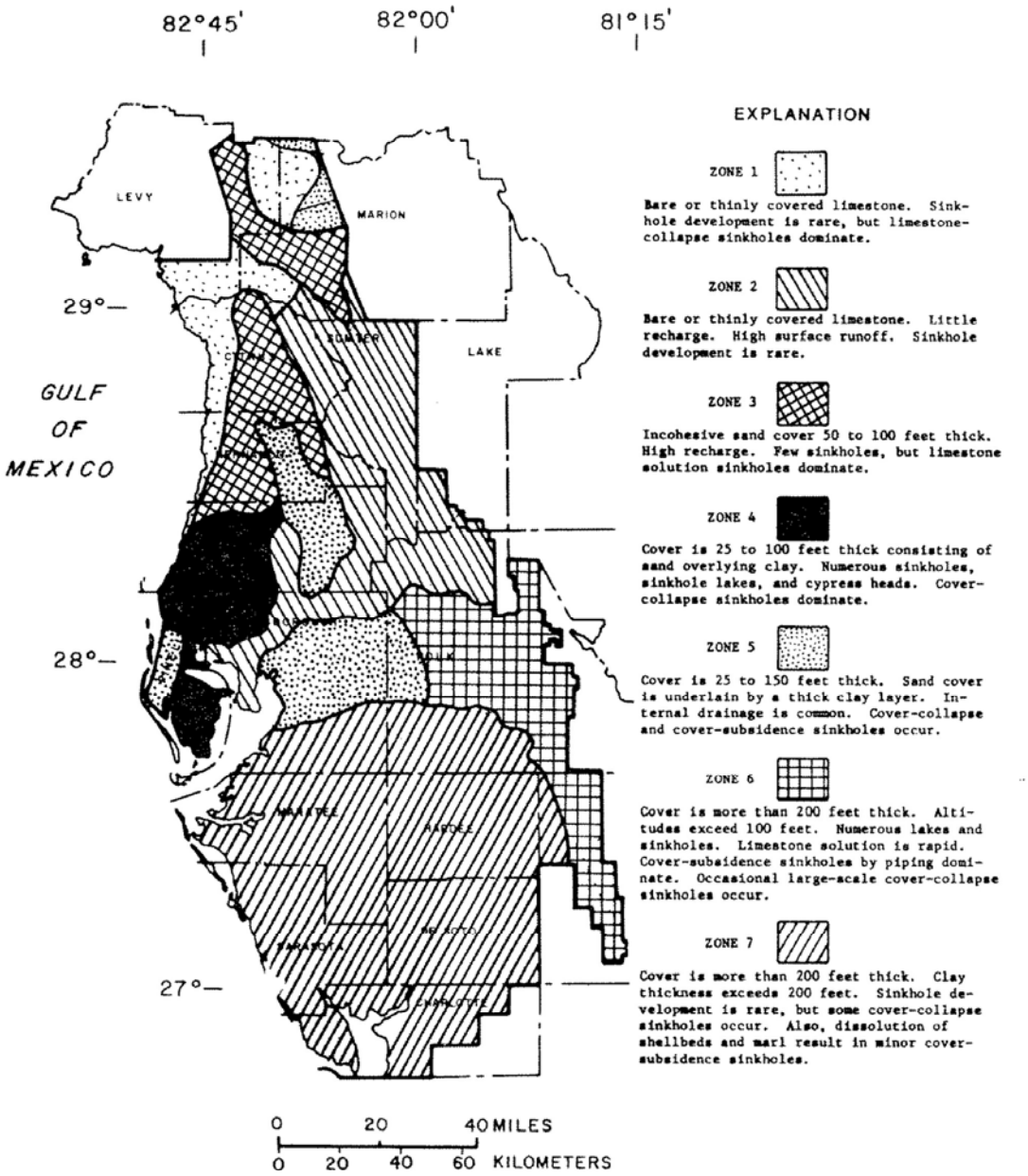


FIGURE 3.3.2-14.

ZONES OF DIFFERENT TYPES OF SINKHOLE DEVELOPMENT

Source: ECT, 2012.

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(100 ft-NGVD), Pamlico shoreline (30 ft-NGVD), and Silver Bluff shoreline (8 ft-NGVD). These shorelines and the sea level fluctuations would have the greatest likelihood of impacting any geologic units above this elevation. The drilling program at the site indicates that these elevation ranges are represented by the calcareous deposits within the Hawthorn Group. The Suwannee Limestone was not encountered above an elevation of -145 ft-NGVD. This indicates that the carbonate sequence that comprises the Floridan aquifer is relatively deep and should have been removed from the extensive karst activity and solutioning effects during the Pleistocene epoch.

A sinkhole occurrence assessment included review of current information obtained from SWFWMD and historical data obtained from the previous SCA and the former Florida Sinkhole Research Institute. These data indicate that no sinkhole of sufficient size or dimension to be noticed formed during the previous mining activities surrounding the Site. Based on the available sinkhole data, only eight sinkholes were reported in a 10-mile radius of the Site (Figure 3.3.2-15). Figure 3.3.2-15 also illustrates the distance from the Site to the reported sinkholes. Table 3.3.2-7 summarizes some pertinent data regarding these eight sinkholes.

Faults, fractures, and lineaments are commonly expressed on aerial photographs and satellite imagery as conspicuous linear features. Features and lineaments are also commonly associated with the presence of sinkholes. Data from available literature and previous studies were reviewed for the identification of linear features in southwest Polk County. Figure 3.3.2-16 presents a lineament map for Polk and Hillsborough Counties prepared by Ardaman & Associates (1987). None of the major lineaments identified in this or other studies intersect or pass beneath the Site. In Polk County, the prominent lineations appear to align with the northwest-southeast trend of the Ocala Platform and the topographic ridges with a series of less prominent lineaments at approximate right angles. The topographic ridges and the gaps between them are believed to be the surface expression of underlying structural features (Sinclair *et al*., 1985).

Several small surface depressions dot the uplands between the two major stream systems that drain the Site. This area has not been inundated by the sea since pre-Pleistocene time. The scarcity and small size of the depressions suggest that sinkhole activity has been relatively minor in the site area.

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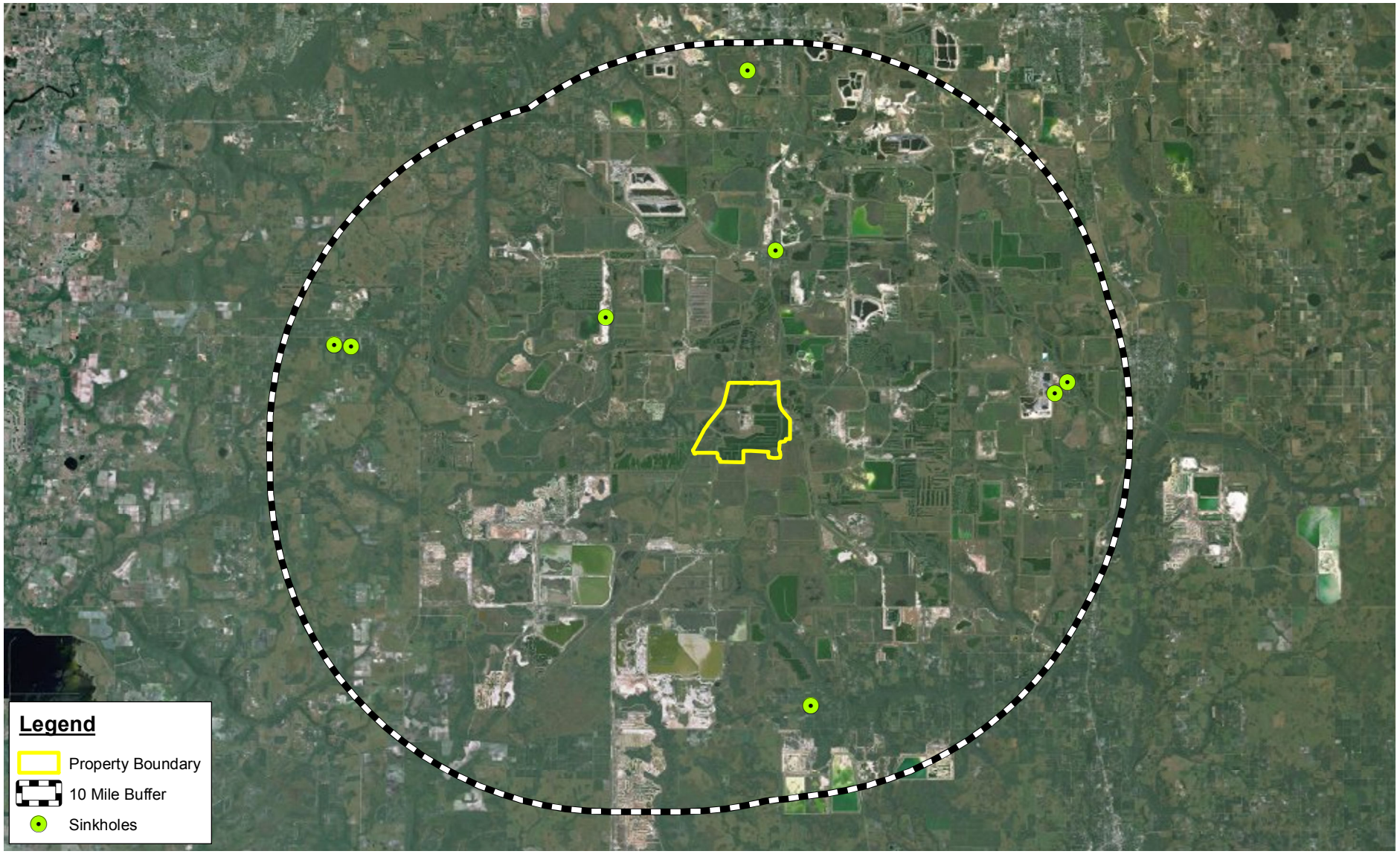


FIGURE 3.3.2-15.
IDENTIFIED SINKHOLES WITHIN A 10-MILE RADIUS OF THE SITE

0 1 2 3
Miles

N

Sources: FGDL, 2006; ECT, 2012.

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Table 3.3.2-7. Summary of Sinkhole Data within a 10-Mile Radius of the Site

Ref Number	Year	LONG_DD	LONG_MM	LONG_SS	LAT_DD	LAT_MM	LAT_SS	CO	Township	Range	Section	Qtr Sect	USGS Topographic Quadrangle	Property Owner Name
06-021	2004	81	57	29	27	36	18	Hardee	33S	23E	13	Southeast	Fort Green	
10-616	74	82	10	45	27	45	30	Hillsborough	31S	21E	26		Lithia AA-34	FDOT
10-648	89	82	3	24	27	46	16	Hillsborough	31S	22E	24		Keysville (AA-35)	Mobil Mining & Minerals Co
10-769	74	82	11	14	27	45	33	Hillsborough	31S	21E	26		Lithia AA-34	Keene
16-017	68	81	50	5	27	44	35	Polk	31S	25E	32		Bowling Green	FDOT
16-050	94	81	59	19	27	52	35	Polk	30S	23E	15	Northeast	Mulberry	IMC-Agrico New Wales Plant
16-065	70	81	50	28	27	44	18	Polk	31S	25E	32	Northwest	Bowling Green	
16-560	81	81	58	30	27	47	58	Polk	31S	23E	11		Bradley Junction	Seaboard Coastline Railroad

Ref Number	SIZDIM	SINSHAPE	SINLNGTH	SINWIDTH	SINDEPTH	Slope	WATSIN	WATBLS	LIMVIS	CAVVIS	SUBRATE	Soil Type	NEARSIN	OLDSIN
06-021	E	E	3	3	4		U		U	U	U	Unknown	U	U
10-616	E	C	150	150			Y	40	U	U	U	Sand	Y	Y
10-648	E	C	100	100	15	90	Y		Y	N	R	Phosphate mine	N	Y
10-769	E	E	130	100	50		Y	25	U	U	U	Unknown	Y	N
16-017	U	U	200	200	45		U		U	U	U	Unknown	U	U
16-050	E	C	160	160	200		U		U	U	U	Unknown	U	U
16-065	U	U					U		U	U	U	Unknown	U	U
16-560	U	U					U		U	U	U	Unknown	U	U

Ref Number	Comments
06-021	Two sinkholes on private property; 1 - 2.5 ft × 3 ft × 4 ft; 2 - 1.5-ft wide
10-616	No comments
10-648	Sinkhole formed on the bottom of an excavation pit at mine and drained the entire pit, which was full of water.
10-769	Five orange trees fell into hole; only one was visible.
16-017	Next to phosphate strip mine.
16-050	Gypsum stack sinkhole; opened July 8, 1994; numerous news articles in Tampa Tribune, Lakeland ledger, etc.
16-065	Highway 630
16-560	This sink caused train to derail.

Source: ECT, 2007.

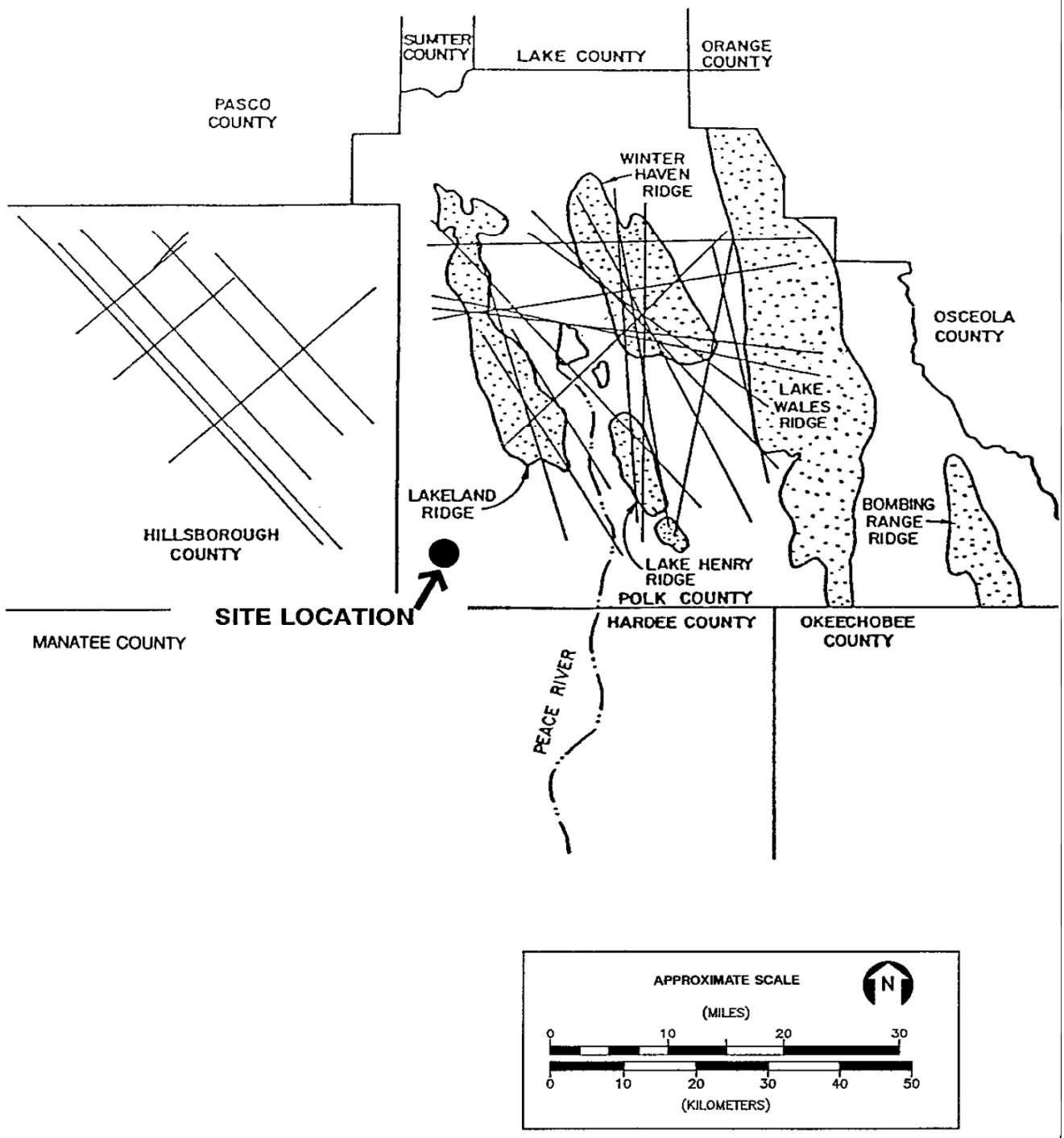


FIGURE 3.3.2-16.

LINEAMENT MAP FOR POLK COUNTY

Source: Ardaman & Associates, 1987.

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Although solution cavities probably exist in the carbonate rocks of the Floridan aquifer, and they may be large, the aquifer is buried beneath approximately 300 ft of unconsolidated clastic and poorly consolidated carbonate rock material. Though possible, it seems highly unlikely that collapse within the deeply buried Floridan aquifer will have an effect at the land surface.

Carbonate rocks of the intermediate aquifer occur within the surficial clastic sediments at depths of 30 to 50 ft. These are the first carbonate rocks with which water, percolating through the surficial aquifer, makes contact. Solution cavities, particularly in the upper part of the intermediate aquifer, are probably responsible for the small land-surface depressions.

Surface lineations, related to fracture zones in the bedrock, are relatively scarce in the area of the Site, suggesting either that groundwater circulation has not been adequate to develop large solution cavities along fractures, or that the bedrock is too deeply buried for these features to affect the land surface.

Recharge to the intermediate aquifer, and below, is relatively slight. The potential for dissolution of carbonate rocks is, likewise, limited.

The thick section of relatively cohesive sandy clay and clay that overlies the carbonate rocks appears to have sufficient bearing strength to bridge cavities of small to moderate size. When the bearing strength is exceeded, however, collapse at land surface will quickly result. It seems unlikely that sinkholes any larger than the existing small depressions will occur in the area.

Thus, through the comparison of the topographic features, structural contours, apparent lineations, and surface water features, it is evident that geology and structural geology affect the occurrence of sinkholes in Polk County (Sinclair *et al*., 1985). Based on the available information, the potential for sinkhole development at the PPS Site is relatively low compared to most other areas in Polk County.

3.3.3 SITE WATER BUDGET AND AREA USES

3.3.3.1 Site Water Budget

Meteorological data representative of the hydrological characteristics of the PPS Site were obtained from Southeast Regional Climate Center Web site (http://www.sercc.com/climateinfo/historical/historical_fl.html). These data contain historical monthly average precipitation and temperatures measured at

Bartow, Florida, from 1931 to 2006. Annual precipitation for the period of record varies from 33.0 to 83.4 inches with an average of 52.6 inches. The month of July has the highest monthly average precipitation of 8.4 inches, while November has the lowest monthly average of 2.0 inches. The annual average temperature measured for the same period of record is 72.8°F, with an average monthly minimum temperature of 51.9°F in December and an average monthly maximum temperature of 85.9°F in the month of June. Table 3.3.3-1 summarizes the meteorological data for Bartow and Lake Alfred.

Monthly pan evaporation data were obtained from the Lake Alfred Experiment Station at Lake Alfred, Florida, for the years 1965 through 1990 (Table 3.3.3-2). Annual pan evaporation for the period of record varies from 66.8 to 86.3 inches with an average of 73.4 inches. The highest monthly average occurs in May with 8.7 inches, while December has the lowest monthly average of 3.3 inches. Swancar *et al.* (2000) reported lake evaporations at Lake Starr in Polk County were 57.1 and 55.9 inches per year for August 1996 through July 1997 and for August 1997 through July 1998, respectively. Similarly, annual evaporation was 57.9 inches at Lake Lucerne in Polk County for October 1985 through September 1986 (Lee and Swancar, 1997).

Pan coefficients are often used to estimate evaporation. In central Florida, a pan coefficient of 0.74 is suggested for converting annual pan evaporation to lake evaporation (Farnsworth *et al.*, 1982). Swancar *et al.* (2000) reported that the annual pan coefficient to convert Lake Alfred pan evaporation to lake evaporation is between 0.69 and 0.73 and suggested that this range of annual coefficients may be applicable for similar Polk County lakes. Using a pan factor of 0.72, the average of reported literature values, annual lake evaporation was determined to be 52.8 inches for the area of the Site.

Evapotranspiration is the largest water consumption component in the water budget and is the most difficult to measure. Few estimates of evapotranspiration were available for Polk County. Spechler and Kroening (2007) suggested a value of 41.6 inches of evapotranspiration for Polk County. This value of evapotranspiration is a reasonable estimate for Polk County and falls within the range of evapotranspiration values determined for the area—27 inches per year reported for a well-drained, deep water table site along the Lake Wales Ridge in southwestern Orange County (Sumner, 1996) and approximately 56.5 inches per year reported at Lake Starr in east-central Polk County (Swancar *et al.*, 2000).

Table 3.3.3-1. Meteorological Data from Bartow and Lake Alfred, Florida

	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Monthly Precipitation (inches)													
Average	2.4	2.8	3.4	2.8	4.2	7.8	8.4	7.4	6.9	2.8	2.0	2.2	52.6
Minimum	0.0	0.0	0.1	0.0	0.0	0.7	2.9	2.6	1.0	0.0	0.0	0.1	33.0
Maximum	7.8	9.2	11.5	8.4	13.1	17.8	17.6	14.4	17.2	9.1	7.4	13.3	83.4
Monthly Temperature (°F)													
Average	61.6	63.5	67.6	72.3	77.5	81.0	82.2	82.4	80.9	75.0	67.9	62.8	72.8
Minimum	52.5	54.6	61.0	68.2	73.8	77.9	79.2	80.5	78.5	70.5	61.5	51.9	70.6
Maximum	71.2	71.0	73.9	77.2	81.4	85.9	84.7	84.6	83.2	78.9	76.4	71.2	75.1
Monthly Pan Evaporation (inches)													
Average	3.5	4.3	6.4	7.7	8.7	7.8	7.7	7.4	6.5	5.7	4.0	3.3	73.4
Minimum	2.8	2.6	5.1	6.9	7.4	6.4	6.4	6.3	5.4	4.1	3.1	2.5	66.8
Maximum	5.4	6.3	8.5	9.7	10.5	9.9	8.9	8.5	8.6	7.1	4.7	4.2	86.3

Source: ECT, 2007.

Table 3.3.3-2. Monthly Pan Evaporation for the Lake Alfred Experiment Station (Inches)

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total
1965					8.6	7.3	7.4	7.2	6.3	4.8	4.0	3.0	
1968	3.4	3.8	5.5	7.0	8.2	6.6	6.9	7.5	6.8	5.0	4.3	3.1	68.3
1967	3.7	4.0	6.3	8.2	9.1	7.4	7.6	6.5	6.1	6.1	3.8	3.6	72.4
1968	3.3	3.7	5.9	7.4	7.8	7.0	7.1	7.0	6.0	5.9	3:9	3.2	68.2
1969	3.5	3.8	5.1	7.3	7.8	8.3	7.9	6.8	5.6	4.1	3.5	3.1	66.8
1970	2.9	3.9	5.7	6.9	8.3	7.4	7.5	6.6	6.5	5.2	3.6	3.4	67.8
1971	3.4	4.4	6.2	7.0	9.0	7.0	6.6	7.0	5.4	5.2	4.1	3.4	68.7
1972	3.3	3.9	6.3	7.2	7.4	7.1	8.8	6.7	7.1	5.4	3.1	2.9	69.2
1973	3.1	3.7	6.2	7.1	7.8	7.2	7.4	7.0	6.2	5.6	4.6	3.1	69.0
1974	3.4	4.4	6.4	8.1	8.0	6.9	6.4	7.1	6.6	5.8	4.3	2.7	70.1
1975	3.6	4.1	6.4	7.2	8.1	7.4	7.0	7.2	6.0	5.4	3.9	2.9	69.1
1976	3.1	4.2	6.3	7.1	7.9	6.4	7.6	7.8	6.4	5.5	3.2	2.5	67.8
1977	3.2	4.2	6.2	7.7	8.0	7.8	7.4	6.3	5.9	4.6	3.6		64.8
1978	3.1	2.6	5.6	7.6	8.6	6.8	6.7	7.3	6.1	5.1	4.1	3.1	66.8
1979	3.6	3.4	6.1	7.2	7.7	7.8	7.9	7.3	5.5	5.3	3.9	3.2	68.8
1980	3.0	3.5	5.8	6.9	8.4	8.8	7.8	7.9	6.7	6.0	3.8	3.0	71.6
1981	5.4	6.3	8.4	9.7	10.5	9.3	8.9	7.6	6.5	6.0	4.3	3.3	86.3
1982	4.0	4.5	6.2	7.3	8.8	7.2	8.3	7.8	6.3	5.5	4.0	3.8	73.7
1983	2.8	4.3	6.4	7.7	9.4	8.1	8.6	7.7	6.1	5.8	4.2	3.1	74.0
1984	3.1	4.9	6.3	7.7	8.4	8.0	8.6	8.1	8.6	7.1	4.7	3.9	79.3
1985	4.4	5.1	8.5	7.8	10.3	9.9	8.5	7.3	7.4	6.4	4.7	4.2	84.4
1986	4.2	5.0	6.9	9.3	10.5	7.9	8.0	8.5	7.0	6.8	4.3	3.4	81.8
1987	3.6	4.0	6.8	8.6	9.0	9.4	8.2	7.8	7.3	6.1	4.0	3.7	78.6
1988	3.2	4.4	7.1	8.3	9.3	8.5	8.1	7.5	7.1	6.4	4.4	3.6	77.7
1989	4.2	5.1	6.5	8.0	10.3	8.5	8.8	8.5	7.0	5.9	4.5	3.5	80.7
1990	4.3	5.4	7.6	8.0	9.4	8.8	7.6	8.4	7.5	6.1	4.5	3.7	81.3
Average	3.5	4.3	6.4	7.7	8.7	7.8	7.7	7.4	6.5	5.7	4.0	3.3	73.1
Maximum	5.4	6.3	8.5	9.7	10.5	9.9	S.9	8.5	8.6	7.1	4.7	4.2	86.3
Minimum	2.8	2.6	5.1	6.9	7.4	6.4	6.4	6.3	5.4	4.1	3.1	2.5	64.8

Source: NWI, 1991.

The USGS station (No. 02295420) at Payne Creek near Bowling Green, Florida, drains an approximately 121-square-mile (mi^2) area. An average discharge between 1963 and 2006 at this station was 120.6 cubic feet per second (cfs). This is equivalent to 13.5 inches of annual surface and subsurface runoff for the watershed that drains at this gauging station. The Site covers approximately 716 and 2,816 acres of the Payne Creek and Little Payne Creek drainage basins, respectively. The estimated annual discharges to Payne Creek and Little Payne Creek from the Site are approximately 1.1 and 4.4 cfs, respectively. Table 3.3.3-3 presents the monthly discharge at Payne Creek near Bowling Green.

The peak discharge resulting from the 25-year, 24-hour storm event was computed for the premining condition using the HEC-1 model (developed by the Hydrologic Engineering Center in Davis, California). The total precipitation for this event is 9 inches. Estimated peak discharge from the Site to South Prong Alafia River was 541 cfs. Similarly, estimated peak discharges to Payne Creek and Little Payne Creek from the Site were 506 and 1,063 cfs, respectively.

Recharge areas of the Upper Floridan aquifer in Polk County include well-drained and poorly drained soils, swamps, closed-basin lakes, and sinkholes. The downward movement of water through the surficial aquifer system and intermediate aquifer system recharge the Upper Floridan aquifer. The recharge rate varies with the vertical hydraulic conductivity, thickness of the surficial aquifer system and underlying units, and magnitude of the downward head gradient (Spechler and Kroening, 2007). Estimated rates of recharge from the surficial aquifer system to the Upper Floridan aquifer range from 0 to greater than 10 inches per year in Polk County (Stewart, 1980; Ryder, 1985; Tibbals, 1990; Yobbi, 1996).

3.3.3.2 Area Uses

SWFWMD routinely summarizes and reports the water use in the 16 full and partial counties that are within its jurisdiction, and furthermore make prediction of anticipated future water needs and usage. Data presented for any partial county only include the water use for that portion of the county that is within SWFWMD.

Water use within the SWFWMD area is analyzed according to six broad categories or types of use, including public supply, domestic self-supply, recreational/aesthetic, agricultural, industrial/commercial, and mining/dewatering (SWFWMD, 2011). In 2005, an average of approximately 1.19 billion gallons of fresh water was withdrawn each day within the SWFWMD area. More than 80 percent of this amount was from groundwater sources, with the remainder

Table 3.3.3-3. Monthly Discharge at Payne Creek at Bowling Green (USGS Station #02295420)

Year	Average Monthly Discharge (cfs)												Annual Average
	January	February	March	April	May	June	July	August	September	October	November	December	
1963	—	—	—	—	—	—	—	—	—	54.8	139.9	63.2	—
1964	183.3	299.4	114.3	53.3	84.3	13.4	30.6	69.7	237.5	19.2	11.6	15.9	94.4
1965	11.3	23.3	172.3	9.3	3.1	55.4	491.3	510.0	69.8	117.3	17.2	26.9	125.6
1966	116.7	183.6	59.4	38.6	13.7	82.8	83.5	69.7	49.2	115.8	19.3	12.7	70.4
1967	10.8	26.4	7.9	2.8	2.0	78.3	103.5	459.9	82.8	70.5	9.0	19.9	72.8
1968	12.7	19.1	20.2	7.1	16.8	418.0	747.0	194.7	511.0	—	—	—	—
1979	—	—	—	—	—	—	—	—	—	308.2	62.3	79.8	—
1980	83.6	93.0	68.7	123.9	90.3	101.3	101.1	89.3	110.1	39.4	40.7	37.2	81.6
1981	35.4	87.6	34.4	21.9	21.0	28.4	19.8	98.4	118.7	24.4	17.1	15.8	43.6
1982	23.5	28.3	48.5	47.8	75.2	592.3	205.5	106.1	319.6	310.7	100.2	46.4	158.7
1983	55.4	249.1	330.6	192.5	42.2	110.9	138.2	207.5	203.2	76.4	40.1	105.7	146.0
1984	123.4	76.3	84.1	53.3	29.8	33.8	97.6	119.9	37.2	16.0	13.6	13.0	58.2
1985	15.2	20.6	18.5	25.0	10.3	30.7	92.8	308.2	203.2	80.4	50.0	31.5	73.9
1986	49.3	59.3	69.6	37.7	19.2	49.6	148.6	244.4	142.9	26.9	22.2	38.7	75.7
1987	48.2	31.6	105.3	132.1	94.6	35.4	132.6	171.7	97.0	77.7	99.4	93.8	93.3
1988	81.8	110.2	192.8	71.9	36.5	33.1	101.1	207.8	643.4	68.6	91.8	60.3	141.6
1989	56.8	53.4	62.1	35.0	9.3	33.5	123.7	60.5	81.4	79.5	29.2	52.0	56.4
1990	66.2	78.5	59.1	29.2	23.5	54.3	106.9	105.5	59.8	62.8	30.9	38.2	59.6
1991	28.8	29.9	51.2	113.0	78.6	99.9	339.1	243.8	160.3	85.9	44.7	25.9	108.4
1992	16.6	41.5	50.5	84.8	45.7	107.2	168.3	346.0	248.2	125.4	55.8	53.0	111.9
1993	113.7	96.1	124.6	172.8	46.7	70.0	85.9	94.8	163.6	121.7	99.6	50.8	103.4
1994	67.7	66.4	68.4	29.8	11.8	153.0	149.2	327.4	786.4	418.2	188.3	154.3	201.7
1995	125.8	101.4	103.9	94.7	62.5	58.1	133.3	597.8	478.0	291.5	248.6	87.9	198.6
1996	193.9	76.6	82.8	45.8	16.2	53.2	129.3	96.7	52.3	49.0	16.4	33.6	70.5
1997	27.6	45.1	33.4	39.1	76.4	44.0	137.1	196.9	101.9	117.1	258.6	357.4	119.6
1998	355.4	488.5	636.6	130.0	50.1	45.4	103.8	143.7	561.1	322.5	111.7	64.7	251.1
1999	99.6	64.4	17.4	7.1	11.5	69.6	67.3	84.0	128.7	121.6	57.3	48.9	64.8
2000	35.2	23.1	9.7	5.9	4.0	13.7	40.1	32.3	42.7	15.3	7.8	8.9	19.9
2001	9.6	6.3	14.8	15.5	2.3	27.8	236.4	235.5	679.6	96.1	32.5	30.1	115.5
2002	36.3	71.2	64.8	50.4	20.8	264.6	460.8	214.8	242.3	149.5	131.1	329.7	169.7
2003	364.0	75.0	86.8	49.8	66.8	555.2	292.9	489.0	256.9	110.2	77.8	96.2	210.1
2004	70.9	132.2	121.0	44.3	229.7	132.9	200.5	630.0	962.2	357.9	101.8	106.7	257.5
2005	182.7	186.6	492.0	81.5	68.2	455.4	490.4	241.8	145.9	156.6	147.3	126.3	231.2
2006	81.0	72.9	24.2	8.9	5.5	35.4	125.5	64.7	223.3	—	—	—	—
Average	86.9	94.3	107.2	58.0	42.8	123.0	183.9	220.7	256.3	127.7	74.2	72.7	120.6

Source: USGS <http://waterdata.usgs.gov/nwis/sw>, 2007.

coming from surface water sources. According to SWFWMD (2012), Polk County is one of four counties in the SWFWMD area with the highest freshwater use of approximately 240 million gallons per day (MGD) in the year of 2010.

In Polk County, decreases are expected in agricultural water use, while increases, some substantial, are projected in all other water use categories (SWFWMD, 2011). The following table compares calendar year 2005 water use with the projected 2030 water use for each use category for Polk County:

Water Use Category	Water Use 2005* (MGD)	Projected Water Use 2030* (MGD)	Percent Increase (+)/ Decrease (-) from 2005 Water Use
Agricultural	122.2	119.9	-1.9
Industrial/commercial/ mining/dewatering/power	65.8	70.7	+7.4
Public supply (includes domestic use and irrigation)	81.3	154.1	+89.5
Recreational/aesthetic	16.8	28.2	+67.8

*Source: SWFWMD, 2011.

Overall, the projected average daily water use in Polk County is expected to increase from 245.2 MGD in 2002 to 338.7 MGD in 2030. Agricultural water use by 2030 is expected to be reduced by approximately 1.9 percent as compared to 2005 water use. Public supply is expected to increase by almost 90 percent by 2030. Combined water use in industrial, commercial, mining, dewatering, and power generation is expected to increase by approximately 7.4 percent by 2030. Water use for recreational/aesthetic purposes is expected to increase by approximately 67.8 percent by 2030.

Figure 3.3.3-1 shows all the wells for various water uses including agricultural, industrial, public supply, mining, dewatering, and power generation within a 5-mile radius of the Site. Water use permits were extracted from SWFWMD geographic information system (GIS) database (SWFWMD, 2012). Within this 5-mile radius, a total of 229 wells are permitted in Hardee, Hillsborough, Manatee, and Polk Counties as of June 2012. Table 3.3.3-4 lists these wells.

As part of the initial PPS 1992 SCA investigative efforts, Environmental Consulting & Technology, Inc. (ECT), conducted a local survey to identify nonpermitted wells located within a 2-mile radius of the PPS Site. As reported at that time in the initial 1992 SCA, approximately 110 wells, primarily residential, were found

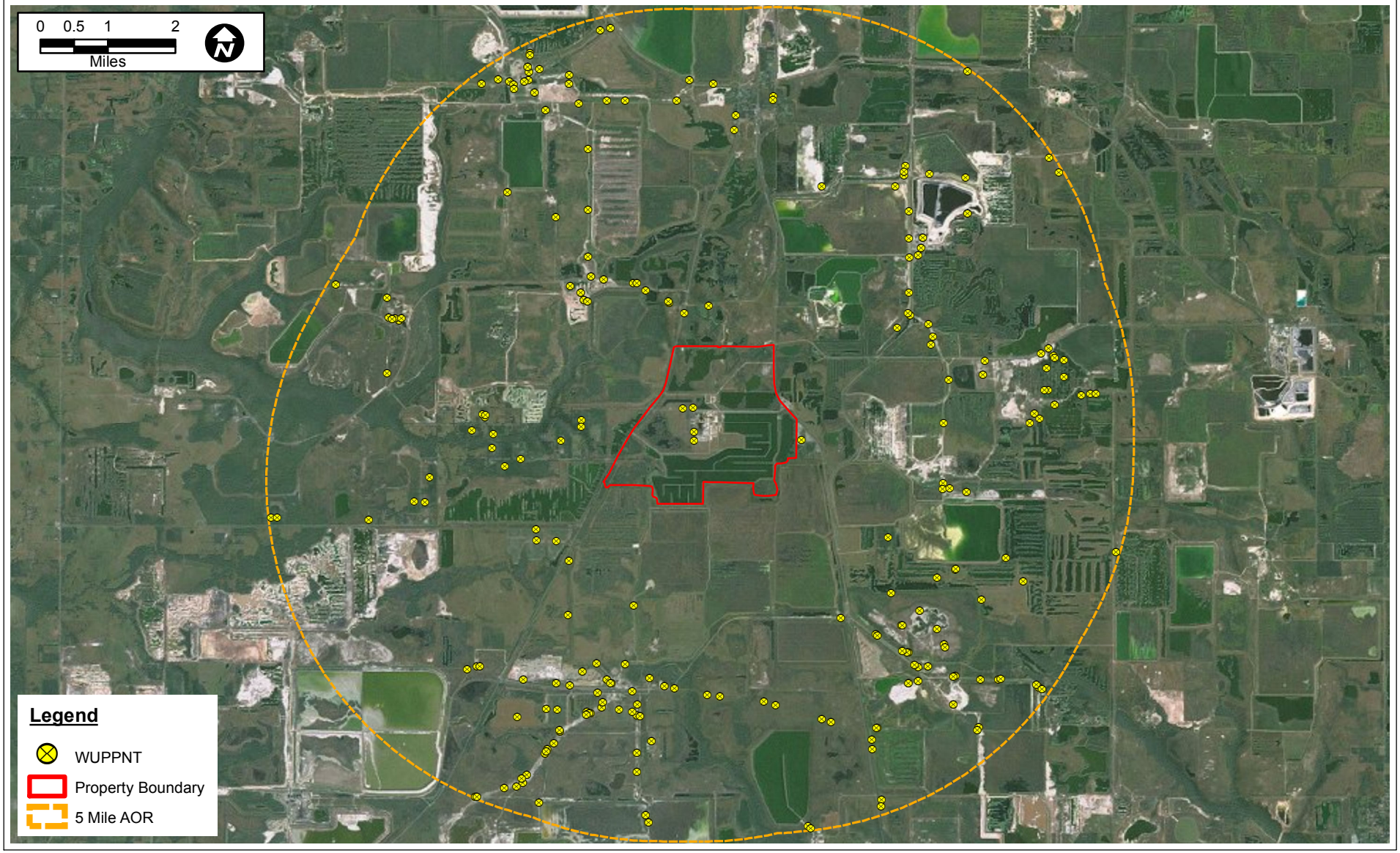


FIGURE 3.3.3-1.

GROUNDWATER USERS WITHIN A 5-MILE RADIUS OF PPS SITE

Sources: ESRI Aerials Express, 2009; ECT, 2012.

TECO TAMPA ELECTRIC

Table 3.3.3-4. Summary of Permitted Wells within a 5-Mile Radius of the Site

WUP Permit Number	Owner Name	Specific Use	General Use	PERM_AVG_A	Latitude	Longitude	Section	Township	Range
11747	Tampa Electric Co	Augmentation	Agricultural	74,800	27 40 59.00	81 56 34.00	19	32	24
11400	Mosaic Fertilizer LLC	Augmentation	Agricultural	59,600	27 40 38.00	81 56 29.00	19	32	24
11400	Mosaic Fertilizer LLC	General recreational	Agricultural	56,000	27 41 42.00	81 55 47.00	17	32	24
11400	Mosaic Fertilizer LLC	General recreational	Agricultural	56,000	27 41 43.00	81 55 46.50	17	32	24
20069	Richard & Tina Ford	Irrigation	Agricultural	54,900	27 43 22.91	81 58 00.98	1	32	23
6670	Mosaic Fertilizer LLC	Irrigation	Agricultural	0	27 43 40.34	82 02 36.45	6	32	23
12137	William C. Wynn, et al	Irrigation	Agricultural	2,900	27 45 08.84	81 59 55.82	27	31	23
6657	Elizabeth G King	Irrigation	Agricultural	30,100	27 42 34.72	82 03 37.85	12	32	22
2514	Sharpe Investment Limited Partnership	Irrigation	Agricultural	107,800	27 39 53.91	82 01 33.40	29	32	23
5243	Robert E & Wilmoth E Reynolds	Irrigation	Agricultural	134,800	27 42 04.41	82 01 34.15	17	32	23
6987	Co-Operative Fruit Company	Irrigation	Agricultural	46,000	27 42 53.18	82 03 24.62	12	32	22
3841	Sun Grown Citrus LLC / Attn: Connally Barnett	Irrigation	Agricultural	41,500	27 43 07.51	82 02 05.18	8	32	23
2715	Mosaic Fertilizer LLC	Irrigation	Agricultural	37,700	27 42 22.01	82 05 42.44	10	32	22
2715	Mosaic Fertilizer LLC	Irrigation	Agricultural	134,800	27 42 04.57	82 01 51.50	17	32	23
2715	Mosaic Fertilizer LLC	Irrigation	Agricultural	12,800	27 43 27.16	82 02 29.18	6	32	23
2715	Mosaic Fertilizer LLC	Irrigation	Agricultural	112,100	27 43 02.16	82 02 19.08	8	32	23
3841	Sun Grown Citrus LLC / Attn: Connally Barnett	Irrigation	Agricultural	24,200	27 45 00.58	81 59 42.91	27	31	23
12477	Kovacs Brothers Inc	Irrigation	Agricultural	13,800	27 43 16.19	82 02 30.07	6	32	23
29	Mosaic Fertilizer LLC	Irrigation	Agricultural	17,800	27 43 42.37	82 02 38.50	6	32	23
29	Mosaic Fertilizer LLC	Irrigation	Agricultural	200	27 43 42.13	82 02 35.83	6	32	23
29	Mosaic Fertilizer LLC	Irrigation	Agricultural	47,200	27 39 52.01	82 00 28.20	28	32	23
2715	Mosaic Fertilizer LLC	Irrigation	Agricultural	13,300	27 43 29.91	82 02 47.67	6	32	23
2715	Mosaic Fertilizer LLC	Irrigation	Agricultural	9,200	27 42 34.27	82 03 28.68	12	32	22
2715	Mosaic Fertilizer LLC	Irrigation	Agricultural	67,200	27 43 32.45	82 01 12.58	4	32	23
2715	Mosaic Fertilizer LLC	Irrigation	Agricultural	37,700	27 42 22.28	82 05 37.01	10	32	22
11400	Mosaic Fertilizer LLC	Irrigation	Agricultural	63,200	27 43 22.19	82 01 30.44	5	32	23
29	Mosaic Fertilizer LLC	Personal sanitary	Agricultural	8,500	27 40 39.00	81 56 33.00	19	32	24
				1,264,100					
11400	Mosaic Fertilizer LLC	Industrial-commercial	Industrial and commercial	4,000	27 48 11.08	82 01 59.26	8	31	23
2514	Sharpe Investment Limited Partnership	Industrial-commercial	Industrial and commercial	20,000	27 45 59.38	81 56 14.86	20	31	24
6670	Mosaic Fertilizer LLC	Industrial-commercial	Industrial and commercial	1,310,000	27 43 47.40	81 59 35.15	3	32	23
13303	Gary N Sharpe	Industrial-commercial	Industrial and commercial	1,310,000	27 43 21.91	81 59 34.31	3	32	23
20069	Richard & Tina Ford	Industrial-commercial	Industrial and commercial	2,000	27 40 27.03	82 02 43.09	30	32	23
12477	Kovacs Brothers Inc	Industrial-commercial	Industrial and commercial	1,310,000	27 43 47.15	81 59 44.19	3	32	23
5188	Chapman Fruit Company	Industrial-commercial	Industrial and commercial	500,000	27 46 17.82	81 55 36.42	20	31	24
6670	Mosaic Fertilizer LLC	Industrial-commercial	Industrial and commercial	3,000	27 40 14.09	82 01 34.27	28	32	23
6670	Mosaic Fertilizer LLC	Industrial-commercial	Industrial and commercial	7,000	27 41 04.69	81 57 26.66	24	32	23
1162	Mac A & Eugene S Greco & Eleanor	Industrial-commercial	Industrial and commercial	1,310,000	27 43 28.82	81 59 34.32	3	32	23
1884	Michael E. And Lanita S. Wynn	Industrial-commercial	Industrial and commercial	8,000	27 40 26.97	82 02 40.77	30	32	23
				5,784,000					
11400	Mosaic Fertilizer LLC	Irrigation	Industrial and commercial	2,900	27 45 08.84	81 59 55.82	27	31	23

Table 3.3.3-4. Summary of Permitted Wells within a 5-Mile Radius of the Site

(Continued, Page 2 of 6)

WUP Permit Number	Owner Name	Specific Use	General Use	PERM_AVG_A	Latitude	Longitude	Section	Township	Range
11400	Mosaic Fertilizer LLC	Mining	Industrial and commercial	3,000,000	27 44 55.14	82 03 51.13	25	31	22
11400	Mosaic Fertilizer LLC	Mining	Industrial and commercial	2,000	27 40 17.98	82 00 12.98	27	32	23
11400	Mosaic Fertilizer LLC	Mining	Industrial and commercial	144,000	27 44 57.58	82 04 00.28	25	31	22
11400	Mosaic Fertilizer LLC	Mining	Industrial and commercial	2,200,000	27 45 45.50	81 56 19.33	29	31	24
11400	Mosaic Fertilizer LLC	Mining	Industrial and commercial	4,588,000	27 40 07.60	82 00 28.16	28	32	23
11400	Mosaic Fertilizer LLC	Mining	Industrial and commercial	4,588,000	27 40 06.88	82 00 58.30	28	32	23
11400	Mosaic Fertilizer LLC	Mining	Industrial and commercial	530,000	27 47 57.68	82 02 11.66	8	31	23
11400	Mosaic Fertilizer LLC	Mining	Industrial and commercial	3,000,000	27 44 56.97	82 03 54.73	25	31	22
11400	Mosaic Fertilizer LLC	Mining	Industrial and commercial	6,000,000	27 48 01.18	82 01 58.56	8	31	23
11400	Mosaic Fertilizer LLC	Mining	Industrial and commercial	2,600,000	27 48 09.88	82 01 48.96	8	31	23
11400	Mosaic Fertilizer LLC	Mining	Industrial and commercial	4,588,000	27 40 28.90	82 00 34.27	28	32	23
11400	Mosaic Fertilizer LLC	Mining	Industrial and commercial	2,200,000	27 45 51.48	81 56 16.76	20	31	24
11400	Mosaic Fertilizer LLC	Mining	Industrial and commercial	1,200,000	27 48 11.68	82 01 59.26	8	31	23
11400	Mosaic Fertilizer LLC	Mining	Industrial and commercial	2,340,000	27 45 18.48	82 00 16.56	27	31	23
11400	Mosaic Fertilizer LLC	Mining	Industrial and commercial	4,588,000	27 40 29.46	82 00 59.34	28	32	23
11400	Mosaic Fertilizer LLC	Mining	Industrial and commercial	47,000	27 48 00.23	82 02 02.34	7	31	23
11400	Mosaic Fertilizer LLC	Mining	Industrial and commercial	80,000	27 40 17.29	82 00 50.20	28	32	23
11400	Mosaic Fertilizer LLC	Mining	Industrial and commercial	3,000,000	27 44 55.96	82 03 57.29	25	31	22
11400	Mosaic Fertilizer LLC	Mining	Industrial and commercial	28,000	27 40 14.01	82 00 46.78	30	33	23
2715	Mosaic Fertilizer LLC	Power plant	Industrial and commercial	3,800,000	27 38 23.64	81 57 55.30	1	33	23
2715	Mosaic Fertilizer LLC	Power plant	Industrial and commercial	3,800,000	27 38 21.52	81 57 52.92	1	33	23
2715	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 48 01.10	81 59 38.30	10	31	23
2715	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 40 24.96	82 02 52.01	30	32	23
2715	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 38 43.62	81 56 51.00	6	33	24
13359	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 48 01.57	82 02 25.16	7	31	23
13359	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 39 46.12	81 57 43.52	25	32	23
2715	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 42 13.31	82 01 51.89	17	32	23
2715	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 38 56.76	82 02 03.35	32	32	23
2715	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 40 10.89	81 54 34.06	28	32	24
2715	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 39 49.11	82 00 24.29	28	32	23
2715	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 39 49.01	82 00 21.39	28	32	23
2715	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 45 44.52	82 01 06.58	28	31	23
2715	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 38 32.12	82 00 16.29	3	33	23
2715	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 45 09.89	81 59 56.66	27	31	23
2715	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 40 13.25	81 54 36.34	27	32	24
9731	Hardee Power Partners	Sealing water well	Industrial and commercial	200,000	27 48 41.33	82 00 46.91	4	31	23
9731	Hardee Power Partners	Sealing water well	Industrial and commercial	200,000	27 40 23.51	82 01 11.29	28	32	23
6506	Polk Co BOCC Util. Division / Attn: Krystal Azzarella	Sealing water well	Industrial and commercial	200,000	27 40 09.33	81 54 31.80	28	32	24

Table 3.3.3-4. Summary of Permitted Wells within a 5-Mile Radius of the Site

(Continued, Page 3 of 6)

WUP Permit Number	Owner Name	Specific Use	General Use	PERM_AVG_A	Latitude	Longitude	Section	Township	Range
10564	Board of Tst Internal Improv Tst Fund of the State of Florida	Sealing water well	Industrial and commercial	200,000	27 45 26.50	82 00 53.29	28	31	23
6506	Polk Co BOCC Util. Division / Attn: Krystal Azzarella	Sealing water well	Industrial and commercial	200,000	27 39 59.72	81 58 33.71	26	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	350,000	27 39 27.61	82 01 36.49	32	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 46 20.88	82 01 06.76	21	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 48 07.28	82 01 57.96	8	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 39 23.00	82 01 41.86	32	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 39 36.59	82 01 30.91	32	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 46 14.91	82 01 34.87	20	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 39 57.92	82 00 23.79	28	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 39 55.51	82 00 54.52	28	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 40 19.63	81 55 46.93	29	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 39 50.91	82 01 04.39	28	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 39 03.24	82 02 00.00	32	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 39 52.02	82 01 07.84	33	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 40 12.50	82 01 22.55	29	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	300,000	27 40 19.02	81 55 48.73	29	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 40 16.09	81 56 19.26	34	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 39 39.38	81 56 55.68	31	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 48 07.88	81 55 36.35	8	31	24
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 47 58.48	81 59 17.46	11	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 39 23.04	81 56 59.51	31	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 45 06.38	81 59 21.66	26	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 39 50.76	82 01 05.63	28	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 39 56.88	81 58 23.30	25	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 40 11.71	82 00 00.14	27	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 40 16.82	81 55 09.67	28	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 39 44.10	81 57 35.14	25	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 40 16.90	82 02 03.05	29	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 48 39.67	82 00 56.16	4	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 40 17.22	81 55 24.94	28	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 40 17.58	81 55 07.62	28	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 39 05.62	82 00 24.29	33	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 39 21.64	82 01 43.00	32	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 38 38.69	81 56 51.50	6	33	24
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 47 08.08	82 01 06.68	16	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 38 41.62	82 01 49.39	5	33	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 39 30.13	81 56 59.58	31	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 38 26.32	82 00 13.89	3	33	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 40 04.01	81 59 11.87	26	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 40 04.73	81 59 22.99	27	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 48 04.98	82 01 23.06	8	31	23

Table 3.3.3-4. Summary of Permitted Wells within a 5-Mile Radius of the Site

(Continued, Page 4 of 6)

WUP Permit Number	Owner Name	Specific Use	General Use	PERM_AVG_A	Latitude	Longitude	Section	Township	Range
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 41 14.31	82 00 26.99	21	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Industrial and commercial	200,000	27 39 20.31	82 00 23.99	33	32	23
5243	Robert E & Wilmoth E Reynolds	Industrial-commercial	Mining and dewatering	4,000	27 48 11.08	82 01 59.26	8	31	23
6670	Mosaic Fertilizer LLC	Industrial-commercial	Mining and dewatering	20,000	27 45 59.38	81 56 14.86	20	31	24
12117	Violet Sheffield Trust	Industrial-commercial	Mining and dewatering	2,000	27 40 27.03	82 02 43.09	30	32	23
1884	Michael E. And Lanita S. Wynn	Industrial-commercial	Mining and dewatering	500,000	27 46 17.82	81 55 36.42	20	31	24
8647	Margie F Dobbs	Industrial-commercial	Mining and dewatering	3,000	27 40 14.09	82 01 34.27	28	32	23
6377	Claude E Mann Inc	Industrial-commercial	Mining and dewatering	7,000	27 41 04.69	81 57 26.66	24	32	23
20069	Richard & Tina Ford	Industrial-commercial	Mining and dewatering	8,000	27 40 26.97	82 02 40.77	30	32	23
11400	Mosaic Fertilizer LLC	Irrigation	Mining and dewatering	376,000	27 44 08.88	81 55 52.59	32	31	24
11400	Mosaic Fertilizer LLC	Irrigation	Mining and dewatering	376,000	27 44 49.56	81 56 37.43	33	31	24
11400	Mosaic Fertilizer LLC	Irrigation	Mining and dewatering	376,000	27 46 45.60	81 55 38.01	17	31	24
29	Mosaic Fertilizer LLC	Mining	Mining and dewatering	376,000	27 45 43.84	81 56 26.77	30	31	24
11400	Mosaic Fertilizer LLC	Mining	Mining and dewatering	3,000,000	27 44 55.14	82 03 51.13	25	31	22
11400	Mosaic Fertilizer LLC	Mining	Mining and dewatering	2,000	27 40 17.98	82 00 12.98	27	32	23
11400	Mosaic Fertilizer LLC	Mining	Mining and dewatering	144,000	27 44 57.58	82 04 00.28	25	31	22
11400	Mosaic Fertilizer LLC	Mining	Mining and dewatering	2,200,000	27 45 45.50	81 56 19.33	29	31	24
11400	Mosaic Fertilizer LLC	Mining	Mining and dewatering	4,588,000	27 40 07.60	82 00 28.16	28	32	23
11400	Mosaic Fertilizer LLC	Mining	Mining and dewatering	4,588,000	27 40 06.88	82 00 58.30	28	32	23
11400	Mosaic Fertilizer LLC	Mining	Mining and dewatering	530,000	27 47 57.68	82 02 11.66	8	31	23
11400	Mosaic Fertilizer LLC	Mining	Mining and dewatering	3,000,000	27 44 56.97	82 03 54.73	25	31	22
29	Mosaic Fertilizer LLC	Mining	Mining and dewatering	6,768,000	27 46 54.59	81 56 30.12	18	31	24
29	Mosaic Fertilizer LLC	Mining	Mining and dewatering	376,000	27 44 36.00	81 56 08.00	32	31	24
11400	Mosaic Fertilizer LLC	Mining	Mining and dewatering	6,000,000	27 48 01.18	82 01 58.56	8	31	23
29	Mosaic Fertilizer LLC	Mining	Mining and dewatering	376,000	27 44 52.22	81 56 10.18	33	31	24
11400	Mosaic Fertilizer LLC	Mining	Mining and dewatering	2,600,000	27 48 09.88	82 01 48.96	8	31	23
29	Mosaic Fertilizer LLC	Mining	Mining and dewatering	376,000	27 46 19.74	81 56 27.11	19	31	24
29	Mosaic Fertilizer LLC	Mining	Mining and dewatering	376,000	27 45 16.49	81 56 27.49	30	31	24
29	Mosaic Fertilizer LLC	Mining	Mining and dewatering	376,000	27 45 01.00	81 56 28.00	30	31	24
11400	Mosaic Fertilizer LLC	Mining	Mining and dewatering	2,200,000	27 45 51.48	81 56 16.76	20	31	24
11400	Mosaic Fertilizer LLC	Mining	Mining and dewatering	4,588,000	27 40 28.90	82 00 34.27	28	32	23
11400	Mosaic Fertilizer LLC	Mining	Mining and dewatering	1,200,000	27 48 11.68	82 01 59.26	8	31	23
11400	Mosaic Fertilizer LLC	Mining	Mining and dewatering	2,340,000	27 45 18.48	82 00 16.56	27	31	23
29	Mosaic Fertilizer LLC	Mining	Mining and dewatering	6,768,000	27 46 47.64	81 56 31.31	18	31	24
11400	Mosaic Fertilizer LLC	Mining	Mining and dewatering	4,588,000	27 40 29.46	82 00 59.34	28	32	23
11400	Mosaic Fertilizer LLC	Mining	Mining and dewatering	47,000	27 48 00.23	82 02 02.34	7	31	23
29	Mosaic Fertilizer LLC	Mining	Mining and dewatering	376,000	27 45 58.68	81 56 27.49	19	31	24
11400	Mosaic Fertilizer LLC	Mining	Mining and dewatering	80,000	27 40 17.29	82 00 50.20	28	32	23
29	Mosaic Fertilizer LLC	Mining	Mining and dewatering	206,000	27 46 50.17	81 56 31.50	18	31	24
11400	Mosaic Fertilizer LLC	Mining	Mining and dewatering	3,000,000	27 44 55.96	82 03 57.29	25	31	22

Table 3.3.3-4. Summary of Permitted Wells within a 5-Mile Radius of the Site

(Continued, Page 5 of 6)

WUP Permit Number	Owner Name	Specific Use	General Use	PERM_AVG_A	Latitude	Longitude	Section	Township	Range
11400	Mosaic Fertilizer LLC	Mining	Mining and dewatering	28,000	27 40 14.01	82 00 46.78	30	33	23
11400	Mosaic Fertilizer LLC	Personal sanitary	Mining and dewatering	3,000	27 39 47.57	82 02 08.04	29	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 40 24.96	82 02 52.01	30	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 38 43.62	81 56 51.00	6	33	24
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 48 01.57	82 02 25.16	7	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 39 46.12	81 57 43.52	25	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 42 13.31	82 01 51.89	17	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 48 01.10	81 59 38.30	10	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 38 56.76	82 02 03.35	32	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 40 10.89	81 54 34.06	28	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 39 49.11	82 00 24.29	28	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 39 49.01	82 00 21.39	28	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 45 44.52	82 01 06.58	28	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 38 32.12	82 00 16.29	3	33	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 45 09.89	81 59 56.66	27	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 40 13.25	81 54 36.34	27	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 48 41.33	82 00 46.91	4	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 40 23.51	82 01 11.29	28	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 40 09.33	81 54 31.80	28	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 45 26.50	82 00 53.29	28	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 39 59.72	81 58 33.71	26	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	350,000	27 39 27.61	82 01 36.49	32	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 46 20.88	82 01 06.76	21	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 48 07.28	82 01 57.96	8	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 39 23.00	82 01 41.86	32	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 39 36.59	82 01 30.91	32	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 46 14.91	82 01 34.87	20	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 39 57.92	82 00 23.79	28	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 39 55.51	82 00 54.52	28	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 39 50.91	82 01 04.39	28	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 40 19.63	81 55 46.93	29	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 39 03.24	82 02 00.00	32	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 39 52.02	82 01 07.84	33	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 40 12.50	82 01 22.55	29	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	300,000	27 40 19.02	81 55 48.73	29	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 48 07.88	81 55 36.35	8	31	24
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 40 16.09	81 56 19.26	34	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 39 39.38	81 56 55.68	31	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 47 58.48	81 59 17.46	11	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 39 23.04	81 56 59.51	31	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 45 06.38	81 59 21.66	26	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 39 50.76	82 01 05.63	28	32	23

Table 3.3.3-4. Summary of Permitted Wells within a 5-Mile Radius of the Site

(Continued, Page 6 of 6)

WUP Permit Number	Owner Name	Specific Use	General Use	PERM_AVG_A	Latitude	Longitude	Section	Township	Range
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 39 56.88	81 58 23.30	25	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 40 11.71	82 00 00.14	27	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 40 16.82	81 55 09.67	28	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 39 44.10	81 57 35.14	25	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 40 16.90	82 02 03.05	29	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 48 39.67	82 00 56.16	4	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 40 17.22	81 55 24.94	28	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 40 17.58	81 55 07.62	28	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 39 05.62	82 00 24.29	33	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 39 21.64	82 01 43.00	32	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 38 38.69	81 56 51.50	6	33	24
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 47 08.08	82 01 06.68	16	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 38 41.62	82 01 49.39	5	33	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 39 30.13	81 56 59.58	31	32	24
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 38 26.32	82 00 13.89	3	33	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 40 04.01	81 59 11.87	26	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 40 04.73	81 59 22.99	27	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 48 04.98	82 01 23.06	8	31	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 41 14.31	82 00 26.99	21	32	23
11400	Mosaic Fertilizer LLC	Sealing water well	Mining and dewatering	200,000	27 39 20.31	82 00 23.99	33	32	23
11400	Mosaic Fertilizer LLC	Fire suppression	Public supply	1,000	27 47 22.56	81 58 59.37	14	31	23
2715	Mosaic Fertilizer LLC	Personal sanitary	Public supply	3,000	27 39 47.57	82 02 08.04	29	32	23
2715	Mosaic Fertilizer LLC	Public supply	Public supply	2,500	27 47 34.24	81 58 57.97	11	31	23
2715	Mosaic Fertilizer LLC	Public supply	Public supply	79,800	27 47 48.76	81 58 25.42	11	31	23
11400	Mosaic Fertilizer LLC	Augmentation	Recreation/aesthetic	74,800	27 40 59.00	81 56 34.00	19	32	24
11400	Mosaic Fertilizer LLC	Augmentation	Recreation/aesthetic	59,600	27 40 38.00	81 56 29.00	19	32	24
11400	Mosaic Fertilizer LLC	General recreational	Recreation/aesthetic	56,000	27 41 42.00	81 55 47.00	17	32	24
11400	Mosaic Fertilizer LLC	General recreational	Recreation/aesthetic	56,000	27 41 43.00	81 55 46.50	17	32	24
2715	Mosaic Fertilizer LLC	Personal sanitary	Recreation/aesthetic	8,500	27 40 39.00	81 56 33.00	19	32	24

Source: ECT, 2012.

primarily along Albritton and Bethlehem Roads, with depths ranging between 25 and 420 ft.

3.3.4 SURFICIAL HYDROLOGY

3.3.4.1 Hydrologic Characterization

Surface Water Quantity

Prior to the development of PPS, the portion of the Site to the east of SR 37 consisted primarily of mined-out lands with water-filled mine cuts between spoil piles surrounding an unmined parcel of land and old mined and unreclaimed lands. In general, lands surrounding the Site and in the region have also been impacted by previous phosphate mining operations.

The original 4,348-acre area within the PPS Site boundaries is drained by three streams: the South Prong Alafia River, Payne Creek, and Little Payne Creek. The South Prong Alafia River is a tributary of the Alafia River, which flows into Hillsborough Bay; Payne Creek and Little Payne Creek are tributaries of the Peace River, which flows into Charlotte Harbor.

The original Site areas in the South Prong Alafia River basin (801 acres) and Payne Creek basin (716 acres) are located west of SR 37 and consist of mostly reclaimed wetland, reclaimed lake, and undeveloped lands, which will not be affected by the proposed Project construction and operation.

Presently, the entire PPS facility is located east of SR 37 in the Little Payne Creek basin (2,837 acres), which includes the existing power generating Units 1 through 5, a 755-acre cooling reservoir, a 26-acre stormwater retention pond, reclaimed wetlands, old mine cuts, and an unnamed lake (see Figure 3.3.4-1). The proposed Polk 2-5 Conversion Project facility will also be located in the Little Payne Creek basin.

According to the SCS soil survey of Polk County (SCS, 1990), the soils on the Site have been classified in the general soil groups Smyrna-Myakka, which is described as nearly level poorly drained sandy soils, some underlain by loamy material, and Arents-Water, which are soils that have been strip-mined for phosphate or silica sand. More specifically, the northern portion of the Site is primarily represented by the Smyrna-Myakka soil complex and the southern portion mostly Arents-Water complex.

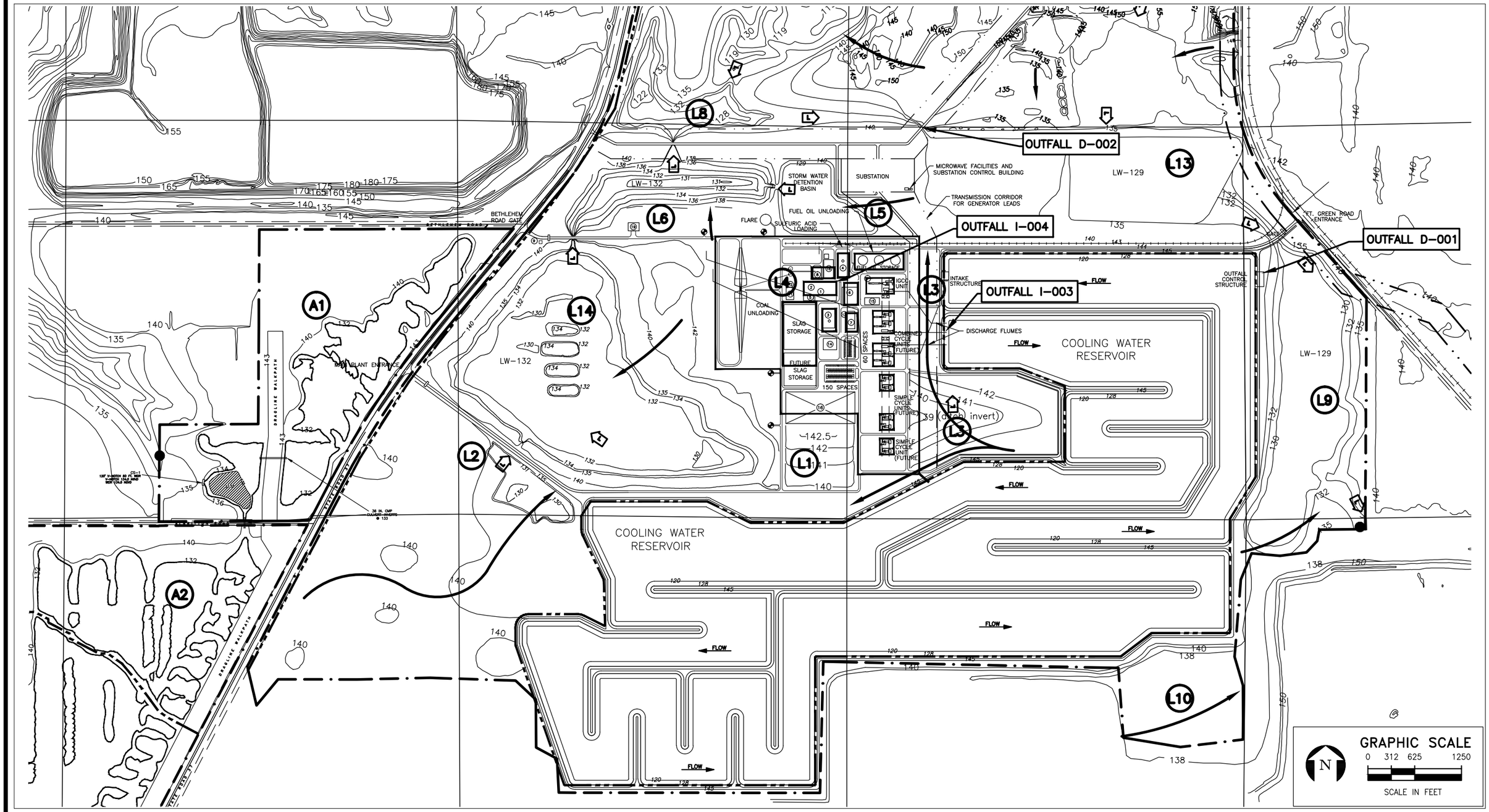


FIGURE 3.3.4-1.

POSTRECLAMATION/DEVELOPMENT DRAINAGE BASINS AND TOPOGRAPHY: 1992 SCA

Source: ECT, 2012.

TECO TAMPA ELECTRIC

USGS has maintained two stream gauging stations located near the Site with long-term water-stage records. The gauge on the South Prong Alafia River near Lithia, Florida (USGS Station No. 02301300), is located approximately 8 miles northwest of the Site and approximately 10 miles downstream from the project boundary (Figure 3.3.4-2). The total drainage area at this station is 107 mi^2, and the average discharge is 97.3 cfs for the period of record from 1964 through 2011. Another gauge on Payne Creek near Bowling Green, Florida (USGS Station No. 02295420), is approximately 12 miles southeast of the Site and approximately 16 miles downstream from the project boundary. The drainage area at this station is 121 mi^2, and the average discharge is 113.7 cfs for the period of record from 1964 to 2011.

Table 3.3.4-1 shows the average flows and drainage areas of five USGS gauging stations in West-Central Florida. The discharge per square mile (watershed yield) was calculated for each station. The watershed yield values for the gauges along the Alafia River system range from 0.91 to 1.11 cubic feet per second per square mile (csm). The watershed yields in the Peace River basin range from 0.73 csm for a large to 0.94 csm for a small basin. These values are typical for the terrain and soils of Florida. To estimate the average flow contributed by the areas located within the project Site boundaries, the watershed yield for the South Prong Alafia River (0.91 csm) and Payne Creek (0.94 csm) were applied to the onsite drainage basin areas. The Payne Creek gauging station near Bowling Green (0.94 csm) is located downstream of the confluence of Little Payne Creek and Payne Creek and was, therefore, applicable to both the Payne Creek and Little Payne Creek subwatersheds. Consequently, the predevelopment average discharges from the PPS Site to the South Prong Alafia River, Payne Creek, and Little Payne Creek were calculated to be 1.2, 1.1, and 4.2 cfs, respectively.

Table 3.3.4-1. Annual Average Discharge at Selected Gauging Stations

Station	Drainage Area (mi^2)	Average Discharge (cfs)	Watershed Yield (csm)
South Prong Alafia River near Lithia (1964 to 2011)	107	97.3	0.909
North Prong Alafia River at Keysville (1951 to 2011)	135	150.3	1.113
Alafia River at Lithia (1933 to 2011)	335	329.0	0.982
Payne Creek near Bowling Green (1964 to 2011)	121	113.7	0.940
Peace River at Zolfo Springs (1934 to 2011)	826	606.0	0.734

Source: USGS, 2012.

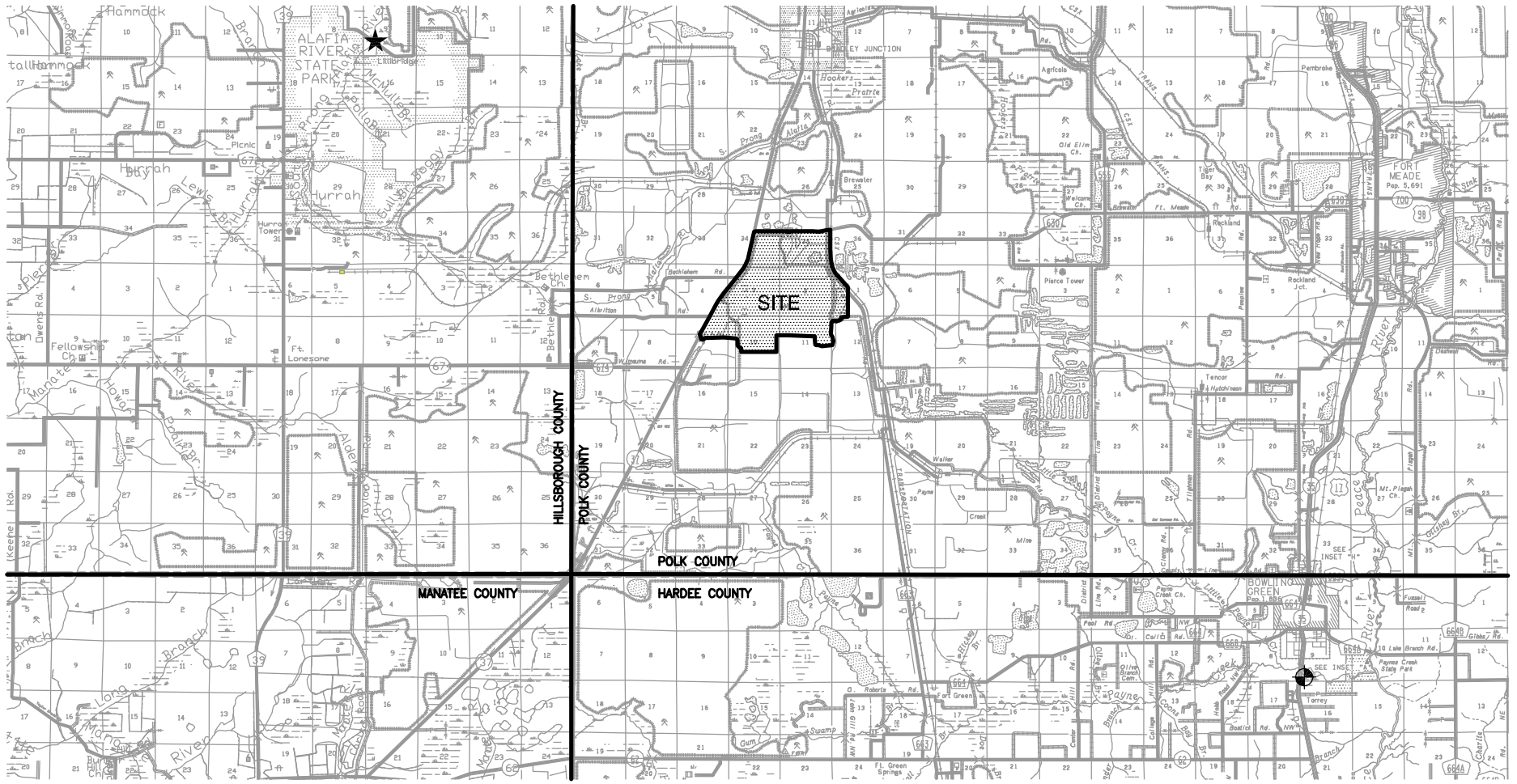


FIGURE 3.3.4-2.

LOCATION OF USGS SURFACE WATER STATIONS

Source: FDOT Map, 2000; USGS, 1990; ECT, 2012.

TECO TAMPA ELECTRIC

USGS, using the log-Pearson Type III frequency distribution, has calculated the 7-day, 10-year (7Q10) low-flow rates for the South Prong Alafia River and Payne Creek gauging stations using gauge data through 1981 (USGS, 1985). The 7Q10 low-flows for the South Prong Alafia River and Payne Creek are 3.0 and 1.6 cfs, respectively; Table 3.3.4-2 presents additional low-flow statistics.

Table 3.3.4-2. Low-Flow Frequency Analysis

Period of Consecutive Days	Lowest Average Flow (cfs) for Indicated Recurrence Interval			
	2 Years	5 Years	10 Years	20 Years
South Prong Alafia River near Lithia				
1	10	4.0	2.3	1.4
3	11	4.4	2.6	1.6
7	12	5.0	3.0	1.9
14	14	6.0	3.6	2.3
30	19	9.0	5.8	4.0
60	27	14	9.9	7.2
90	34	18	13	9.3
120	44	24	17	12
183	54	32	25	20
Payne Creek near Bowling Green				
1	3.2	1.6	1.2	1.0
3	3.7	1.8	1.4	1.1
7	4.8	2.2	1.6	1.3
14	5.8	2.5	1.7	1.3
30	7.9	3.3	2.1	1.5
60	13	5.0	2.9	1.9
90	18	8.3	5.5	3.8
120	23	12	9.1	7.2
183	36	18	12	8.2

Source: USGS, 1985a.

Table 3.3.4-3 illustrates flood flows computed at selected gauging stations in the Peace River and Alafia River basins for 2- to 100-year recurrence intervals. These values were computed using a log-Pearson Type III distribution with long-term historical discharge data. The 100-year peak flow was estimated to be 3,960 cfs for the South Prong Alafia River gauging station near Lithia and 4,876 cfs for the Peace River at the Bartow gauging station.

Table 3.3.4-3. Peak Flow Frequency Analysis

Station	Years of Record	Drainage Area (mi^2)	Return Period (Year) (cfs)					
			2	5	10	25	50	100
South Prong Alafia River near Lithia	44	107	722	1,331	1,836	2,591	3,238	3,960
Alafia River at Lithia	74	335	2,525	5,406	8,626	15,005	22,138	32,079
Peace River at Bartow	67	390	925	1,655	2,264	3,182	3,978	4,876
Peace River at Zolfo Springs	74	826	3,993	7,149	10,023	14,746	19,203	24,591
Payne Creek near Bowling Green	32	121	999	1,982	2,845	4,190	5,387	6,758

Source: ECT, 2007.

Ardaman & Associates, Inc. conducted a hydrologic analysis of a 19,936-acre area (Ardaman, 1991) for the Agrico Fort Green Mine Reclamation Plan, which included the majority of the PPS Site area. The HEC-1 Flood Hydrograph Package was used to simulate the runoff hydrographs of the premining watershed resulting from a design storm. The peak discharge per square mile with the 24-hour, 25-year design storm was calculated to be 370 csm for the South Prong Alafia River, 122 csm for Payne Creek, and 198 csm for Little Payne Creek, according to Ardaman's analysis.

The 100-year floodplains on the Site for the premining condition were documented by FEMA (1983) and are shown in Figure 3.1.5-1. Most of the floodplain areas to the east of SR 37 were associated with the headwaters of Little Payne Creek where mining activities have occurred. These mined areas were not the passageway of any other upstream stormwater runoff since they were located at the headwaters of the drainage basin.

Currently, the Site does not contribute to flood hazard potential because the existing conditions resulting from the previous mining operations (reclaimed lake, mine pits, etc.) and development of the existing PPS provide for significant water retention.

Surface Water Quality

According to Chapter 62-302, F.A.C., the surface waters on and around the PPS Site are classified Class III fresh waters, and the designated uses are recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife. The nearest Outstanding Florida Water is the Little Manatee River. The

nearest portion of this river designated as such is approximately 11.5 miles west of the Site and is not and will not be affected by the facilities.

Water quality of the South Prong Alafia River is considered fair by FDEP (SWFWMD, 2001). Although better than the North Prong Alafia River, the South Prong is affected to some degree by the phosphate mining industry as well as agriculture development. FDEP's 2009 final verified list of impaired waters reports that elevated nutrients and depressed dissolved oxygen (DO) values remain a problem on the South Prong Alafia River. FDEP considers the water quality in Payne Creek and Little Payne Creek to be good. However, DO concentrations occasionally below 5.0 mg/L and elevated nutrient levels have been observed on these streams as well (FDEP, 2003). Little Payne Creek, which drains the PPS facility area, is not listed on FDEP's 303(d) impaired water list.

Section 373.042 of the Florida Statutes mandates that SWFWMD establish minimum flows and levels (MFLs) for streams and rivers within the district boundary to protect water resources from significant harm. The established MFLs will be used to regulate consumptive use of water. SWFWMD's MFLs development methodology is to establish multiple thresholds for seasonal *building blocks*, including minimum low, minimum average, and minimum high flows and levels. Little Payne Creek is a tributary of the Middle Peace River basin. SWFWMD proposed the minimum low flow for the Middle Peace River in 2005. The proposed low flow threshold at Zolfo Springs USGS gauge is 45 cfs (SWFWMD, 2005). Rule 40D-8.041, F.A.C., has established minimum flow threshold for middle Peace River at the Arcadia USGS gauge of 67 cfs and the minimum high flow threshold of 1,362 cfs, respectively.

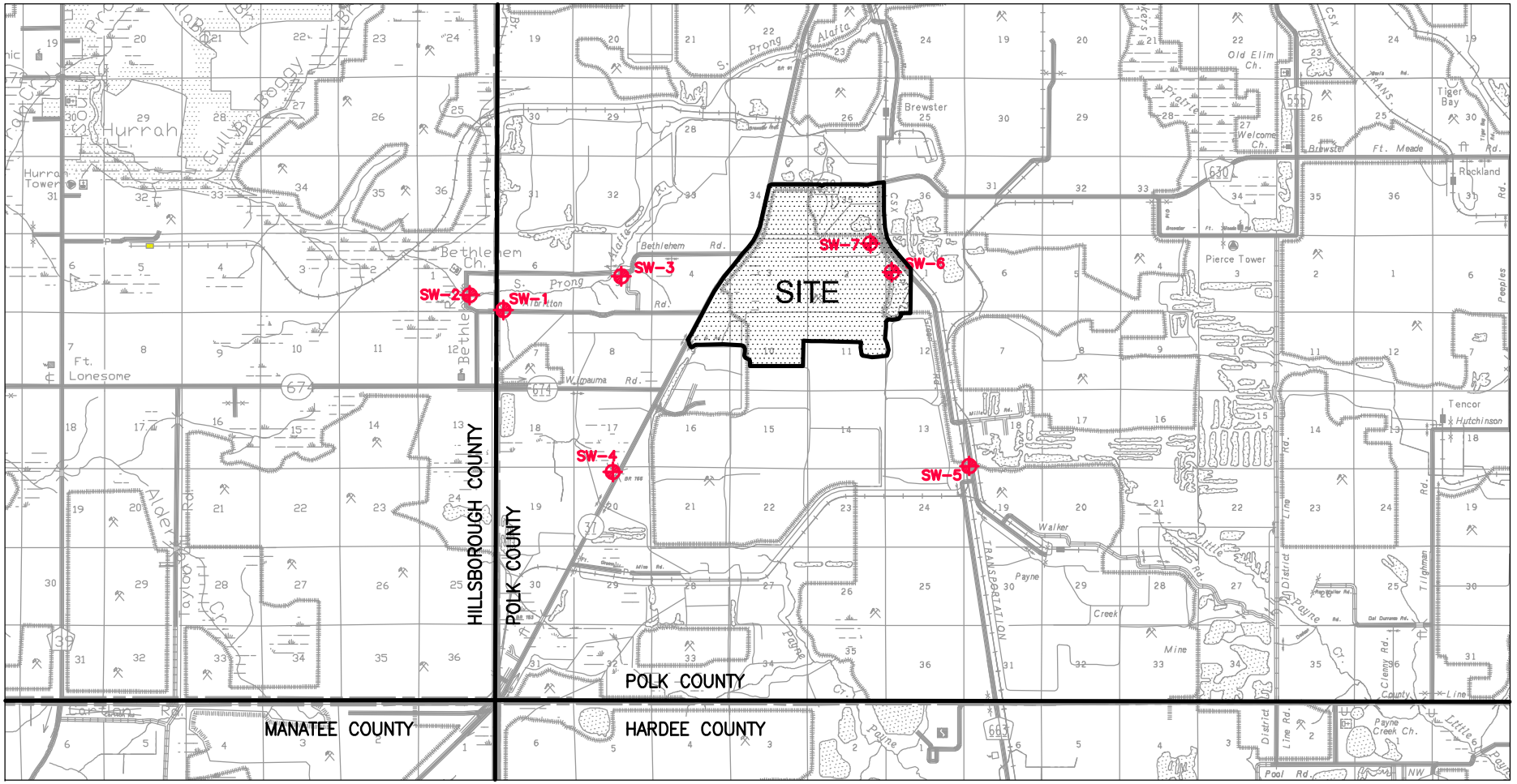
Data used to prepare the following description of surface water quality in the vicinity of the PPS Site were obtained from a variety of sources. The most extensive data sources included the site-specific comprehensive monitoring program for the original SCA; U.S. Environmental Protection Agency's (EPA's) STORET data; FDEP Point Source Evaluation Section's (PSES's) intensive survey of the Alafia River Basin; USGS' routine water quality data, much of which are reported in EPA's STORET system; and water quality data collected by Tampa Electric.

In the following paragraphs, the water quality of waters in the Little Payne Creek basin is described in detail based on the aforementioned sources. Site-specific water quality data collected during 1991 for the initial SCA include both the historically dry and wet seasons in this area of Florida. These data are compared with

the longer-term historical data from EPA, FDEP PSES, and USGS by water body groups. For discussion purposes, the historic surface water monitoring stations have been grouped according to distinct surface water systems as follows: (1) SW-1 through SW-3 (South Prong Alafia River and its tributary on the Site); (2) SW-4 and SW-5 (Payne Creek and its tributary, Little Payne Creek); and (3) SW-6 (unnamed lake) and SW-7 (old mine cut), which are also located in the premining headwater area of Little Payne Creek. Figure 3.3.4-3 depicts these historic water quality monitoring stations.

Tables 3.3.4-4 and 3.3.4-5 present statistical summaries including the mean, maximum, minimum, standard deviation, and number of samples for monitoring data in the Little Payne Creek basin (Stations SW-6 and SW-7). These tables do not include those parameters which were not detected during the course of the monitoring program.

PPS is permitted (under NPDES Permit No. FL0043869-Major) to have two external outfalls to the Little Payne Creek system (Figure 3.3.4-1): Outfall D-001 discharges into the unnamed lake from the cooling water reservoir, and stormwater Outfall D-002 discharges into an old mine cut lake. Tampa Electric has been monitoring the water quality at these two external outfalls according to the NPDES permit conditions. Table 3.3.4-6 presents the comprehensive pollutant scan of the water quality at Outfall D-001 for four different occasions between 2005 and 2012. Table 3.3.4-7 shows the statistical summary of discharge monitoring data between January 2007 and April 2012 at Outfall D-001 as required by the NPDES permit. Table 3.3.4-8 provides the water quality data at Outfall D-002. Figure 3.3.4-4 shows the daily discharge at Outfall D-001 from January 1, 2005, to June 12, 2012. The average flow during the period was 0.72 MGD, and the maximum discharge was 2.15 MGD. Figure 3.3.4-5 depicts the daily average temperature at Outfall D-001 from September 1, 2004, to June 12, 2012. The maximum daily average temperature at Outfall D-001 during the period was 91.6°F, and the average temperature was 75.2°F.



LEGEND

SW-1 SURFACE WATER MONITORING STATIONS

N

GRAPHIC SCALE

0 1 2

SCALE IN MILES

FIGURE 3.3.4-3.

SURFACE WATER MONITORING STATIONS

Source: FDOT Map, 2000; ECT, 2012.

TECO TAMPA ELECTRIC

Table 3.3.4-4. Statistical Summary—Surface Water Quality: SW-6

Analyte	Units	Class III Standard	Mean	Maximum	Minimum	Standard Deviation	Number
In situ measurements							
Temperature	°C		27.5	32.6	21.2	3.8	5
Specific conductance	µmhos/cm		307	328	269	21	5
Hydrogen ion activity (pH)	s.u.	from 6 to 8.5	8.5	9.4	7.9	—	5
DO	mg/L	≥5.0	9.3	12.7	4.7	2.7	5
DO saturation	%		115	159	64	34	5
Oxidation-reduction potential	V		0.044	0.063	0.017	0.017	4
Classical							
Alkalinity, total as $CaCO_3$	mg/L	≥20	82	91	75	6	5
Alkalinity, bicarbonate	mg/L		60	91	31	24	5
Alkalinity, carbonate	mg/L		22	50	1	17	6
Acidity, total	mg/L		1	5	1	2	6
Hardness, total as $CaCO_3$	mg/L		104	110	94	6	6
Color	pcu		48	67	35	10	6
Solids, total	mg/L		227	260	190	24	6
TDS	mg/L		198	220	180	15	6
TSS	mg/L		23	50	3	16	6
Turbidity	NTU	≤29	9.2	18	5.7	4.3	6
Chloride	mg/L		16	17	13	2	6
Fluoride, soluble	mg/L	≤10	1.97	2.90	1.40	0.45	6
Sulfate	mg/L		38.2	45.0	30.0	5.2	6
Sodium	mg/L		20	21	19	1	6
Calcium	mg/L		23	26	21	2	6
Magnesium	mg/L		12.2	14.0	11.0	1.1	6
Total anions	meq/L		1.65	2.70	1.10	0.52	6
Total cations	meq/L		2.89	3.30	1.90	0.47	6
Ammonia (unionized)	mg/L	≤0.02	0.01	0.02	0.01	0.00	6
Nitrogen, nitrate	mg/L		0	—	—	—	6
Nitrogen, nitrite	mg/L		0	—	—	—	6
Nitrogen, total organic	mg/L		1.64	2.80	0.78	0.71	6
Nitrogen, Kjeldahl	mg/L		1.75	2.80	0.80	0.63	6
Phosphorus, total	mg/L		0.47	0.81	0.25	0.19	6
Surfactants	mg/L	≤0.5	0.03	0.05	0.01	0.01	6
5-day biochemical oxygen demand	mg/L		9	10	8	1	6
Chemical oxygen demand	mg/L		58	70	47	8	5
Hydrogen sulfide	mg/L		0.13	0.2	0.05	0.1	2
Other metals							
Iron	mg/L	≤1.0	0	—	—	—	6
Lead	µg/L	≤2.9 to 3.6*	4.25	13	2.50	4	6
Manganese	mg/L		0	—	—	—	6
Silver	µg/L	≤0.07	0.04	0.07	0.035	0.01	6
Zinc	mg/L	≤0.10 to 0.11*	0	—	—	—	6
Radioactive substances							
Radium 226	pCi/L	≤5	1.4	7.1	0.30	2.8	6
Radium228	pCi/L	≤5	0	—	—	—	6
Gross alpha	pCi/L	≤15	2.1	4.0	1.0	1.4	6

Note: Half <MDL is used to compute mean value for <MDL.
Analytes not detected during the monitoring program are not included in the table.

Note:
°C = degree Celsius.
µg/L = microgram per liter.
µmhos/cm = micromhos per centimeter.
$CaCO_3$ = calcium carbonate.
meq/L = milliequivalent per liter.
mg/L = milligram per liter.
NTU = Nephelometric turbidity unit.
pCi/L = picocuries per liter.
pcu = platinum-cobalt unit.
s.u. = standard unit.
TDS = total dissolved solids.
TSS = total suspended solids.
V = volt.

*Standard range is calculated using the hardness from each sampling period at the station from data collected by Tampa Electric.

Source: ECT, 1992.

Table 3.3.4-5. Statistical Summary—Surface Water Quality: SW-7

Analyte	Units	Class III Standard	Mean	Maximum	Minimum	Standard Deviation	Number
In situ measurements							
Temperature	°C		27.6	33.2	21.9	3.8	5
Specific conductance	µmhos/cm		333	363	279	35	5
Hydrogen ion activity (pH)	s.u.	from 6 to 8.5	8.4	9.4	8.0	—	5
DO	mg/L	≥5.0	11.2	14.5	8.5	2.2	5
DO saturation	%		140	164	104	22	5
Oxidation-reduction potential	V		0.013	0.071	-0.054	0.044	4
Cassical							
Alkalinity, total as $CaCO_3$	mg/L	≥20	67	84	39	16	5
Alkalinity, bicarbonate	mg/L		55	80	33	15	5
Alkalinity, carbonate	mg/L		11	26	0.5	9	6
Acidity, total	mg/L		4	15	0.5	5	6
Hardness, total as $CaCO_3$	mg/L		108	120	89	11	6
Color	pcu		111	150	75	23	6
Solids, total	mg/L		270	290	240	19	6
TDS	mg/L		230	260	200	20	6
TSS	mg/L		33	50	13	14	6
Turbidity	NTU	≤29	22	27	15	4.6	6
Chloride	mg/L		14	16	12	1	6
Fluoride, soluble	mg/L	≤10	1.58	4.00	0.88	1.12	6
Sulfate	mg/L		58.0	68.0	42.0	7.9	6
Sodium	mg/L		25	27	23	1	6
Calcium	mg/L		22	26	17	4	6
Magnesium	mg/L		13.5	15.0	12.0	1.0	6
Total anions	meq/L		2.02	2.40	1.70	0.22	6
Total cations	meq/L		3.14	3.60	1.80	0.63	6
Ammonia (unionized)	mg/L	≤0.02	0.09	0.32	0.01	0.12	6
Nitrogen; nitrate	mg/L		0.88	1.70	0.50	0.54	6
Nitrogen, nitrite	mg/L		0.24	1.40	0.01	0.52	6
Nitrogen, total organic	mg/L		2.73	3.40	2.18	0.46	6
Nitrogen, Kjeldahl	mg/L		2.97	4.10	2.20	0.73	6
Phosphorus, total	mg/L		4.52	6.10	1.80	1.58	6
Surfactants	mg/L	≤0.5	0.02	0.05	0.01	0.01	6
5-day biochemical oxygen demand	mg/L		14	20	9	4	6
Chemical oxygen demand	mg/L		72	83	59	8	5
Hydrogen sulfide	mg/L		0.13	0.20	0.05	0.08	2
Other metals							
Iron	mg/L	≤1.0	0	—	—	—	6
Lead	µg/L	≤2.7 to 4.0*	4	13	2.50	4	6
Manganese	mg/L		0	—	—	—	6
Silver	µg/L	≤0.07	0.04	0.06	0.04	0.01	6
Zinc	mg/L	≤0.10 to 0.12*	0	—	_	—	6
Radioactive substances							
Radium 226	pCi/L	≤5	0.65	2.4	0.3	0.85	6
Radium 228	pCi/L	≤5	1.0	3.5	0.5	1.20	6
Gross Alpha	pCi/L	≤15	1.8	3.4	1.0	0.99	6

Note: Half <MDL is used to compute mean value for <MDL.
Analytes not detected during the monitoring program are not included in the table.

Note:
°C = degree Celsius.
µg/L = microgram per liter.
µmhos/cm = micromhos per centimeter.
$CaCO_3$ = calcium carbonate.
meq/L = milliequivalent per liter.
mg/L = milligram per liter.
NTU = Nephelometric turbidity unit.
pCi/L = picocuries per liter.
pcu = platinum-cobalt unit.
s.u. = standard unit.
TDS = total dissolved solids.
TSS = total suspended solids.
V = volt.

*Standard range is calculated using the hardness from each sampling period at the station from data collected by Tampa Electric.

Source: ECT, 1992.

Table 3.3.4-6. Pollutant Scan of Water Quality at D-001

Parameter	Units	10/19/05	10/20/05	05/09/07	08/16/12
General Chemistry					
Ammonia (as N)	mg/L			0.13	1.0
Bromide	mg/L		0.86	0.38	0.31
Calcium	mg/L		62.6		70.4
Carbonaceous biochemical oxygen demand, 5-day	mg/L		<2	<2	2
Chemical oxygen demand	mg/L		<20	49	38
Chloride	mg/L			110	
Chlorine, total residual	mg/L		<0.01		<0.01
Coliform, fecal	CFU/100 mL		10	2	<1
Color	pcu		25	35	32
Cyanide	µg/L		5		<4.8
Fluoride	mg/L		2.85	2.9	2.86
Hardness, total	mg/L		258		
HEM (oil and grease)	mg/L			<1.1	4.42
Methylene blue active substances	mg/L LAS			0.056	
Nitrate nitrite nitrogen	mg/L		0.083	<0.1	<0.05
Nitrogen, ammonia (as N)	mg/L		0.35		
Nitrogen, Kjeldahl	mg/L		1.6	1.4	1.1
Nitrogen, organic	mg/L		1.25	1.3	0.1
Nitrogen, total	mg/L		1.7	1.4	1.1
pH	s.u.		6.9		6.6
Phosphorus, total	mg/L		0.1	<0.075	0.071
Specific conductance	µmhos/cm		945		1,070
Sulfate	mg/L		225	260	294
Sulfide	mg/L		<1	<1	
Sulfite	mg/L		<4	<5	<4
Surfactants	mg/L		<0.039		0.18
Temperature, field	°C		26.5		31.0
Total organic carbon	mg/L		14	15	12
Total suspended solids	mg/L		7	9.2	<5
Total Recoverable Metals					
Aluminum	mg/L		1.14	0.24	0.16
Antimony	µg/L		5.5	1.7	1.35
Arsenic	µg/L		29.3	5.4	4.30
Barium	µg/L		36.7	10	9.55
Beryllium	µg/L		<0.2	<0.072	<0.04
Boron	mg/L		2.4	0.52	1.43
Cadmium	µg/L		<0.3	<0.097	<0.100
Chromium	µg/L		1.92	<0.42	<1.00
Cobalt	µg/L		<0.1	0.18	0.181
Copper	µg/L		4.1	0.93	0.702
Mercury	µg/L	0.0015	0.0015	0.0036	0.00083
Iron	mg/L		0.026	0.048	0.0477
Lead	µg/L		0.6	<0.19	<0.08
Magnesium	mg/L		24.8	31	37.5
Manganese	µg/L		13.6	3.2	2.77
Molybdenum	µg/L		35.2	8	9.05
Nickel	µg/L		81.7	15	24.0
Selenium	µg/L		<2.8	4.6	2.09
Silver	µg/L		<0.1	<0.09	<0.02
Thallium	µg/L		0.2	<0.5	<0.100
Tin	µg/L		<3	<0.8	0.197
Titanium	µg/L		0.27	<0.96	181
Vanadium	µg/L			<2.5	
Zinc	µg/L		40.7	<3.7	<10.0

Table 3.3.4-6. Pollutant Scan of Water Quality at D-001 (Continued, Page 2 of 3)

Parameter	Units	10/19/05	10/20/05	05/09/07	08/16/12
Volitle Organic Compounds					
1,1,1-Trichloroethane	µg/L	<0.46	<0.46	<0.46	<0.46
1,1,2,2-Tetrachloroethane	µg/L	<0.14	<0.14	<0.15	<0.15
1,1,2-Trichloroethane	µg/L	<0.47	<0.47	<0.47	<0.47
1,1-Dichloroethane	µg/L	<0.52	<0.52	<0.52	<0.52
1,1-Dichloroethene	µg/L	<0.45	<0.45	<0.45	<0.45
1,2-Dichloroethane	µg/L	<0.57	<0.57	<0.57	<0.57
1,2-Dichloropropane	µg/L	<0.52	<0.52	<0.52	<0.52
1,2-trans-Dichloroethylene	µg/L		<0.61	<0.44	<0.44
2-Chloroethyl vinyl ether	µg/L	<0.98	<0.98	<0.95	<0.95
Acrolein	µg/L	<0.38	<0.38	<3.8	<3.8
Acrylonitrile	µg/L	<1.2	<1.2	<1.2	<1.2
Benzene	µg/L	<0.27	<0.27	<0.5	<0.5
Bromoform	µg/L	<0.58	<0.58	<0.58	<0.58
Bromomethane	µg/L			<2.5	
Carbon tetrachloride	µg/L	<0.42	<0.42	<0.42	<0.42
Chlorobenzene	µg/L	<0.61	<0.63	<0.63	<0.63
Chlorodibromomethane	µg/L	<0.34	<0.34	<0.34	<0.34
Chloroethane	µg/L	<0.8	<0.8	<2.5	<2.5
Chloroform	µg/L	<0.9	<0.9	<0.9	<0.9
Chloromethane	µg/L			<1	
cis-1,2-Dichloroethene	µg/L	<0.65	<0.65		<0.65
cis-1,3-Dichloropropene	µg/L	<0.14	<0.14		<0.14
Dichlorobromomethane	µg/L	<0.35	<0.35	<0.35	<0.35
Dichlorodifluoromethane	µg/L	<0.4	<0.4		<2.5
Ethylbenzene	µg/L	<0.44	<0.44	<0.44	<0.44
Methyl bromide	µg/L	<0.66	<0.66		<2.5
Methyl chloride	µg/L	<0.64	<0.64		<1.0
Methylene chloride	µg/L	<4	<4	<4	<4
n-Hexane extractable material (SPE)	mg/L		<2		
Purgeable Organic Compounds					
Tetrachloroethene	µg/L	<0.34	<0.34	<0.5	<0.5
Toluene	µg/L	<0.51	<0.51	<0.51	<0.51
trans-1,2-Dichloroethylene	µg/L	<0.44	<0.44		
trans-1,3-Dichloropropene	µg/L	<1.4	<1.4		<0.14
Trichloroethylene	µg/L	<0.28	<0.28	<0.5	
Trichlorofluoromethane	µg/L	<0.98	<0.98	<2.5	
Vinyl chloride	µg/L	<0.5	<0.5	<0.5	<0.5
Base/Neutral and Acid Organics					
1,2,4-Trichlorobenzene	µg/L			<0.78	<1.2
1,2-Dichlorobenzene	µg/L			<0.76	<1.1
1,2-Diphenylhydrazine	µg/L		<3.6	<3.6	<2.0
1,3-Dichlorobenzene	µg/L			<0.6	<1.1
1,4-Dichlorobenzene	µg/L		<0.72	<0.71	<1.2
2,4,6-Trichlorophenol	µg/L		<0.35	<0.35	<1.8
2,4-Dichlorophenol	µg/L		<0.67	<0.9	<1.7
2,4-Dimethylphenol	µg/L		<1.2	<1.2	<1.7
2,4-Dinitrophenol	µg/L		<1.5	<1.5	<6.0
2,4-Dinitrotoluene	µg/L		<1.3	<1.3	<0.88
2,6-Dinitrotoluene	µg/L		<1	<1	<0.70
2-Chloronaphthalene	µg/L		<0.84	<0.83	<1.6
2-Chlorophenol	µg/L		<0.24	<1.1	<2.0
2-Nitrophenol	µg/L		<0.14	<1.4	<1.2
3,3'-Dichlorobenzidine	µg/L		<1.6	<1.6	<1.6
4,6-Dinitro-ortho-cresol	µg/L		<1.2	<1.2	<1.5
4-Chlorophenyl phenyl ether	µg/L		<0.79	<0.78	<1.7

Table 3.3.4-6. Pollutant Scan of Water Quality at D-001 (Continued, Page 3 of 3)

Parameter	Units	10/19/05	10/20/05	05/09/07	08/16/12
4-Nitrophenol	µg/L		<1.5	<1.5	<6.0
Acenaphthene	µg/L		<1.1	<1.1	<1.5
Acenaphthylene	µg/L		<0.6	<0.59	<1.7
Anthracene	µg/L		<1.2		<0.97
Benzidine	µg/L		<12	<12	<17
Benzo[a]anthracene	µg/L		<1.2	<1.2	<1.6
Benzo[a]pyrene	µg/L		<1.3	2.5	<0.96
Benzo[b]fluoranthene	µg/L		<1.7	<1.2	<1.6
Benzo[g,h,i]perylene	µg/L			<1.3	<1.1
Benzo[k]fluoranthene	µg/L			<1.7	<1.3
Bis(1-chloroisopropyl) ether	µg/L		<1.3	<1.3	
Bis(2-chloroethoxy)methane	µg/L		<0.93	<0.92	<1.9
Bis(2-chloroethyl)ether	µg/L		<0.87	<0.86	<2.5
Bis(2-ethylhexyl) phthalate	µg/L		<3.6	<3.6	<1.3
Bromophenyl phenyl ether	µg/L			<1.1	
Butyl benzyl phthalate	µg/L		<1.4	<1.4	<1.2
Chrysene	µg/L		<1.2	<1.2	<1.2
Dibenz(a,h)anthracene	µg/L		<1.4	<1.4	<0.97
Diethyl phthalate	µg/L		<1.1	<1.1	<2.4
Dimethyl phthalate	µg/L		<1	<1	<2.4
Di-n-butyl phthalate	µg/L		<1.5	<1.5	<2.4
Di-n-octyl phthalate	µg/L		<1.7	<1.7	<2.4
Fluoranthene	µg/L		<1.5	<1.5	<1.2
Fluorene	µg/L		<1	<0.99	<1.7
Hexachlorobenzene	µg/L		<0.79	<0.78	<1.7
Hexachlorobutadiene	µg/L		<0.83	<0.82	<0.97
Hexachlorocyclopentadiene	µg/L		<1	<1	<1.2
Hexachloroethane	µg/L		<0.68	<0.67	<0.83
Indeno[1,2,3-cd]pyrene	µg/L		<1.3	<1.3	<1.2
Isophorone	µg/L			<0.81	<1.4
Naphthalene	µg/L		<0.73	<0.72	<1.3
Nitrobenzene	µg/L		<0.84	<0.83	<1.8
N-Nitrosodimethylamine	µg/L		<1.5	<1.5	<2.3
N-Nitrosodi-n-propylamine	µg/L		<0.93	<0.92	<1.8
N-Nitrosodiphenylamine	µg/L		<1.2	<1.2	<1.6
nthracene	µg/L			<1.2	
p-Chloro-m-cresol	µg/L		<0.33	<1.5	<1.7
Pentachlorophenol	µg/L		<0.98	<1.6	<1.5
Phenanthrene	µg/L		<1.2	<1.2	<1.3
Phenol	µg/L		<0.86	<0.85	<2.3
Phenols, Total	µg/L		<35		
Pyrene	µg/L		<1.3	<1.3	<1.2
Radioactive Substances					
Gross alpha	pCi/L		11.4+/-1.5		7.1
Gross beta	pCi/L		7.6+/-0.9		6.4
Radium 226, total	pCi/L		2.8+/-0.3		2.0
Radium 228, total	pCi/L		0.0+/-0.8		1.1

Note:
°C = degree Celsius.
µg/L = microgram per liter.
µmhos/cm = micromhos per centimeter.
CFU/100 mL = coliform-forming units per 100 milliliters.
LAS = linear alkylbenzene sulfonate.
mg/L = milligram per liter.
pCi/L = picocurie per liter.
pcu = platinum-cobalt unit.
s.u. = standard unit.

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

Table 3.3.4-7. Discharge Monitoring Water Quality Data at D-001

Parameter	Units	Count	Average	Minimum	Maximum	Standard Deviation
Flow - Average	MGD	47	1.026	0.315	1.685	0.359
Flow - Maximum	MGD	47	1.329	0.482	2.227	0.433
Temperature, average	°C	98	24.994	14.500	31.800	4.972
Temperature, maximum	°C	49	27.361	18.333	33.111	4.349
Aluminum	µg/L	1	246.3			
Ammonia as N	mg/L	8	0.134	0.005	0.269	0.103
Ammonia, unionized	mg/L	46	0.003	0.001	0.043	0.006
Antimony	µg/L	11	1.715	0.002	2.680	0.928
Arsenic	µg/L	11	6.072	4.660	7.650	1.127
Barium	µg/L	1	14.180			
Beryllium	µg/L	10	0.056	0.020	0.379	0.114
Cadmium	µg/L	11	0.055	0.030	0.130	0.025
Calcium	mg/L	8	72.363	68.600	79.400	3.268
Carbonaceous BOD, 5-day	mg/L	42	1.802	1.000	6.980	1.263
Carbonaceous BOD (CBOD)	mg/L	6	1.967	1.000	2.600	0.771
Chlorine, total residual	mg/L	41	0.005	0.005	0.005	0.000
Cobalt	µg/L	1	0.180			
Copper	µg/L	11	0.523	0.220	1.476	0.356
Dissolved oxygen	mg/L	394	8.113	6.700	11.300	0.945
Gross alpha	pCi/L	55	10.612 +/-1.92			
Iron	µg/L	10	40.8	9.0	148.0	39.9
Lead	µg/L	11	0.133	0.040	0.307	0.099
Magnesium	mg/L	9	32.149	2.940	41.500	11.544
Molybdenum	µg/L	1	10			
n-Hexane	mg/L	42	0.700	0.700	0.700	0.000
Nickel	µg/L	11	18.450	14.510	24.190	2.996
Nitrate + nitrite	mg/L	1	0.025			
Nitrogen, ammonia (as N)	mg/L	41	0.136	0.005	0.360	0.100
Nitrogen, nitrate (as N)	mg/L	56	0.021	0.005	0.080	0.023
Nitrogen, nitrite (as N)	mg/L	41	0.012	0.005	0.050	0.009
Oil and grease	mg/L	7	0.705	0.700	0.733	0.012
pH	s.u.	49	7.286	6.400	8.200	0.326
Phosphorus, total (as P)	mg/L	46	0.111	0.018	0.330	0.081
Radium 226, total	pCi/L	5	1.86 +/-0.76			
Residual chlorine	mg/L	8	0.005	0.005	0.005	0.000
Residue, nonfilterable (TSS)	mg/L	41	6.332	2.500	13.000	2.524
Selenium	µg/L	54	4.233	1.976	7.630	1.700
Silver	mg/L	14	0.050	0.000	0.600	0.158
Specific conductance	µmhos/cm	400	1081	978	1162	40
Sulfate	mg/L	49	262.6	206.0	320.0	24.2
Thallium	µg/L	11	0.102	0.005	0.590	0.165
Total hardness	mg/L	18	304	205	354	43
Total Kjeldahl nitrogen	mg/L	49	1.623	0.380	1.984	0.249
Total nitrogen	mg/L	49	1.644	0.380	2.020	0.259
Total suspended solids	mg/L	8	4.616	2.427	10.500	3.144
Zinc	µg/L	11	5.38	0.85	11.84	2.84

Sources: Tampa Electric, 2012.
ECT, 2012.

Table 3.3.4-8. Discharge Monitoring Water Quality Data at D-002

Parameter	Unit	Sampling Date											
		11/30/04	12/31/04	01/31/05	02/28/05	03/31/05	04/30/05	05/31/05	06/30/05	07/31/05	08/31/05	09/30/05	10/31/05
Daily average flow	MGD	1.900	0.312	591.600	0.435	1.871	1.288	0.646	1.842	1.269	1.381	0.952	2.917
Daily maximum flows	MGD	5.800	0.513	847.100	12.190	3.447	2.823	0.909	4.323	1.719	2.368	1.540	16.704
Total suspended solids	mg/L	<5	<5	<5	7	<5	<5	<5	7	<5	<5	<5	7
pH	s.u.	6.6	6.4	6.6	6.4	6.6	6.5	6.4	6.8	6.9	6.9	6.8	6.7
Oil and grease	mg/L	1.8	<1.4	1.7	<1.4	1.8	2.9	3.4	2.1	2.6	2.4	2.6	3.5
Biochemical oxygen demand, carbonaceous 5-day	mg/L	<2	<2	<2	<2	<2	<2	<2	2.2	<2	<2	<2	3.1

Sources: Tampa Electric, 2012.
ECT, 2012.

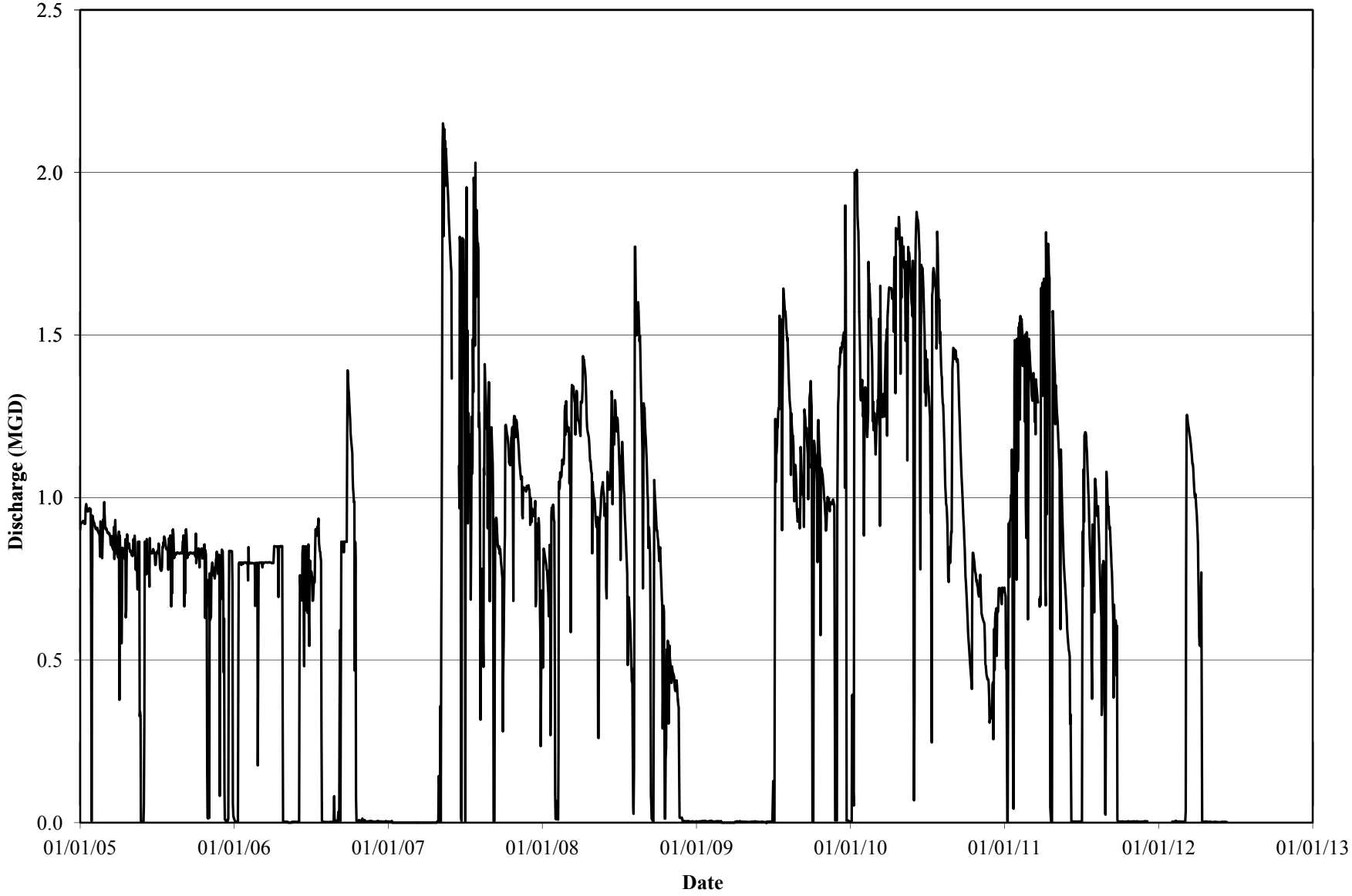


FIGURE 3.3.4-4.

DAILY DISCHARGE RATE AT D-001 (01/01/05 THROUGH 06/12/12)

Source: ECT, 2012.

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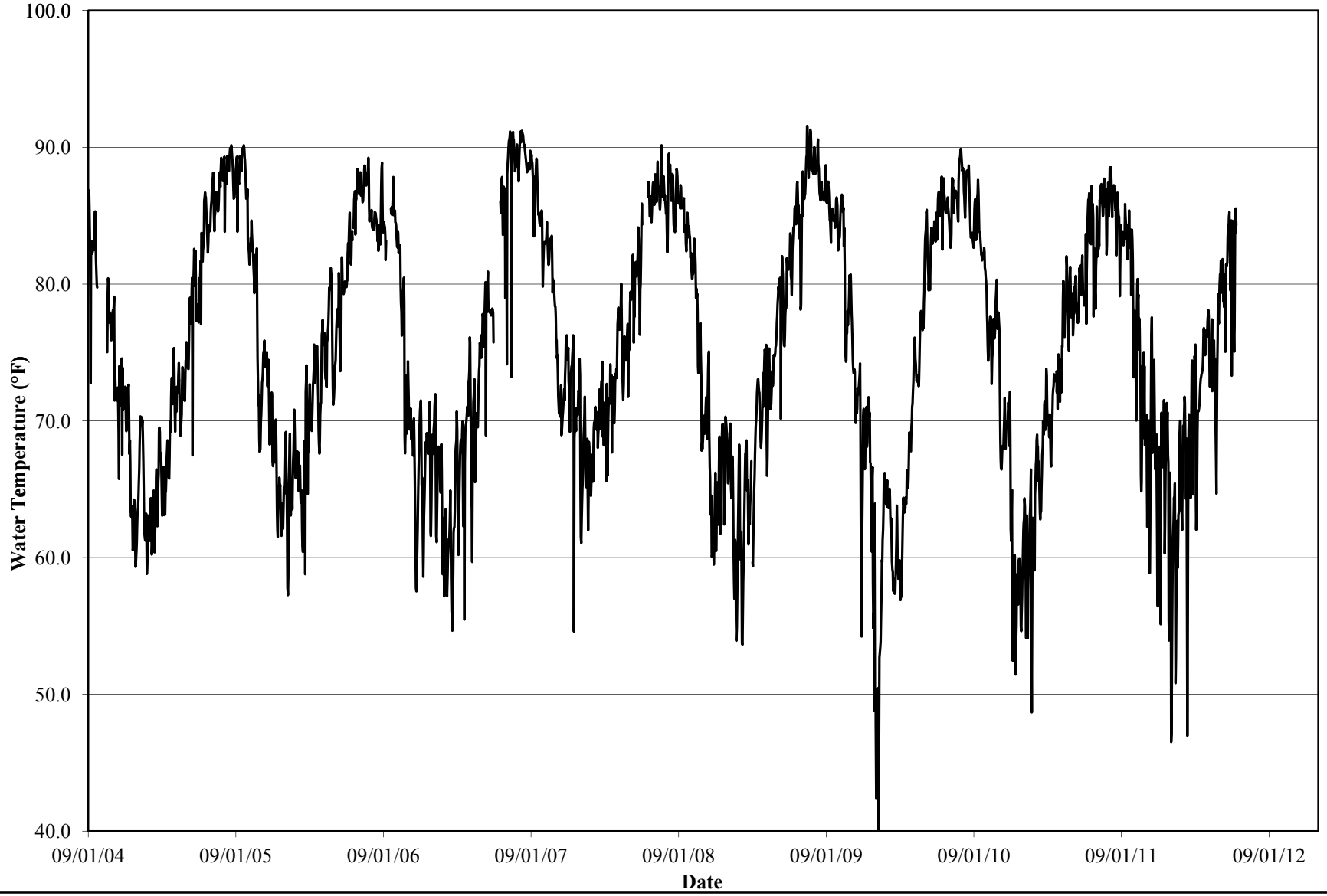


FIGURE 3.3.4-5.

WATER TEMPERATURE DATA AT D-001 (09/01/04 THROUGH 06/12/12)

Source: ECT, 2012.

TECO TAMPA ELECTRIC

Tampa Electric also records the water level of the cooling reservoir weekly. The annual maximum and minimum water levels from 2004 to June 2012 are presented as follows:

Year	Minimum Level (ft-NGVD)	Maximum Level (ft-NGVD)
2004	135.0	137.5
2005	136.0	136.9
2006	135.0	136.9
2007	132.7	136.6
2008	133.7	135.7
2009	134.5	136.0
2010	132.5	136.6
2011	133.6	136.0
2012 (as of June 12)	134.6	135.6

3.3.4.2 Measurement Programs

An extensive surface water field program was conducted for the original PPS SCA. The number, locations, and conditions of surface water stations, as well as detailed information on data collection methods, data analyses, and results, are summarized in the following paragraphs.

Seven surface water stations (Figure 3.3.4-3) were established for field monitoring in 1991 and were operated for 9 months. Station SW-1, was located on an unnamed tributary to the South Prong Alafia River. This tributary receives some runoff from the reclaimed lands on the originally certified Site to the west of SR 37. This stream is also representative of other small first-order tributaries in the area. Stations SW-2 and SW-3 were located to characterize the South Prong Alafia River.

Other surface water bodies that may potentially be affected either by construction or operation of PPS include Little Payne Creek and Payne Creek. Both of these streams have been substantially modified as a result of previous mining activities. To characterize regional baseline surface water conditions, surface water stations were located along these water bodies. Station SW-4 was located near the headwaters of Payne Creek at the point where SR 37 crosses Payne Creek. Station SW-5 was located where Fort Green Road crosses the drainage canal that now represents the headwaters of Little Payne Creek.

Surface water stations were located in both the recently reclaimed lake and the old unreclaimed mine cut lake. These stations, designated SW-6 and SW-7, respectively, were used to characterize water quality in these two distinct types of water bodies.

Continuous stage recorders were installed at stations SW-2, SW-5, and SW-6 for 6 months beginning in late February and continuing through August 1991. This period encompasses central Florida's normal dry and wet seasons. The locations of these stations and the rationale for selecting these stations were presented previously.

In addition, monthly instantaneous flows were measured at stations SW-1, SW-3, and SW-4. Flow measurements were not applicable at station SW-7 since the unreclaimed mine cut is not normally a flowing system. Measurements were made during the monthly sampling efforts whenever there was water flowing at these stations. From the instantaneous flow data, streamflow at these locations for a variety of conditions was characterized.

Concurrent with discharge data collection, water quality samples were collected monthly at the seven surface water monitoring stations. These samples were analyzed for the parameters listed in Table 3.3.4-6. This list is based on the Class III standards presented in Section 62-302.520, F.A.C. Additional analytes were included because they are either essential for describing an aquatic system or for adequately interpreting water quality conditions in these surface water bodies.

In addition to the in situ measurements associated with the monthly water quality sampling, diurnal (i.e., daytime) DO measurements were made twice during the 6-month sampling period. During these sampling events, DO concentration was measured in situ from approximately 1 hour before sunrise to 2 hours after sunrise. Temperature was measured concurrently with DO to determine DO saturation.

Currently, Tampa Electric monitors effluent characteristics at four sampling stations as required by the NPDES permit, including two external outfalls (D-001 and D-002), two internal outfalls (I-003 and I-004), and an old mine cut (Sampling Point SWA-1). Outfall D-001 is the discharge from the cooling reservoir to the unnamed lake. Outfall D-002 is the stormwater discharge into the old mine cut. Outfall I-003 is the low-volume waste internal outfall (including RO concentrate, boiler blowdown, and laboratory waste), and Outfall I-004 is the equaliza-

tion basin wastewater (including filter backwash and slag runoff). Outfalls I-003 and I-004 discharge into the cooling water reservoir via a collection box. A temperature monitoring sensor was installed in an old mine cut (SWA-1), which is used to represent ambient water temperature and compute delta temperature (temperature difference between Outfall D-001 and SWA-1). Tables 3.3.4-9 through 3.3.4-12 present the analytes and sampling frequency of the monitoring program for Outfalls D-001, D-002, I-003, and I-004, respectively.

3.3.5 VEGETATION/LAND USE

3.3.5.1 Onsite Vegetation Communities

The new facilities for the proposed Polk 2-5 Conversion Project will be located in previously developed and disturbed portions of the Site. Construction of the proposed power generating facilities will occur west of and between existing Units 2 through 5, and the associated construction laydown and parking areas will be temporarily provided in the upland fields south of the existing PPS facilities. A new 230-kV transmission line is also proposed to be built within the existing transmission line corridor on the PPS Site that extends 0.75 mile from the existing switchyard west to SR 37. The land within the existing transmission line corridor is mostly maintained old field. A rebuilt 230-kV transmission line is also proposed to be constructed from the existing switchyard, northeast and then east, along an existing transmission corridor. This rebuilt line will be contained within existing onsite right-of-way until it exits the site along Fort Green Road. The land located in the proposed areas of construction at the PPS Site for the proposed Project has been previously converted to an industrial use through the development of the existing PPS facilities. As a result of past development, the major land use/cover represented within the construction areas consists primarily of developed land and old fields.

In the original PPS 1992 SCA, the proposed and existing land use/cover types were mapped using a Level II 1985 Florida Land Use and Cover Classification System (FLUCCS). Figure 3.3.5-1 provides a portion of this map (i.e., the area east of SR 37). Because no significant disturbances have occurred on the PPS Site east of SR 37 since the Polk Unit 1 power plant facilities and reclaimed wetlands were constructed, Figure 3.3.5-1 can still be used to generally characterize the current vegetation communities on the Site.

Table 3.3.4-9. Monitoring Program at Outfall D-001

Parameter	Measurement Frequency	Sample Type
Flow (MGD)	Continuous	Recorder or calculation
Point of discharge temperature °F summer (May through October)	Continuous	Recorders
Point of discharge temperature °F winter (November through April)	Continuous	Recorders
Temperature (°C)	1 per month	Grab
pH (s.u.)	1 per month	Grab
Total phosphorous (as P) (mg/L)	1 per month	Grab
Total ammonia (as N) (mg/L)	1 per month	Grab
Unionized ammonia (mg/L)	1 per month	Calculation
Dissolved oxygen (mg/L)	2 per week	Grab
Oil and grease (mg/L)	1 per month	Grab
Total nitrogen (as N) (mg/L)	1 per month	Grab
Total Kjeldahl nitrogen (mg/L)	1 per month	Grab
Total sulfate (mg/L)	1 per month	Grab
Total suspended solids (mg/L)	1 per month	Grab
Total residual chlorine (mg/L)	1 per month	Grab
Total recoverable antimony (mg/L)	2 per year	Grab
Total recoverable arsenic (mg/L)	2 per year	Grab
Total recoverable beryllium (µg/L)	2 per year	Grab
Total recoverable cadmium (µg/L)	2 per year	Grab
Total recoverable copper (µg/L)	2 per year	Grab
Total recoverable zinc (µg/L)	2 per year	Grab
Total recoverable lead (µg/L)	2 per year	Grab
Total recoverable nickel (µg/L)	2 per year	Grab
Total recoverable selenium (µg/L)	2 per year	Grab
Total recoverable silver (µg/L)	2 per year	Grab
Total recoverable thallium (µg/L)	2 per year	Grab
Total recoverable iron (mg/L)	2 per year	Grab
Specific conductance (µmhos/cm)	2 per week	Grab
Gross alpha particle activity (including radium 226 (but excluding radon and uranium) (pCi/L)	1 per month	Grab
Carbonaceous biochemical oxygen demand (5-day) (mg/L)	1 per month	Grab
Total hardness (as $CaCO_3$) (mg/L)	2 per year	Grab
Toxicity (acute)	1 per year	Grab

Note: µmhos/cm = micromhos per centimeter.
°C = degree Celsius.
s.u. = standard unit.
mg/L = milligram per liter.
µg/L = microgram per liter.
pCi/L = picocurie per liter.
$CaCO_3$ = calcium carbonate.

Source: Tampa Electric, 2012.

Table 3.3.4-10. Monitoring Program at Outfall D-002

Parameter	Measurement Frequency	Sample Type
Flow	1 per week	Estimate
Carbonaceous biochemical oxygen demand (5-day)	1 per week	Grab
Total suspended solids	1 per week	Grab
Oil and grease	1 per week	Grab
pH, s.u.	1 per week	Grab

Source: Tampa Electric, 2012.

Table 3.3.4-11. Monitoring Program at Outfall I-003

Parameter	Measurement Frequency	Sample Type
Flow	1 per month	Calculation
Total suspended solids	1 per month	Grab
Oil and grease	1 per month	Grab

Source: Tampa Electric, 2012.

Table 3.3.4-12. Monitoring Program at Outfall I-004

Parameter	Measurement Frequency	Sample Type
Flow	1 per month	Calculation
Total suspended solids	1 per month	Grab
Oil and grease	1 per month	Grab
pH	1 per month	Grab

Source: Tampa Electric, 2012.

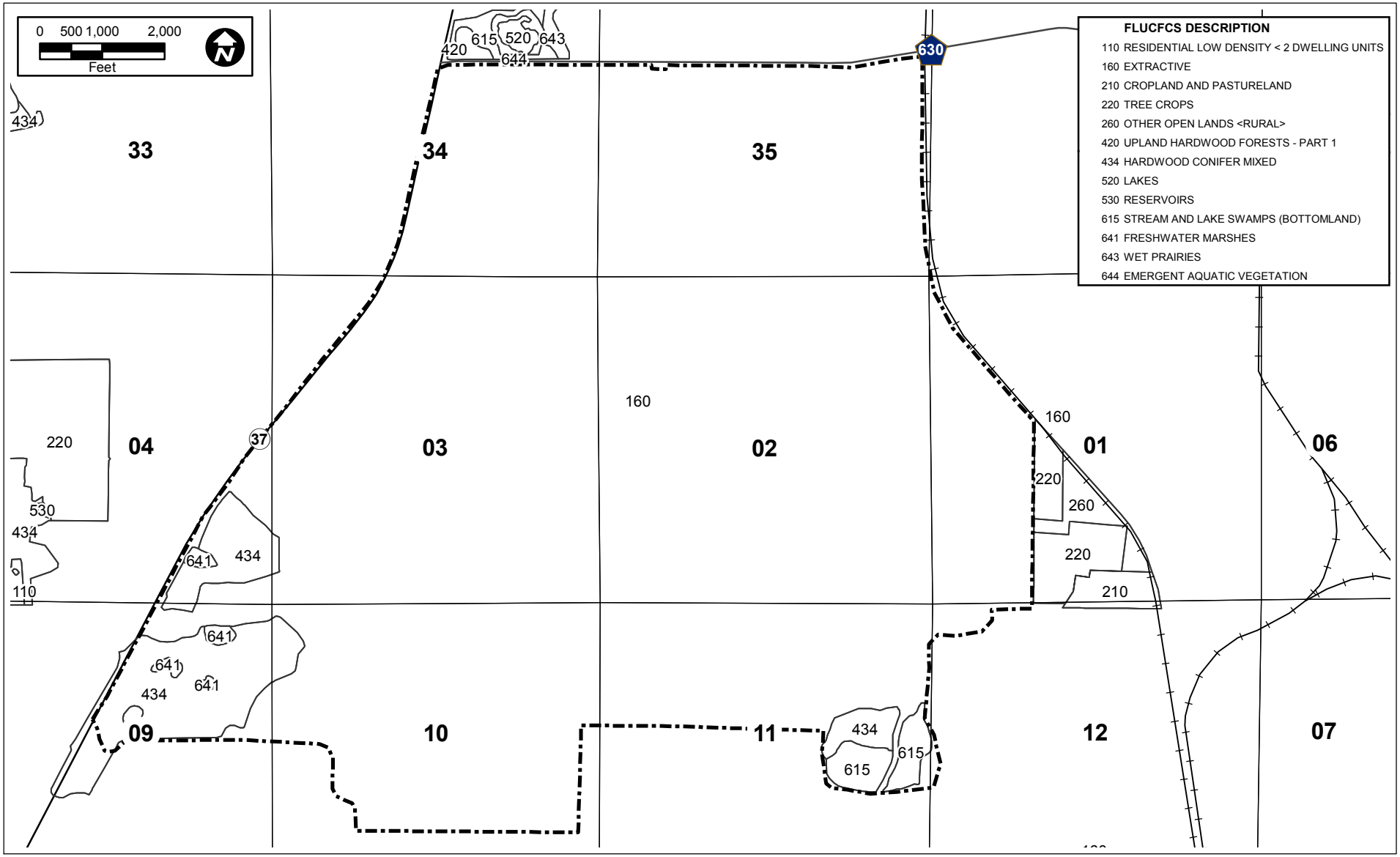


FIGURE 3.3.5-1.
LAND USE/COVER MAP

Sources: FLUCFCS, 2008; ECT, 2012.

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The old field community to the south of PPS was originally mapped as 210 (Cropland and Pastureland). Currently, the undeveloped upland and developed areas on PPS are mostly mapped as 8300, Utilities, which is a Level II category in the 1999 version of FLUCFCS. The maintained grassy areas within the existing transmission line corridors on the Site could be classified as a Level III FLUCFCS 8320, Electrical Power Transmission Lines. However, the more current FLUCFCS classifications identify the land uses but not the land covers within the upland fields. The following subsection provides a detailed description and plant species inventory of the vegetation association present within the proposed construction laydown and parking areas and the existing transmission line corridors for the proposed Polk 2-5 Conversion Project.

3.3.5.2 Dominant or Indicator Plant Species

As stated previously, the new facilities and associated construction laydown and parking areas will be built to the south and west of the existing facilities. The majority of the project construction will be located mostly within the developed portions of the existing power blocks for Units 2 through 5. However, the new transmission line and temporary construction laydown and parking areas will be located to the west and south of the main power block, respectively, and consist mostly of land that is flat to gently sloping, open old field. The dominant grass species in the old field is Bahia grass (*Paspalum notatum*). Other grasses, forbes, and pioneer species occurring within the old field community include Bermudagrass (*Cynodon dactylon*), vasey grass (*Paspalum urvillei*), smutgrass (*Sporobolus indicus*), bushy bluestem (*Andropogon virginicus*), broomsedge bluestem (*Andropogon glomeratus*), cogongrass (*Imperata cylindrica*), hairy indigo (*Indigofera hirsuta*), beggarticks (*Bidens alba*), sweet broom (*Scoparia dulcis*), American blueheart (*Buchnera americana*), dog fennel (*Eupatorium capillifolium*), Caesarweed (*Urena lobata*), slender goldenrod (*Euthamia caroliniana*), shrub verbena (*Lantana camara*), Indian hemp (*Sida rhombifolia*), and Mexican tea (*Chenopodium ambrosioides*). Occasionally, shrubs are found scattered throughout the old field, such as groundsel tree (*Baccharis halimifolia*) and wax myrtle (*Myrica cerifera*).

3.3.6 ECOLOGY

The ecological descriptions for the areas of the proposed Polk 2-5 Conversion Project primarily come from site reconnaissance and field studies conducted in early 2007 for the proposed PPS Unit 6 expansion, which was cancelled. Infor-

mation from the field studies is supplemented with data presented in the original PPS SCA submitted in 1992 for the power plant facility development.

3.3.6.1 Species—Environmental Relationships

Terrestrial System—Flora

The majority of the areas proposed for the Polk 2-5 Conversion Project have been previously disturbed by past power plant development. Vegetation within the proposed construction laydown and parking areas and existing transmission line corridor mainly consists of pioneer weedy upland shrubs and herbs. Section 3.3.5.2 provides a complete description of the plant community located within the proposed construction laydown and parking areas and existing transmission line corridor.

Terrestrial System—Fauna

Common wildlife species found in Central Florida are expected to occur over the entire acreage of the PPS Site. However, the current power plant operations and relatively small additional footprint required for the proposed Project will mean already disturbed habitat will be affected, and current activities onsite have already affected local populations of wildlife. Wildlife usage will now represent species inhabiting open or ruderal lands as opposed to species primarily inhabiting more natural areas.

Detailed wildlife surveys were conducted over the project area and immediate environs in early May 2007. Wildlife surveys were conducted by wetland ecologists during wetland delineations on the Site and by a wildlife biologist subsequent to their surveys. Table 3.3.6-1 presents the results.

Table 3.3.6-1. Wildlife Observed on the PPS Site—May 10, 2007

Common Name	Scientific Name
Reptiles	
American Alligator	*Alligator mississippiensis*
Birds	
Tricolored heron	*Egretta tricolor*
Killdeer	*Charadrius vociferous*
Red-tailed hawk	*Buteo jamaicensis*
Osprey	*Pandion haliaetua*
Northern mockingbird	*Mimus polyglottos*
White-eyed vireo	*Vireo griseus*
Red-winged blackbird	*Agelaius phoeniceus*
Boat-tailed grackle	*Quiscalus major*
Eastern meadowlark	*Sturnella magna*
Eastern towhee	*Piplo erythrophthalmus*
Mammal	
Coyote	*Canis latrans*
Feral hog	*Sus scrofa*

Source: ECT, 2007.

There were few wildlife observations during the survey, since the property to be affected primarily consisted of cleared lands next to existing power plant facilities. Since the developed land and upland fields being proposed for development of the new Polk 2-5 Conversion Project facilities include the same areas previously surveyed in 2007, the wildlife species list is considered appropriate for this study, except perhaps for the presence of the American alligator and tricolored heron, which are mostly associated with wetland habitats.

Threatened and Endangered Species—Flora

In 1992, prior to development of the existing power plant facility, threatened and endangered plant species were thoroughly investigated. It was determined that only two important species of plants, namely wild coco and golden polypody, were present on the Site but were in no danger from development. Based on element occurrence records for the project area provided by the Florida Natural Areas Inventory (FNAI) and review of the FNAI and Florida Atlas of Vascular Plants databases, approximately 79 state- and/or federally listed commercially exploited, threatened, and/or endangered plant species potentially occurr in Polk County,

Florida (see Table 3.3.6-2). Of the species listed, none are expected to be present within the areas proposed for development of the new facilities based on the absence of preferred habitat. During site searches in 2007, none of the plant species listed on Table 3.3.6-2 were observed. Since the old field habitat has remained the same since 2007, none of the previously identified listed plant species or any other listed plants are expected to occur or be disturbed through the proposed actions.

Threatened and Endangered Species—Fauna

In 2012, FNAI was consulted for the known occurrences of listed wildlife species in Polk County. A total of 28 vertebrate species listed by the U.S. Fish and Wildlife Service (USFWS) as endangered or threatened, or by the Florida Fish and Wildlife Conservation Commission (FWC) as endangered, threatened, or of special concern, were recorded for Polk County. In the original SCA for PPS filed in 1992, 18 of those species were confirmed as occurring on the original 4,348-acre power plant site prior to development. Table 3.3.6-2 lists the likelihood of occurrence of listed species within the areas of the surveyed areas on the PPS Site.

The only two listed species actually observed during the 2007 surveys were the tricolored heron and the American alligator. Both of these species are listed as species of special concern by FWC; they are not listed by USFWS. Both of these species were observed in the large reclaimed wetland habitat located approximately 1 mile northeast of the currently proposed Polk 2-5 Conversion Project area. In 2007, an eagle's nest (ID #PO 040) was reported by both FWC and FNAI as occurring on the southeastern corner of the PPS property. The FWC eagle nest locator Website currently reports that the same nest site was last surveyed and determined to be active in 2010. Regardless of whether or not the eagle's nest location is active, it is located more than 1 mile from the newly proposed Polk 2-5 Conversion Project areas. Since the only potential wildlife habitat available in the areas proposed for construction laydown and parking and the new transmission lines are upland old field, none of the previously identified listed animal species or any other listed animals are expected to occur or be disturbed through the proposed actions.

Aquatic Systems

Little Payne Creek is the only aquatic system located on or in the vicinity of the eastern portion of the PPS Site. Wetlands associated with the onsite drainage basin of Little Payne Creek have been drastically altered due to past mining and development on the property. An old, unreclaimed mine cut lake, a reclaimed lake,

Table 3.3.6-2. Threatened and Endangered Species that Could Potentially Occur on the PPS Site

Common Name	Scientific Name	Designated Status			Potential for Occurrence*
		USFWS†	FWC	FDACS‡	
Plants					
Pine-woods bluestem	*Andropogon arctatus*	—	—	Threatened	Low
Curtiss' milkweed	*Asclepias curtissii*	—	—	Endangered	Low
Florida bonamia	*Bonamia grandiflora*	Threatened	—	Endangered	Low
Ashe's savory	*Calamintha ashei*	—	—	Threatened	Low
Many-flowered grass-pink	*Calopogon multiflorus*	—	—	Endangered	Low
Chapman's sedge	*Carex chapmannii*	—	—	Endangered	Low
Sand butterfly pea	*Centrosema arenicola*	—	—	Endangered	Low
Pygmy fringe tree	*Chionanthus pygmaeus*	Endangered	—	Endangered	Low
Florida goldenaster	*Chrysopsis floridana*	Endangered	—	Endangered	Low
Florida perforate cladonia	*Cladonia perforata*	Endangered	—	Endangered	Low
Sweetscented pigeonwings	*Clitoria fragrans*	Threatened	—	Endangered	Low
Piedmont jointgrass	*Coelorachis tuberculosa*	—	—	Threatened	Low
False rosemary	*Conradina canescens*	Endangered	—	Endangered	Low
Avon park harebells	*Crotalaria avonensis*	Endangered	—	Endangered	Low
Florida tree fern	*Ctenitis sloanei*	—	—	Endangered	Low
Blushing scrub balm	*Dicerandra modesta*	Endangered	—	Endangered	Low
Spoon-leaved sundew	*Drosera intermedia*	—	—	Threatened	Low
Florida butterfly orchid	*Encyclia tampensis*	—	—	Commercially exploited	Low
Green fly orchid	*Epidendrum conopseum*	—	—	Commercially exploited	Low
Umbelled epidendrum	*Epidendrum floridense*	—	—	Endangered	Low
Scrub buckwheat	*Eriogonum longifolium var. gnaphalifolium*	Threatened	—	Endangered	Low
Garberia	*Garberia heterophylla*	—	—	Threatened	Low
Anglepod	*Gonolobus suberosus*	—	—	Threatened	Low
Snowy orchid	*Habenaria nivea*	—	—	Threatened	Low
Threadroot orchid	*Harrisella porrecta*	—	—	Threatened	Low
Hartwrightia	*Hartwrightia floridana*	—	—	Threatened	Low
Highlands scrub hypericum	*Hypericum cumulicola*	Endangered	—	Endangered	Low
Edison's ascyrum	*Hypericum edisonianum*	—	—	Endangered	Low
Star anise	*Illicium parviflorum*	—	—	Endangered	Low
Nodding pinweed	*Lechea cernua*	—	—	Threatened	Low

Table 3.3.6-2. Threatened and Endangered Species that Could Potentially Occur on the PPS Site

(Continued, Page 2 of 4)

Common Name	Scientific Name	Designated Status			Potential for Occurrence*
		USFWS†	FWC	FDACS‡	
Spreading pinweed	*Lechea divaricata*	—	—	Endangered	Low
Florida blazing star	*Liatris olingerae*	Endangered	—	Endangered	Low
Pine lily	*Lilium catesbaei*	—	—	Threatened	Low
Southern twayblade	*Listeria australis*	—	—	Threatened	Low
Cardinal flower	*Lobelia cardinalis*	—	—	Threatened	Low
Scrub lupine	*Lupinus westianus var. aridorum*	Endangered	—	Endangered	Low
Nodding club-moss	*Lycopodiella cernua*	—	—	Commercially exploited	Low
Florida spiny-pod	*Matelea floridana*	—	—	Endangered	Low
Sandhill spiny-pod	*Matelea pubiflora*	—	—	Endangered	Low
Celestial lily	*Nemastylis floridana*	—	—	Endangered	Low
Britton's beargrass	*Nolina brittoniana*	Endangered	—	Endangered	Low
Hand fern	*Ophioglossum palmatum*	—	—	Endangered	Low
Cinnamon fern	*Osmunda cinnamomea*	—	—	Commercially exploited	Moderate
Royal fern	*Osmunda regalis var. spectabilis*	—	—	Commercially exploited	Moderate
Cutthroat grass	*Panicum abscissum*	—	—	Endangered	Low
Paper nailwort	*Paronychia chartacea*	Threatened	—	Endangered	Low
Plume polypody	*Pecluma plumula*	—	—	Endangered	Low
Swamp plume polypody	*Pecluma ptilodon var. bourgeauana*	—	—	Endangered	Low
Creeping leafstalkgrass	*Pharus lappulaceus*	—	—	Endangered	Low
Blueflower butterwort	*Pinguicula caerulea*	—	—	Threatened	Low
Yellow-flowered butterwort	*Pinguicula lutea*	—	—	Threatened	Low
White-fringed orchid	*Platanthera blephariglottis var. conspicua*	—	—	Threatened	Low
Yellow-fringed orchid	*Platanthera ciliaris*	—	—	Threatened	Low
Palegreen orchid	*Platanthera flava*	—	—	Threatened	Low
Rose pogonia	*Pogonia ophioglossum*	—	—	Threatened	Low
Lewton's polygala	*Polygala lewtonii*	Endangered	—	Endangered	Low
Florida jointweed	*Polygonella basiramia*	Endangered	—	Endangered	Low
Small's jointweed	*Polygonella myriophylla*	Endangered	—	Endangered	Low
Scrub plum	*Prunus geniculata*	Endangered	—	Endangered	Low
Giant orchid	*Pteroglossaspis ecristata*	—	—	Threatened	Moderate

Table 3.3.6-2. Threatened and Endangered Species that Could Potentially Occur on the PPS Site

(Continued, Page 3 of 4)

Common Name	Scientific Name	Designated Status			Potential for Occurrence*
		USFWS†	FWC	FDACS‡	
Needle palm	*Rhapidophyllum hystrix*	—	—	Commercially exploited	Low
Long bristle beaksedge	*Rhynchospora megaplumosa*	—	—	Endangered	Low
Leafless beaked orchid	*Sacoila lanceolata*	—	—	Threatened	Low
Hooded pitcher plant	*Sarracenia minor*	—	—	Threatened	Low
Pine scrub bluestem	*Schizachyrium niveum*	—	—	Endangered	Low
Chaffseed	*Schwalbea americana*	Endangered	—	Endangered	Low
Small ladiestresses	*Spiranthes brevilabris*	—	—	Endangered	Low
Long lip ladiestresses	*Spiranthes longilabris*	—	—	Threatened	Low
Scrub stylisma	*Stylisma abdita*	—	—	Endangered	Low
Toothed maidenfern	*Thelypteris serrata*	—	—	Endangered	Low
Inflated and reflexed wild pine	*Tillandsia balbisiana*	—	—	Threatened	Low
Cardinal airplant	*Tillandsia fasciculata*	—	—	Endangered	Low
Giant airplant	*Tllandsia utriculata*	—	—	Endangered	Moderate
Clasping warea	*Warea amplexifolia*	Endangered	—	Endangered	Low
Carter's mustard	*Warea carteri*	Endangered	—	Endangered	Low
Coontie	*Zamia pumila*	—	—	Commercially exploited	Low
Simpson's zephyr-lily	*Zephyranthes simpsonii*	—	—	Threatened	Moderate
Treat's zephyr-lily	*Zephyranthes treatiae var. atamasca*	—	—	Threatened	Low
Scrub ziziphus	*Ziziphus celata*	Endangered	—	Endangered	Low
Amphibians and Reptiles					
American alligator	*Alligator mississippiensis*	Threatened (S/A)**	—	—	Present
Eastern indigo snake	*Drymarchon corais couperi*	Threatened	Threatened	—	High
Florida pine snake	*Pituophis melanoleucus mugitus*	—	SSC	—	High
Short-tailed snake	*Stilosoma extenuatum*	—	Threatened	—	Low
Gopher tortoise	*Gopherus polyphemus*	—	SSC	—	High
Gopher frog	*Rana capito*	—	SSC	—	Moderate
Birds					
Southern bald eagle	*Haliaeetus leucocephalus leucocephalus*	—	Threatened	—	Present‡
Southeastern American kestrel	*Falco sparverius paulus*	—	Threatened	—	High

Table 3.3.6-2. Threatened and Endangered Species that Could Potentially Occur on the PPS Site
(Continued, Page 4 of 4)

Common Name	Scientific Name	Designated Status			Potential for Occurrence*
		USFWS†	FWC	FDACS‡	
Little blue heron	*Egretta caerula*	—	SSC	—	High
Snowy egret	*Egretta thula*	—	SSC	—	High
Tricolored heron	*Egretta tricolor*	—	SSC	—	Present
White ibis	*Eudocimus albus*	—	SSC	—	High
Wood stork	*Mycteria americana*	Endangered	Endangered	—	High
Limpkin	*Aramus quarauna*	—	SSC	—	Moderate
Florida sandhill crane	*Grus canadensis pratensis*	—	Threatened	—	High
Red-cockaded woodpecker	*Picoides borealis*	Endangered	Threatened	—	Unlikely
Florida scrub jay	*Aphelocoma coerulescens coerulescens*	Threatened	Threatened	—	Unlikely
Mammals					
Sherman's fox squirrel	*Sciurus niger shermani*	—	SSC	—	High
Florida mouse	*Podomys floridanus*	—	SSC	—	Low
Florida panther	*Felis concolor coryi*	Endangered	Endangered	—	Unlikely

Note: SSC = species of special concern.

*Low = occurrence within or in proximity to area of proposed development highly unlikely because of species range, unsuitable habitat, or both.
Moderate = may occur within or in proximity to the area of proposed development since range and suitable habitat exists.
High = good possibility of occurrence within or in proximity to area of proposed development since range and suitable to optimal habitat exists.
Present = species listed has been observed in the vicinity of the proposed development during spring 2007 surveys.
Unlikely = site is not within the species' range and contains unsuitable habitat.
‡Active nest (PO 040) located on the southeastern corner of PPS property.
**Threatened due to similarity of appearance.

Sources: †USFWS, 2012 (endangered species Website <www.fws.gov/endangered/>).
‡FDACS (list published in the Preservation of Native Flora of Florida Act, Section 582.185-187, F.S.)
FWC, 2011.
FNAI, 2012.
ECT, 2012

and a small remnant mine pond are situated in the east-central area on the Site within the former headwater area of Little Payne Creek.

On the eastern portion of the PPS Site, the Little Payne Creek system consists primarily of a manmade ditch that connects to an unnamed reclaimed lake on the Site and runs along the western side of Fort Green Road. This ditch crosses Fort Green Road in an easterly direction at a point approximately 1.5 miles south of the Site and eventually discharges into a remnant portion of Little Payne Creek. The smaller, remnant mine pond appears to be hydrologically isolated and is situated to the south of the larger unreclaimed mine cut lake and north of the interior access road. This drainage system is located approximately 1 mile east of the proposed new facilities.

3.3.6.2 Preexisting Stresses

Terrestrial Systems—Flora

Prior to development of PPS in the early 1990s, phosphate mining was the greatest preexisting stress to biota on and in the vicinity of the Site. Mining results in elimination or conversion of vegetation and wildlife habitats and alterations to the topography, surface water drainage, groundwater levels, and soil compositions. The previously mined areas of the Site were reclaimed, except for the old mine cut lakes in the eastern portion of the property.

Alterations to surface water and groundwater have resulted in drastic changes to the hydroperiods of remnant and reclaimed wetland associations. Most of the wetlands onsite have been invaded by weedy plants that flourish due to hydrological changes. Invasion by these competitive plants results in changes in community structure, species dominance, and species diversity. The PPS power block area is in an area that was not previously mined. However, industrial development has resulted in a regrading of the soil profile and conversion of the currently vegetated portions of the area proposed for construction laydown and parking into a maintained upland grassy field.

Terrestrial Systems—Fauna

Wildlife habitat in the areas to be disturbed by the proposed Polk 2-5 Conversion Project is already affected by existing power plant facilities and operations, including noise and human presence. The wildlife species currently present have acclimated to those existing disturbances or are species coming from other nearby habitats to forage. The entire PPS Site, however, has numerous wildlife habitat benefits that are currently not affected by existing operations. As previously men-

tioned, construction will be on already developed portions of the existing power block. The new transmission lines and associated construction laydown and parking areas are proposed to be situated on old field habitat previously disturbed by power plant construction.

Aquatic Systems

As discussed in Section 3.3.6.1, the wetland headwater area of Little Payne Creek was originally located in the area of what is today the PPS Site. However, due to phosphate mining on the property prior to 1991, these headwaters and any recognizable creek beds have long been eliminated. The surface water features described on the Site have resulted from mining and development of its existing PPS facilities. One lake was reclaimed, and the other old pond and mine cut lake were not reclaimed.

3.3.6.3 Measurement Programs

The primary sources of information in this section include the field studies conducted on the PPS Site in 2007 and data compiled for the SCA initially conducted for development of the Site. No recent wildlife or vegetation surveys were conducted, nor were these activities considered necessary in describing the ecological resources present. In addition, no aquatic ecological studies were conducted recently, nor were such studies considered necessary for the purposes of evaluating impacts to aquatic systems from the proposed project.

3.3.7 METEOROLOGY AND AMBIENT AIR QUALITY

3.3.7.1 Meteorology/Climatology

PPS lies within the Northern Hemisphere's humid subtropical climate zone. This zone is noted for long, hot, humid summers and mild and wet winters. The Central Florida climate is also affected by maritime influences from the Atlantic Ocean and the Gulf of Mexico. With the Gulf of Mexico nearby, only relative slight variations in humidity and temperature result through the seasons. Summers are humid, warm to hot, and long. Winters are typically mild with weak cold fronts occurring, which in rare instances produces a frost.

Table 3.3.7-1 provides a summary of monthly mean and extreme temperatures based on National Weather Service (NWS) data collected at Wauchula, Florida, for the period of record from 1971 through 2000. The Wauchula station is located approximately 19 miles southeast of the PPS Site and is considered to be the most representative NWS surface observation station with available temperature and

precipitation data. A slightly closer site is located in Bartow approximately 15 miles to the northeast. However, the area surrounding the Wauchula station is more rural and therefore more similar to the PPS Site. As shown in Table 3.3.7-1, there is only an approximately 20°F variation in the monthly mean temperatures. Temperatures above 90°F have occurred in every month except January, which had a highest recorded temperature of 88°F. From 1971 through 2000, there were only 5 days with below-freezing temperatures.

Table 3.3.7-1. Ambient Temperatures Measured at Wauchula, Florida

	Daily (°F)				Monthly (°F)		
Month	Mean Maximum	Mean Minimum	Highest	Lowest	Lowest Mean	Mean	Highest Mean
January	72.8	48.5	88	20	51.0	60.7	69.5
February	74.3	49.2	93	25	54.6	61.8	68.2
March	78.7	53.2	94+	23	61.9	66.0	71.0
April	83.1	57.4	97	34	65.7	70.3	73.5
May	88.3	63.7	101+	44	72.3	76.0	79.6
June	90.7	69.6	102	51	77.5	80.2	83.4
July	91.6	71.2	100+	57	79.3	81.4	83.5
August	91.7	71.7	98+	58	80.4	81.7	83.3
September	89.9	70.7	99	55	78.7+	80.3	82.1
October	85.1	64.2	95+	39	71.4	74.7	79.0
November	79.3	56.8	90+	24	63.6	68.1	74.7
December	74.2	50.7	92	21	57.5	62.5	68.4
Annual	83.3	60.6	102	20	51.0	72.0	83.5

Note: Highest and lowest daily temperatures based on complete station record (i.e., 1948 to 2001). Mean temperatures based on years 1971 through 2000.

Sources: National Climatic Data Center (NCDC), Climatography of the United States: No. 20, 1971-2000. ECT, 2012.

Relative humidity values were not available from the Wauchula station but were available from the Tampa International Airport (TPA), which is approximately 37 miles (60 kilometers [km]) northwest of the Site (see Table 3.3.7-2). Generally, winter temperatures are quite temperate and less humid. Wintertime temperatures generally range between approximately 50 and 70°F, with a relative humidity slightly lower than experienced in late summer. Typical monthly summertime temperatures range between 75 and 90°F, with a relative humidity of 86 to 90 percent during the night and early morning and 60 to 65 percent in the afternoon. Relative humidity in the Tampa area varies from 52 to 91 percent throughout the year. The highest relative humidity occurs in the early morning hours, with a range of 85 to 91 percent and an average of 88 percent. The relative humid-

ity during the daytime and early evening hours ranges from approximately 52 to 65 percent with an average of 59 percent. The mild winter climate can be attributed to the close proximity of the Site to the Gulf of Mexico, which is approximately 50 miles to the west. During the winter, relatively warm air from the Gulf of Mexico maintains the mild winter climate.

Table 3.3.7-2. TPA Normal Relative Humidity Data (1963 through 2002)

Month	Morning (%)	Afternoon (%)
January	87	60
February	86	57
March	87	55
April	86	52
May	85	53
June	86	60
July	87	64
August	90	65
September	91	63
October	89	58
November	88	58
December	88	60
Annual	88	59

Source: NCDC, 2012.

Based on historical records, rainfall in the vicinity of the Site is expected to vary widely from month to month. Table 3.3.7-3 presents 79-year rainfall records from the Wauchula station. Average rainfall is greatest during the summer months, when convective thunderstorms are likely, and lower for the remainder of the year, especially in the winter months. Daily and maximum values are also shown in Table 3.3.7-3. The maximum daily rainfall has ranged from 2.74 to 10.56 inches. Monthly precipitation has varied from 0 to more than 18 inches.

Table 3.3.7-3. Precipitation Measured at Wauchula, Florida (1933 through 2011)

Month	Monthly (inches)			Daily Maximum (inches)
	Mean	Maximum	Minimum	
January	2.08	7.84	0.00	2.74
February	2.71	8.92	0.00	4.40
March	3.05	12.14	0.00	5.75
April	2.65	8.26	0.00	5.55
May	3.91	11.32	0.00	5.72
June	8.60	16.20	1.69	6.91
July	8.48	15.54	2.21	4.73
August	7.41	15.53	2.66	6.94
September	6.78	18.06	1.19	10.56
October	2.87	10.36	0.00	6.76
November	1.77	11.18	0.02	7.60
December	1.87	7.89	0.00	3.96

Source: ECT, 2012.

The normal annual precipitation recorded for Wauchula, Florida, is 52.2 inches, with most of this precipitation occurring during the summer months. The winter months are much drier, with the monthly precipitation averaging 2.2 inches per month. The large amount of summer rainfall is attributed to strong afternoon thunderstorms that can become extremely intense at times. These thunderstorms are a result of the moisture and heat introduced into the atmosphere during the hot summer days. Rainfall during the winter months results from frontal systems moving through the Tampa area.

The nearest representative station with detailed wind data is the Orlando International Airport located approximately 63 miles northeast of PPS. There were a number of other weather stations closer to the Site, but they were not considered to be as representative because of their coastal locations. The observations at these other stations could be expected to be affected more by the Gulf of Mexico and thus experience routine onshore and offshore breezes. Therefore, the Orlando International Airport is expected to have wind patterns more representative of the PPS Site's inland location. Figure 3.3.7-1 provides a 5-year annual wind rose based on wind speed and direction observed for the years 1996 through 2000. Figure 3.3.7-2 depicts 5-year seasonal wind roses for the same station. The information presented in Figure 3.3.7-2 represents the percent of time the wind blows from a particular direction at a given speed. Although there is no single prevailing

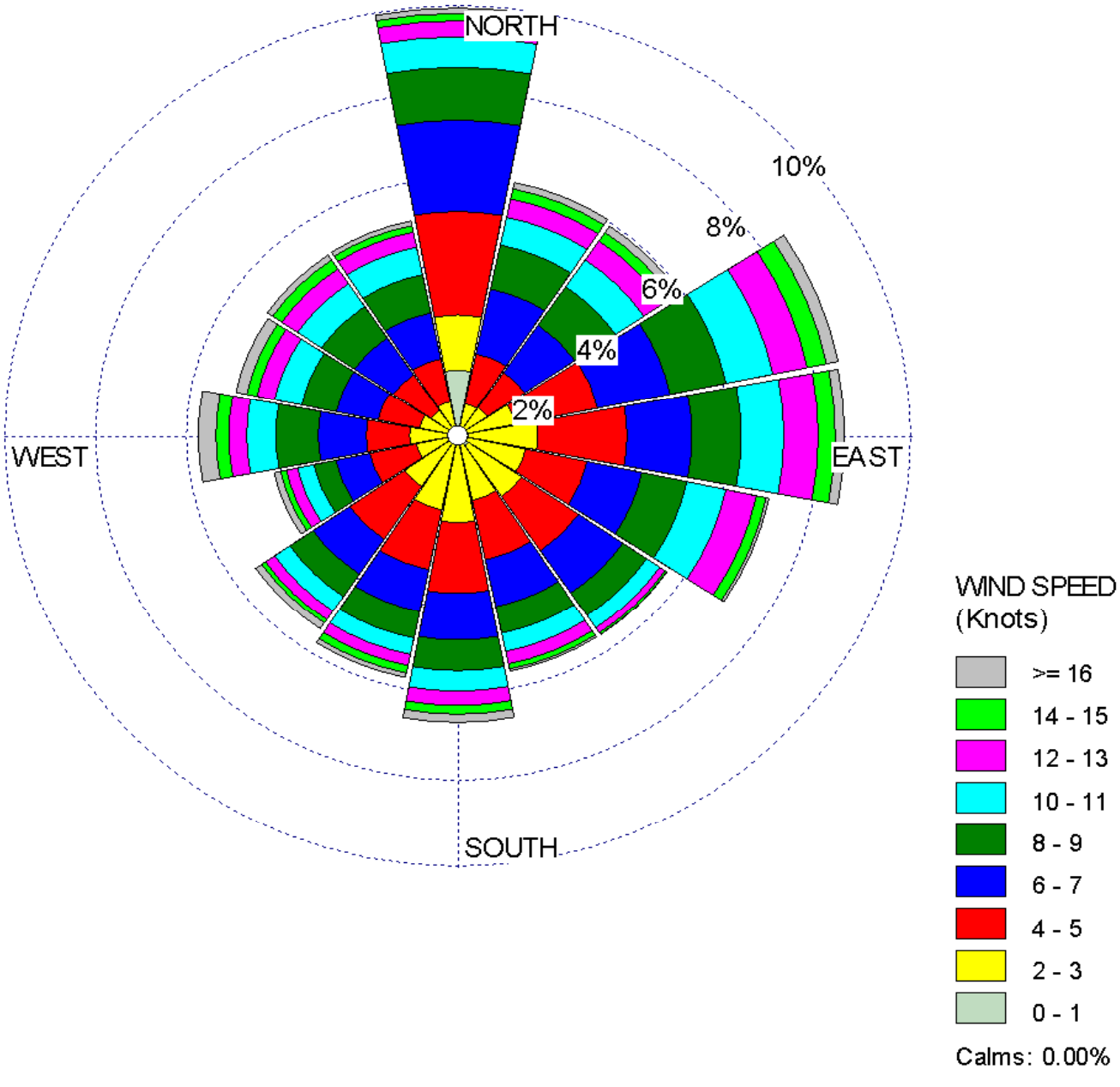


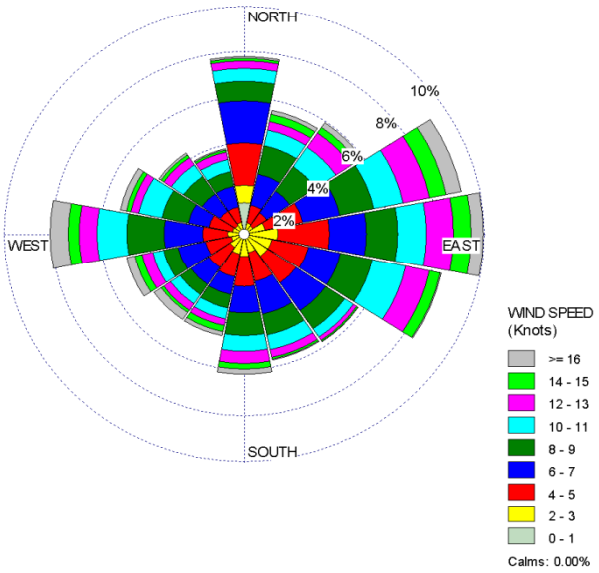
FIGURE 3.3.7-1.

5-YEAR ANNUAL WIND ROSE, ORLANDO INTERNATIONAL AIRPORT (2006 THROUGH 2010)

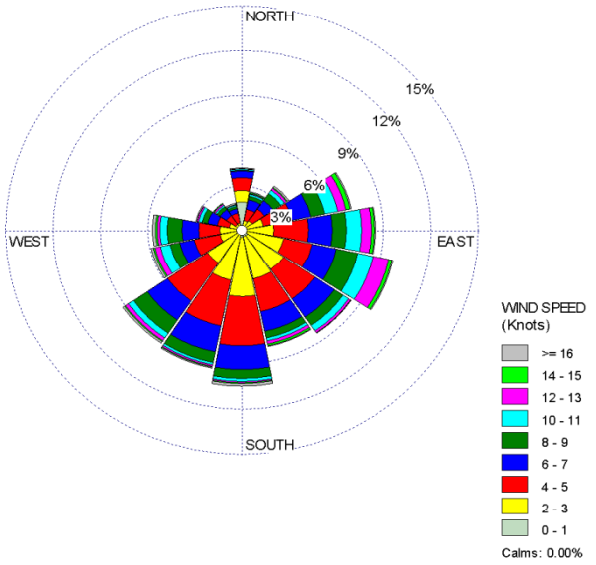
Source: ECT, 2012.

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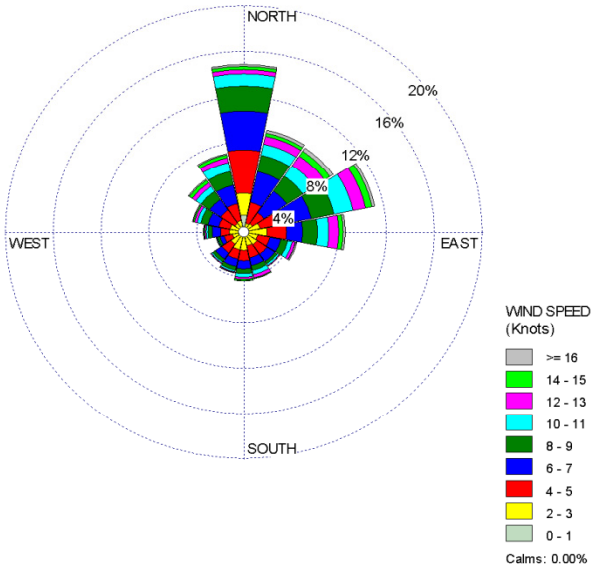
SPRING



SUMMER



FALL



WINTER

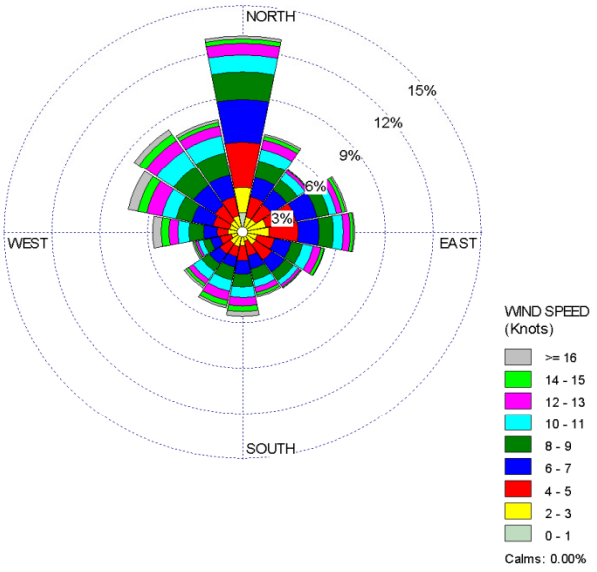


FIGURE 3.3.7-2.

5-YEAR SEASONAL WIND ROSE, ORLANDO INTERNATIONAL AIRPORT (2006 THROUGH 2010)

Source: ECT, 2012.

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wind direction throughout the year, the winds are slightly more predominant from the easterly direction (56° through 101°), which occurs approximately 15 percent of the time, with another 7+ percent from the north and 6+ percent from the south. Winds in the spring predominate from the southern sector, and southwesterly winds are common during summer months. In the fall, winds mostly occur from the northeast quadrant, and there is a strong northerly wind component in the winter. The average wind speed over the 5-year period was 7.5 miles per hour (mph). Spring has the highest winds at 8.4 mph. The lowest average winds are in the summer at 6.3 mph.

Polk County has experienced hurricanes and tropical storms in the past. Based on data from 1926 through 2006, Polk County experienced seven hurricanes and seven tropical storms. Of the storms that have impacted Polk County, Tropical Storm Josephine caused the most property damage, and Tropical Storm Gordon caused the most deaths (eight people). Most of the property damage and all of the deaths contributed to these storms occurred outside Polk County. During most of the past storm events, Polk County experienced minor to severe flooding.

3.3.7.2 Ambient Air Quality

Ambient air quality is affected by meteorology, atmospheric chemistry, and pollutant emissions. The type, amount, and location of sources of emissions affect ambient air quality. Meteorology controls the distribution, dilution, and removal (e.g., deposition) of pollutants. Atmospheric chemistry governs the reactions that transform primary pollutants into other chemical compounds referred to as secondary pollutants. It is during periods of low wind speeds that the maximum ground level concentration of pollutants normally occurs. During the summer months, the intensity of sunlight is at its highest peak. The combination of high pollutant concentrations and an abundance of ultraviolet light causes the production of photochemical smog, which contains pollutants such as ozone. Relative humidity is important to atmospheric dispersion and chemical transformation because of the interaction between pollutants and water molecules.

Air pollutants are broken down into two different categories: primary and secondary. Primary pollutants are generated directly from the source (i.e., NO_x, sulfur oxides [SO_x], carbon monoxide [CO], and particulates). Secondary pollutants are formed when primary pollutants react with atmospheric compounds (water, nitrogen, oxygen) under various atmospheric conditions (temperature, humidity, light intensity). An example of a secondary pollutant is ozone, which is formed when NO_x and organic compounds combine in the presence of sunlight.

EPA has established national ambient air quality standards (NAAQS) for six different pollutants: sulfur dioxide (SO_2), nitrogen dioxide (NO_2), CO, particulate matter (PM), lead, and ozone. These six pollutants are referred to as *criteria* pollutants. There are two sets of federal limits developed for each criteria pollutant, primary and secondary NAAQS. Primary NAAQS are health-based, with the principle objective being to protect human health. Secondary NAAQS were developed to protect the environment and physical property.

As a criteria pollutant, PM is separated into two different size categories. The NAAQS for particulate matter less than or equal to 10 micrometers (PM_{10}) and particulate matter less than or equal to 2.5 micrometers ($PM_{2.5}$) were revised effective October 17, 2006.

An 8-hour ozone NAAQS replacing the existing 1-hour standard was promulgated in July 1997. On the federal level, the 8-hour ozone standard is in effect, and the 1-hour ozone standard has been revoked, except in specific metropolitan areas (in Florida these are Jacksonville, Miami-Fort Lauderdale-West Palm Beach, and Tampa-St. Petersburg-Clearwater).

Table 3.3.7-4 shows the primary and secondary NAAQS developed for different averaging times dependent on the characteristics of the pollutant. The states have the right to establish more stringent ambient air quality standards (AAQS). Florida has adopted the federal limits for all pollutants.

Polk County, the surrounding counties, and the entire state of Florida are designated as attainment for all AAQS. On April 30, 2004, EPA issued final designations for the 8-hour ozone NAAQS. For Florida, Chapter 40, Part 81.310, Code of Federal Regulations (CFR), was revised to designate all areas of the state, including Polk County, as unclassifiable/attainment for the 8-hour ozone NAAQS.

Ambient air quality monitors collect data used to determine attainment status. Figure 3.3.7-3 shows the locations for the ambient monitors in the Polk County area. Table 3.3.7-5 shows the most recent monitored levels at selected monitor locations in relation to the NAAQS.

Table 3.3.7-4. NAAQS and Florida AAQS (µg/m^3 unless otherwise stated)

Pollutant (units)	Averaging Periods	National Standards	
		Primary	Secondary
SO_2	3-hour[1]		1,300 (0.5 ppm)
	1-hour[2]	196 (75 ppb)	
PM_{10}	24-hour[3]	150	150
$PM_{2.5}$	24-hour[4]	35	35
	Annual[5]	15	15
CO	1-hour[1]	40,000 (35 ppm)	
	8-hour[1]	10,000 (9 ppm)	
Ozone (ppmv)	8-hour[6]	0.075 ppm	0.075 ppm
NO_2	Annual[7]	100 (53 ppb)	100 (53 ppb)
	1-hour	188 (100 ppb)	
Lead	Calendar quarter arithmetic mean	1.5	1.5

Note: µg/m^3 = microgram per cubic meter. ppm = part per million.
ppb = part per billion. ppmv = part per million by volume.

[1]Not to be exceeded more than once per calendar year.
[2]99th percentile of 1-hour daily maximum concentrations averaged over 3 years.
[3]The standards are attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m^3, as determined in accordance with 40 CFR 50, Appendix K, is equal to or less than 1.
[4]98th percentile concentration, as determined in accordance with 40 CFR 50, Appendix N.
[5]Arithmetic mean concentration, as determined in accordance with 40 CFR 50, Appendix N.
[6]Standard attained when the average of the annual 4th highest daily maximum 8-hour average concentrations over a 3-year period are less than or equal to the standard, as determined by 40 CFR 50, Appendix I.
[7]Standard based on average of 98th percentile of the annual distribution of1-hour daily maximum NO_2 concentrations.
[8]Arithmetic mean.

Sources: 40 CFR 50.
Section 62-204.240, F.A.C.

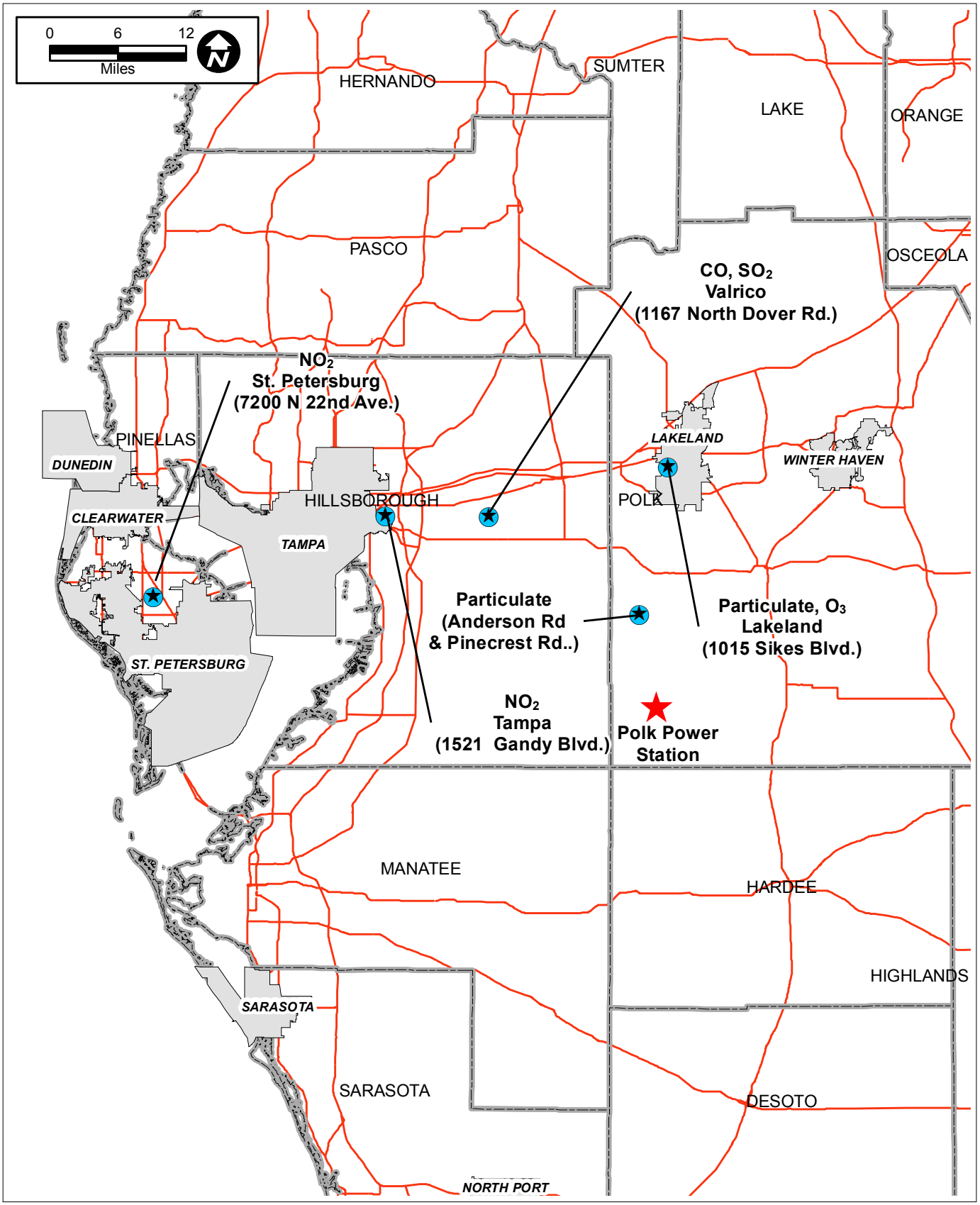


FIGURE 3.3.7-3.
LOCATION OF AMBIENT AIR QUALITY MONITORS NEAR THE PPS SITE

Sources: FGDL, 2006; ECT, 2012.

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Table 3.3.7-5. NAAQS and Monitored Air Quality Concentrations

Pollutant and Averaging Time	Primary NAAQS[1]	2011 Monitored Data[2]		Location of Monitor	
				City	County
CO				Valrico	Hillsborough
8-hour*	9 ppm	0.5 ppm	2nd Maximum		
1-hour*	35 ppm	0.9 ppm	2nd Maximum		
NO_2					
Annual†	100 ppb	37 ppb	3-year average of daily 98th percentile	Tampa	Hillsborough
1-hour§	100 ppb	37 ppb	3-year average of daily 98th percentile	St. Petersburg	Pinellas
PM_{10}					
24-hour*	150 µg/m³	32 µg/m³	2nd Maximum	Not in city	Polk
24-hour*	150 µg/m³	31 µg/m³	2nd maximum	Lakeland	Polk
$PM_{2.5}$				Lakeland	Polk
24-hour‡	35 µg/m³	15.7 µg/m³	3-year average of 98th percentile		
Ozone				Lakeland	Polk
8-hour (2008 standard)£	0.075 ppm	0.068 ppm	4th Maximum		
SO_2				Valrico	Hillsborough
24-hour*	0.14 ppm	0.003 ppm	2nd Maximum		
1-hour¥	75 ppb	15 ppb	3-year average of 99th percentile		
Lead◊				Tampa	Hillsborough
Rolling 3-month average	0.15 µg/m³	0.011 µg/m³	Maximum daily		

Note: µg/m³ = microgram per cubic meter.
ppm = part per million.
ppb = part per billion.

*Not to be exceeded more than once per year. Standard has been revoked for 24-hour SO_2.
†Arithmetic mean.
‡The 3-year average of the 98th percentile of 24-hour concentrations.
§The 3-year average of the 98th percentile of the daily maximum 1-hour average concentration is less than or equal to the standard.
£Standards attained when the 3-year average of the annual 4th highest daily maximum 8-hour average concentration is less than or equal to the standard.
¥The 3-year average of the 99th percentile of the daily maximum 1-hour average concentration is less than or equal to the standard.
◊Lead value from 2010 data.

Sources: [1]40 CFR 50.1-50.12.
[2]EPA, 2011; 2009 through 2011 data used for 3-year averages. http://www.epa.gov/airdata/.
ECT, 2012.

EPA has developed a descriptor of air quality that can be used to characterize the air quality in the site vicinity. This descriptor is called the air quality index (AQI). Air quality is described over a range from *good* to *hazardous* based on a calculated numerical value, as follows:

AQI Values	Levels of Health Concern	Colors
When the AQI is in this range:	*...air quality conditions are:*	*...as symbolized by this color:*
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for sensitive groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very unhealthy	Purple
301 to 500	Hazardous	Maroon

Each category corresponds to a different level of health concern. The following describes the six levels of health concern and what they mean:

- Good—The AQI value for your community is between 0 and 50. Air quality is considered satisfactory, and air pollution poses little or no risk.
- Moderate—The AQI for your community is between 51 and 100. Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people. For example, people who are unusually sensitive to ozone may experience respiratory symptoms.
- Unhealthy for Sensitive Groups—When AQI values are between 101 and 150, members of sensitive groups may experience health effects. This means they are likely to be affected at lower levels than the general public. For example, people with lung disease are at greater risk from exposure to ozone, while people with either lung disease or heart disease are at greater risk from exposure to particle pollution. The general public is not likely to be affected when the AQI is in this range.
- Unhealthy—Everyone may begin to experience health effects when AQI values are between 151 and 200. Members of sensitive groups may experience more serious health effects.
- Very Unhealthy—AQI values between 201 and 300 trigger a health alert, meaning everyone may experience more serious health effects.
- Hazardous—AQI values over 300 trigger health warnings of emergency conditions. The entire population is more likely to be affected.

The higher the AQI value, the greater the level of air pollution and the greater the health concern. For example, an AQI value of 50 represents good air quality with little potential to affect public health, while an AQI value more than 300 represents hazardous air quality.

An AQI value of 100 generally corresponds to the NAAQS for the pollutant, which is the level EPA has set to protect public health. AQI values below 100 are generally thought of as satisfactory. As AQI values go above 100, air quality is considered to be unhealthy—at first for certain sensitive groups of people, then for everyone as AQI values get higher.

Figure 3.3.7-4 provides an AQI chart for Polk County for 2005 through 2007. The AQI is developed from monitored levels of ozone, $PM_{2.5}$, PM_{10}, and SO_2. In 2005, Polk County experienced 312 *good* air quality days, 49 *moderate* days, and 4 *unhealthy for sensitive groups* days. In 2006, there were 304 *good* days, 55 *moderate*, and 6 *unhealthy for sensitive groups* days. In 2007, there were 302 *good* days, 58 *moderate*, and 5 *unhealthy for sensitive groups* days. Overall, based on these charts, air quality in Polk County is generally satisfactory or *good*. The pollutant primarily affecting air quality in Polk County is ozone, which is a regional pollutant formed in the atmosphere in the summer. Generally, days having the highest AQI values are mostly caused by elevated concentrations of ozone in the spring and summer months. As can be seen from Figure 3.3.7-4, the AQI has only varied slightly over the 3 years.

Air quality is influenced by the emissions of pollutants into the air. Emissions come from a variety of sources, including the combustion of fuel by stationary sources (e.g., power plants, factories, home furnaces fired by natural gas), automobiles, and manufacturing processes. Figures 3.3.7-5 (SO_2, NO_x, volatile organic compounds [VOCs], and CO) and 3.3.7-6 ($PM_{2.5}$ and PM_{10}) summarize data on emissions of five criteria pollutants in Polk County for the year 2008 (the latest year for which such data are readily available). Most emissions of PM_{10} were attributed to fugitive dust. SO_2 emissions from industrial processing result in the greatest amounts of SO_2 emissions in the county. Vehicles emit the greatest percentages of VOCs and CO, which are products of incomplete combustion.

There are no ambient air quality standards for VOC; rather, VOC emissions contribute to the formation of ozone, for which ambient standards have been set.

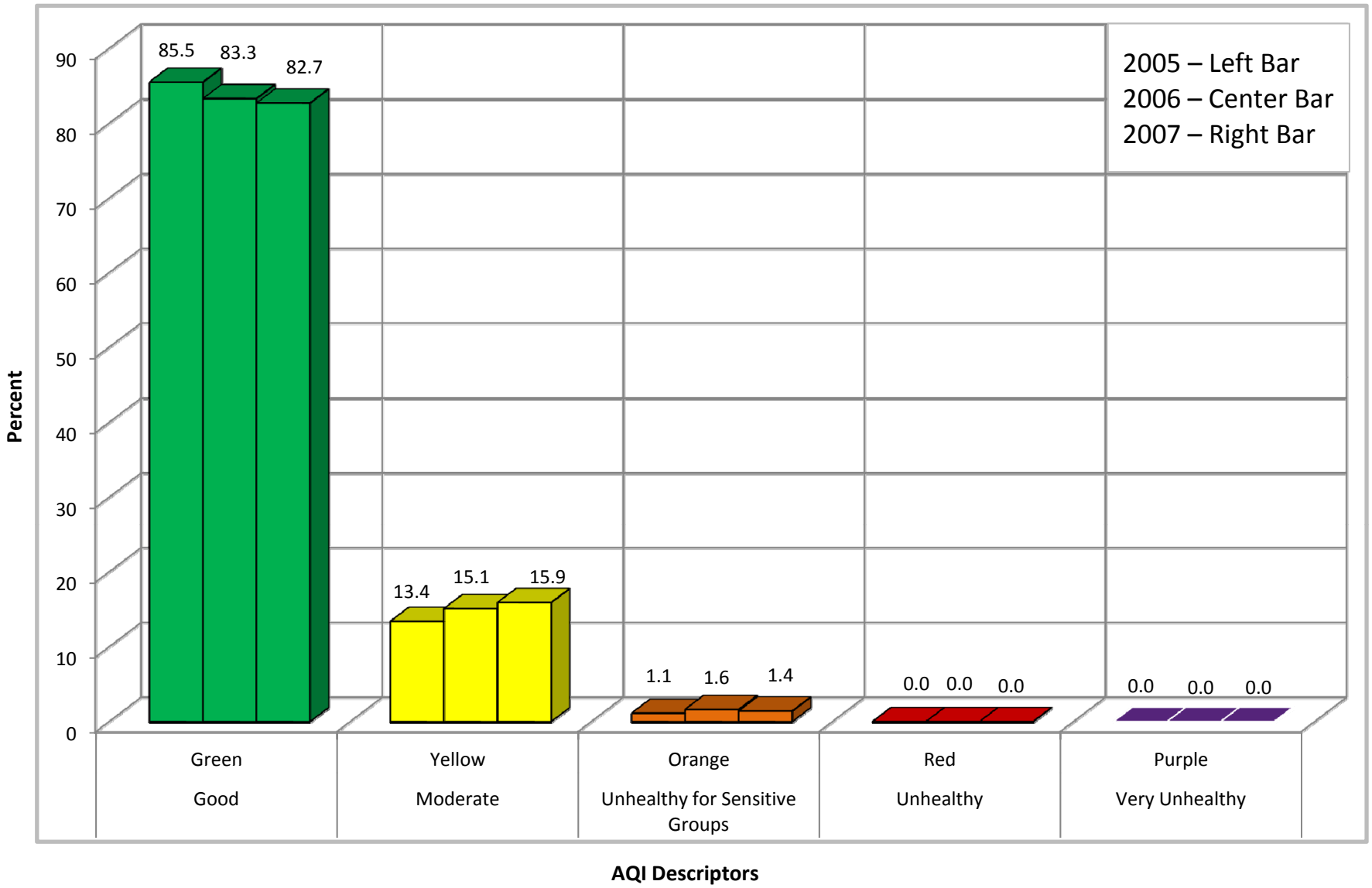


FIGURE 3.3.7-4.

AQI FOR POLK COUNTY, FLORIDA (2005 THROUGH 2007)

Source: EPA AirData <http://www.epa.gov/airdata>, 2012.

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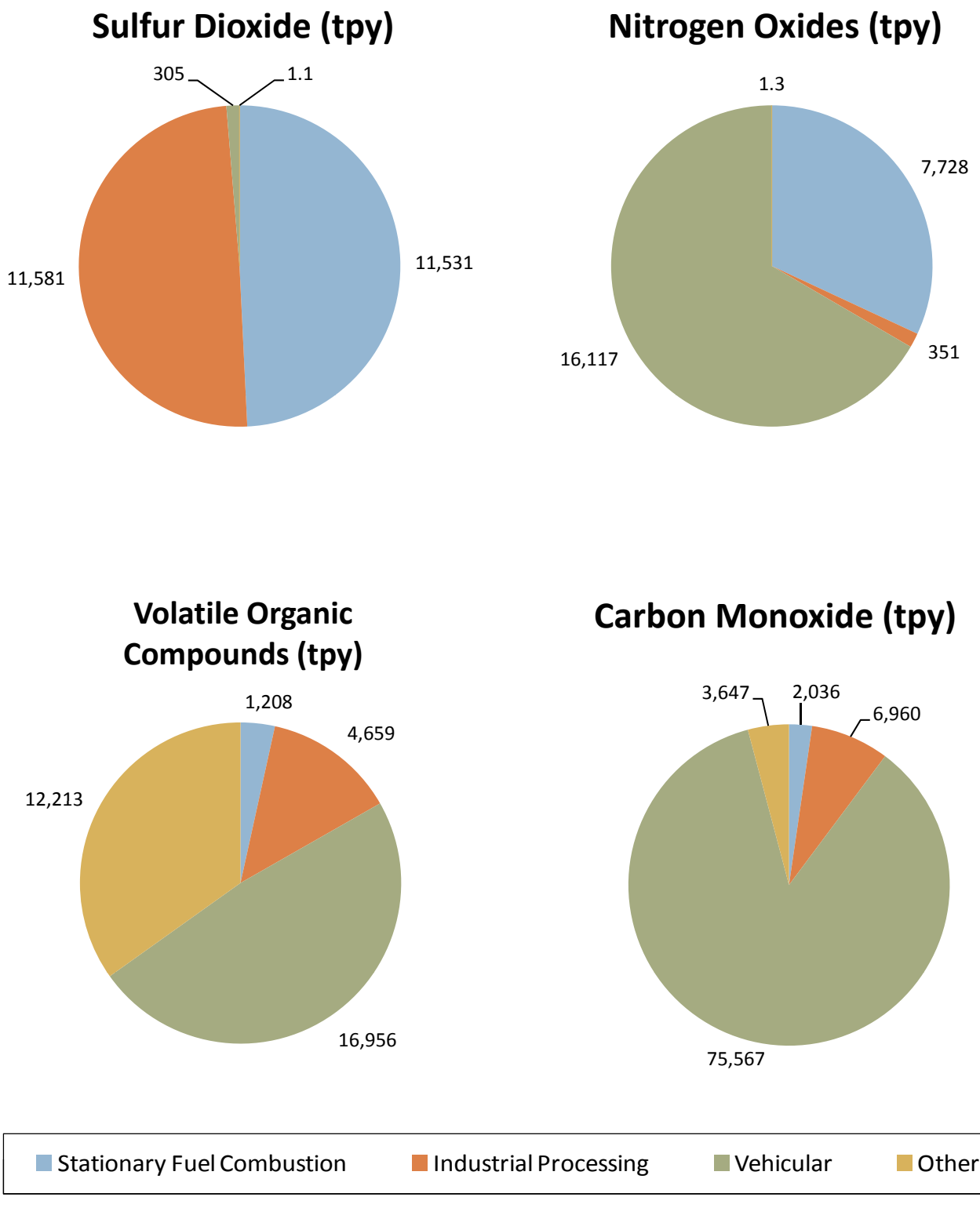


FIGURE 3.3.7-5.

EXISTING POLK COUNTY SO_2, NO_x, VOC, AND CO EMISSIONS FOR 2008

Source: EPA AirData <http://www.epa.gov/airdata>, 2012.

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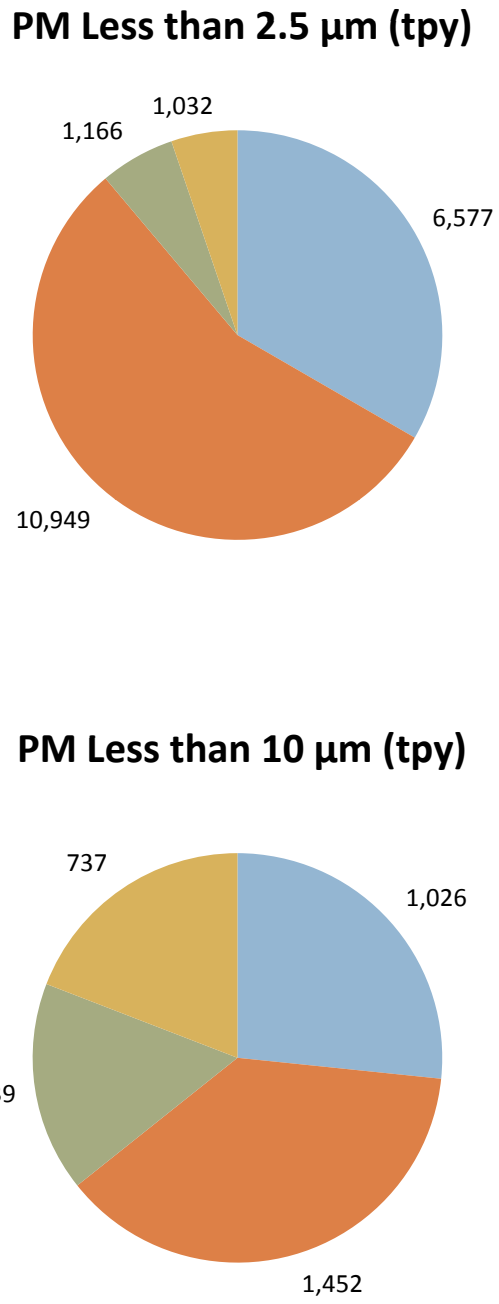


FIGURE 3.3.7-6.

EXISTING POLK COUNTY PM EMISSIONS FOR 2008

Source: EPA AirData <http://www.epa.gov/airdata>, 2012.

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In addition to the six criteria pollutants, EPA categorizes 188 other compounds as *noncriteria* air pollutants, or hazardous air pollutants (HAPs). HAPs are those pollutants known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. Examples of HAPs include benzene, which is found in gasoline; perchlorethlyene, which is emitted from some dry cleaning facilities; and methylene chloride, which is used as a solvent and paint stripper by a number of industries. Examples of other listed air toxics include dioxin, asbestos, toluene, and metals such as cadmium, mercury, chromium, and lead compounds.

Besides the five criteria pollutants addressed in Figures 3.3.7-5 and 3.3.7-6, EPA has tabulated 1999 emissions data for lead and noncriteria pollutants (no AAQS have been established for noncriteria pollutants). Table 3.3.7-6 presents emissions data for Polk County and provides a comparison of how those levels of emissions compare to those from other Florida counties having the greatest emissions for each pollutant.

Large point sources of emissions may contribute to air quality in a given area at a given time, depending on wind direction and other meteorological variables. Figure 3.3.7-7 shows the locations of large point sources of air emissions in the area. Table 3.3.7-7 summarizes the actual reported 2008 emissions data for Polk County, other industrial sources, and PPS.

3.3.7.3 Measurement Programs

Measurements of ambient air quality were conducted at the PPS Site for the original SCA. Existing data presented in the previous section are more than adequate to describe background meteorological and air quality conditions. Therefore, no additional ambient air quality measurements are proposed.

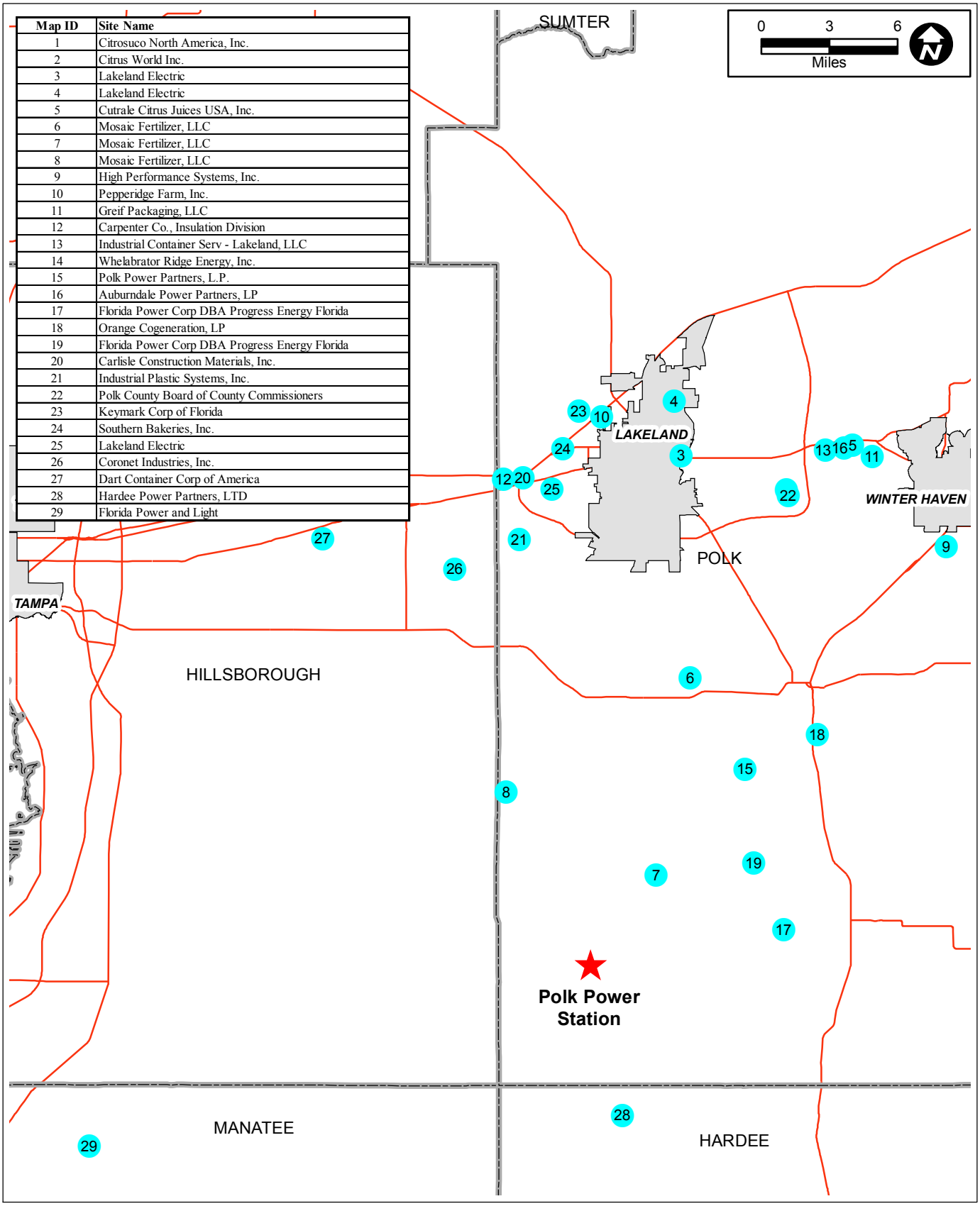
Table 3.3.7-6. Lead and Noncriteria Pollutant Emissions, 1999

Pollutant	Polk County (lb/yr)	County with Highest Emissions	
		County	Emissions (lb/yr)
Lead compounds*	5,300	Palm Beach	236,840
Acetaldehyde*	210,500	Miami-Dade	692,960
Acrolein*	102,620	Miami-Dade	313,320
Antimony compounds	0.4	Brevard	5,420
Arsenic compounds*	40.0	Hillsborough	3,000
Benzene*	1,197,100	Miami-Dade	3,717,220
Beryllium compounds*	5.2	Escambia	1,260
1,3-Butadiene*	190,040	Miami-Dade	587,300
Cadmium compounds*	5.8	Hillsborough	880
Carbon disulfide	1,100	Bay	43,240
Chromium compounds*	3,420	Hillsborough	4,360
Cobalt compounds	900	Brevard	6,620
Ethylbenzene	507,940	Miami-Dade	1,634,880
Formaldehyde*	876,400	Miami-Dade	2,651,120
Manganese compounds*	40.0	Palm Beach	14,900
Mercury compounds*	140	Hillsborough	2,700
Naphthalene	48,220	Palm Beach	525,760
Nickel compounds*	2,240	Duval	123,680
Propylene oxide	220	Miami-Dade	1,140
Selenium compounds	280	Citrus	10,000
Toluene	3,043,800	Miami-Dade	10,764,100
Xylenes	2,023,200	Miami-Dade	6,412,560
Sum of *urban HAPs*	2,897,440	Miami-Dade	10,279,400

Note: lb/yr = pound per year.

*One of the 33 *urban HAPs*, defined by EPA as "the 33 air toxics that present the greatest threat to public health in the largest number of urban areas." All of these urban HAPs generally have most of their emissions contributed from area (small but numerous, such as gas stations and dry cleaners) and mobile (vehicular) sources. In Polk County, 86 percent of the urban HAPs emissions in 1999 were attributed to area and mobile sources.

Sources: EPAAirData, 2012.
ECT, 2012.



Map ID	Site Name
1	Citrosuco North America, Inc.
2	Citrus World Inc.
3	Lakeland Electric
4	Lakeland Electric
5	Cutrale Citrus Juices USA, Inc.
6	Mosaic Fertilizer, LLC
7	Mosaic Fertilizer, LLC
8	Mosaic Fertilizer, LLC
9	High Performance Systems, Inc.
10	Pepperidge Farm, Inc.
11	Greif Packaging, LLC
12	Carpenter Co., Insulation Division
13	Industrial Container Serv - Lakeland, LLC
14	Whelabrator Ridge Energy, Inc.
15	Polk Power Partners, L.P.
16	Auburndale Power Partners, LP
17	Florida Power Corp DBA Progress Energy Florida
18	Orange Cogeneration, LP
19	Florida Power Corp DBA Progress Energy Florida
20	Carlisle Construction Materials, Inc.
21	Industrial Plastic Systems, Inc.
22	Polk County Board of County Commissioners
23	Keymark Corp of Florida
24	Southern Bakeries, Inc.
25	Lakeland Electric
26	Coronet Industries, Inc.
27	Dart Container Corp of America
28	Hardee Power Partners, LTD
29	Florida Power and Light

FIGURE 3.3.7-7.
LOCATION OF MAJOR EMISSIONS SOURCES WITHIN 40 km OF PPS

Sources: FGDL, 2006; ECT, 2012.

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Table 3.3.7-7. Reported 2008 Emissions for Polk County, Industrial Sources, and PPS

Pollutant	Polk County (tons)	Industrial Sources (tons)	PPS (tons)
CO	89,208	2,097	114
NO_x	26,196	651	429
PM_{10}	19,724	680	45
$PM_{2.5}$	3,853	444	45
SO_2	27,773	11,614	1,211
VOC	55,744	3,013	16

Source: ECT, 2012.

3.3.8 NOISE

3.3.8.1 Noise Concepts

Noise metrics are used to quantify sound pressure levels and describe a sound's loudness, duration, and tonal character. A commonly used descriptor is the A-weighted decibel (dBA). The A-weighting scale approximates the human ear's sensitivity to certain frequencies by emphasizing the middle frequencies and de-emphasizing the lower and higher frequency sounds. The decibel is a logarithmic unit of measure of sound. A 10-decibel change in the sound level means a 10-fold change in sound pressure, which roughly corresponds to a doubling or halving of perceived loudness. A 3-dBA change in the noise level is generally defined as being just perceptible to the human ear. Table 3.3.8-1 provides the subjective effect of different changes in sound levels.

Table 3.3.8-1. Subjective Effect of Changes in Sound Pressure Levels

Change in Sound Level	Apparent Change in Loudness
3 dBA	Just perceptible
5 dBA	Noticeable
10 dBA	Twice (or half) as loud

Source: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) Handbook—Fundamentals, Atlanta, 1989.

Sound level measurements sometimes include the analysis and breakdown of the sound spectrum into its various frequency components to determine tonal characteristics. The unit of frequency is the hertz (Hz), measuring the cycles per second of sound waves, and typically the audible frequency range from 16 to 16,000 Hz is broken down into 11 (full octave) or 33 (one-third octave) bands. A source is said to create a pure tone, also referred to as a prominent discrete tone, if the one-third octave band sound pressure level in the band with the tone exceeds the arithmetic average of the sound pressure levels of the two contiguous one-third octave bands by 5 dBA for center frequencies of 500 Hz and above, by 8 dBA for center frequencies between 160 and 400 Hz, and by 15 dBA for center frequencies less than or equal to 125 Hz. Examples of pure tone sounds are a large motor vehicle backup alarm, emergency vehicle siren, or squeaky ventilation fan.

When pure tones are present in a noise spectrum, the dBA level is not adequate to predict human response, because pure tones, especially at higher frequencies, are much more annoying than a broadband noise of the same decibel level. Therefore, sound level measurements typically include the analysis and breakdown of the sound spectrum into its various frequency components to determine tonal characteristics.

3.3.8.2 Noise Regulations

Section 761 of the Polk County LDC regulates noise in the county (Polk County, Revised September 2011). Florida has no applicable state noise laws or regulations. Maximum permissible sound levels are established by land use designation category and are summarized in Table 3.3.8-2 as follows:

Table 3.3.8-2. A-Weighted Sound Pressure Level Limits (Time Averaged)

Land Use Category	Time	Sound Level Limit (dBA)
Nonresidential	7 a.m. to 9 p.m.	75
Residential and other areas potentially allowing residential use	7 a.m. to 9 p.m.	65

Source: Polk County LDC, Revised September 2011.

For the purposes of Section 761, noise levels are measured at the property line of the property on which the noise source is located, and at least 10 ft from any large reflecting surfaces on the subject property.

3.3.8.3 Ambient Noise Levels

Ambient noise levels were measured at several locations on the PPS property boundary in 2007. PPS Units 1 through 5 were existing and in operation during these ambient noise level measurements. Since 2007, there have been no additional noise sources added to PPS or to the surrounding adjacent properties that would change or invalidate these ambient noise readings. Therefore, the ambient noise data conducted in 2007 is still valid and representative of the ambient noise data currently at the PPS property boundary.

Ambient noise levels were measured at four locations to the north, south, east, and west of the existing PPS power block in May/June 2007. Figure 3.3.8-1 presents graphically these four noise measurement locations. As shown, the noise measurement locations were located either on or within the PPS property boundary at plant entrances. Noise meters 1, 3, and 4 were located to the west, east, and north of the PPS power block, respectively, at a distance of approximately 4,500 ft. Noise meter 2 was located to the south of the PPS power block at a distance of approximately 6,000 ft. Table 3.3.8-3 provides a summary of the results of the noise measurements at these representative locations.

Table 3.3.8-3. Ambient Noise Level Summary (2007)

Location	Location Description	Date	Range of Noise Levels (dBA)	L_{eq} (dBA)*	Predominant Noise Sources
1	West property boundary, main PPS entrance	May 29 to June 1	33.6 to 81.9	50.0	Entering and exiting vehicles from the plant, opening and closing of main gate
2	South property boundary	May 29 to June 1	32.7 to 75.3	41.9	Wind
3	East property boundary. PPS entrance	May 21 to May 25	38.3 to 86.4	50.6	Entering and exiting vehicles from the plant, H_2SO_4 metering pump
4	North property boundary	May 21 to May 25	33.0 to 85.3	51.1	Passing vehicles on CR 630

*Equivalent sound pressure level (L_{eq}) averaged over the specific monitoring time period.

Source: ECT, 2007.



FIGURE 3.3.8-1.

NOISE MONITORING STATION LOCATIONS

Sources: 2011 Dept. of Revenue Aerials; ECT, 2012.

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The ambient noise data were collected under conditions of light to moderate winds and with the existing power plant operational. Figure 3.3.8-2 depicts the equivalent sound level (L_{eq}) data for 10-minute intervals for the entire recording period at the northern property boundary measuring location. The spike seen in the afternoon of May 23, 2007, is due to the technician checking the meter. The sounds measured at the northern boundary are primarily the result of vehicle traffic traveling eastbound and westbound on CR 630. The power plant operations were not audible at this location. The L_{eq} levels at this location are all below 60 dBA. Figure 3.3.8-3 depicts the L_{eq} data for 10-minute intervals for the entire recording period at the southern property boundary measuring location. The sounds measured at this location are primarily the result of wind. The meter was placed on top of the perimeter berm above any trees or other wind breaks. The existing power plant operations were not audible at this location. The L_{eq} levels at this location are all below 60 dBA.

Figure 3.3.8-4 depicts the L_{eq} data in 10-minute intervals for the entire recording period at the western property boundary measuring location. The sounds measured at this location are primarily the result of entering and exiting vehicles from the plant and the opening and closing of the main gate. The power plant operations were not audible at this location. The L_{eq} levels at this location are all below 60 dBA. Figure 3.3.8-5 depicts the L_{eq} data in 10-minute intervals for the entire recording period at the eastern property boundary measuring location. The sounds measured at this location are primarily the result of entering and exiting vehicles from the plant. The power plant operations were not audible at this location. The L_{eq} levels at this location are all below 60 dBA, except for one 10-minute period measured during the morning of May 23.

It is noteworthy that noise from the existing PPS generating units and associated facilities was detected only at the eastern property boundary as a result of the metering pump for the H_2SO_4 tank. Generally speaking, the measured noise levels in the area of the Site could be characterized as typical of a quiet to normal suburban area, based on a comparison with the typical peak sound levels presented in Table 3.3.8-4.

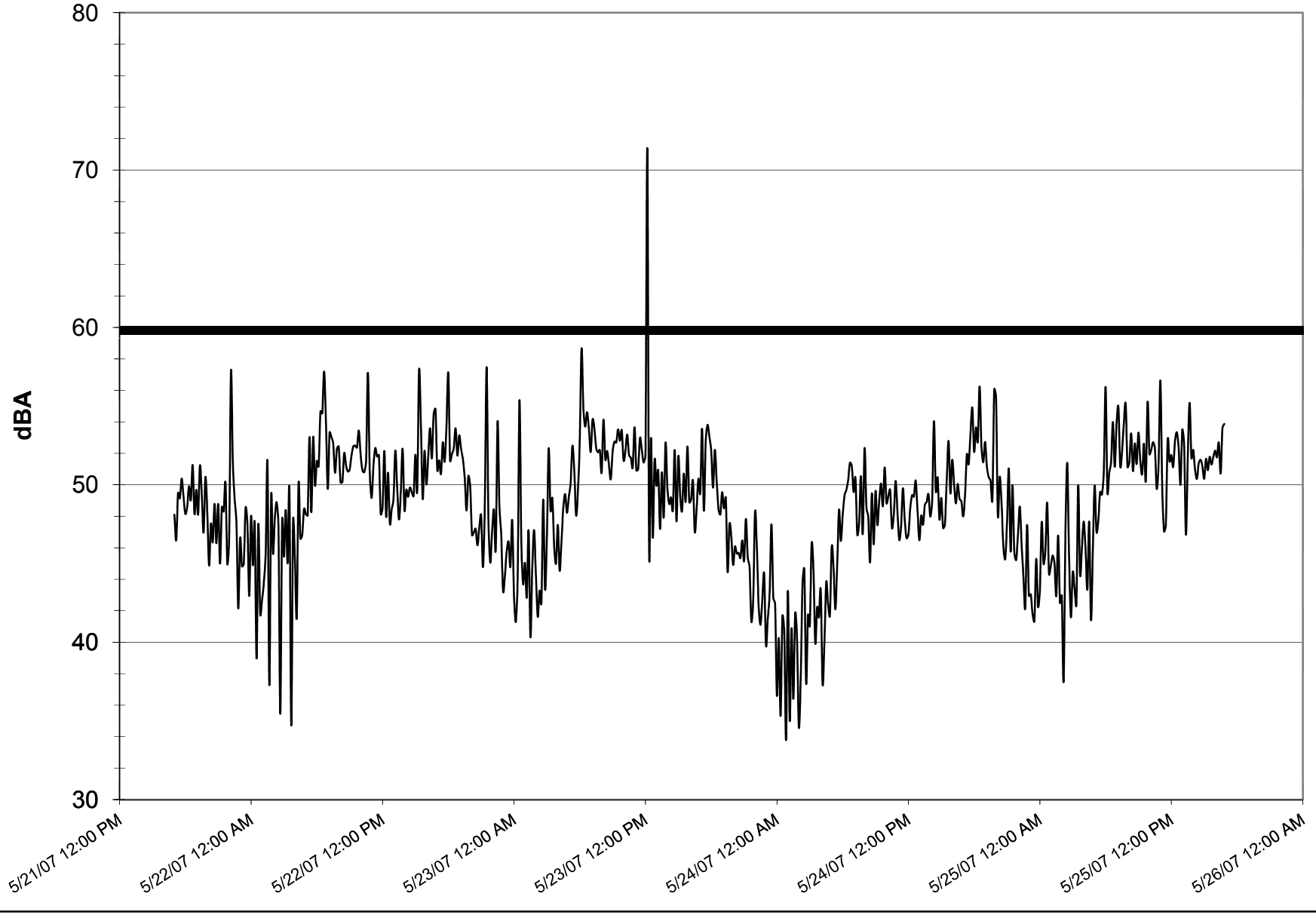


FIGURE 3.3.8-2.

NORTH BOUNDARY L_{eq} 10-MINUTE INTERVALS

Source: ECT, 2007.

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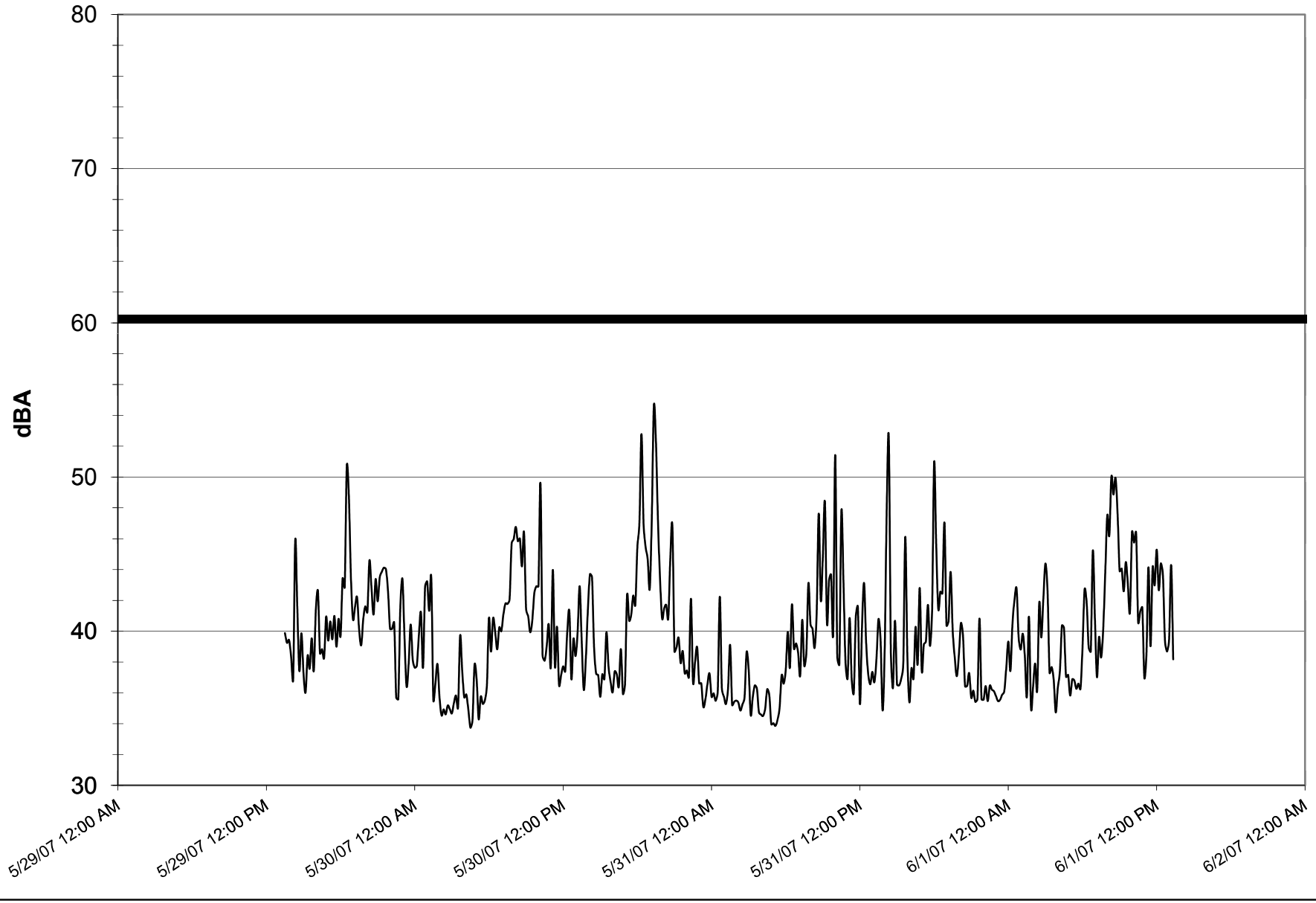


FIGURE 3.3.8-3.

SOUTH BOUNDARY L_{eq} 10-MINUTE INTERVALS

Source: ECT, 2007.

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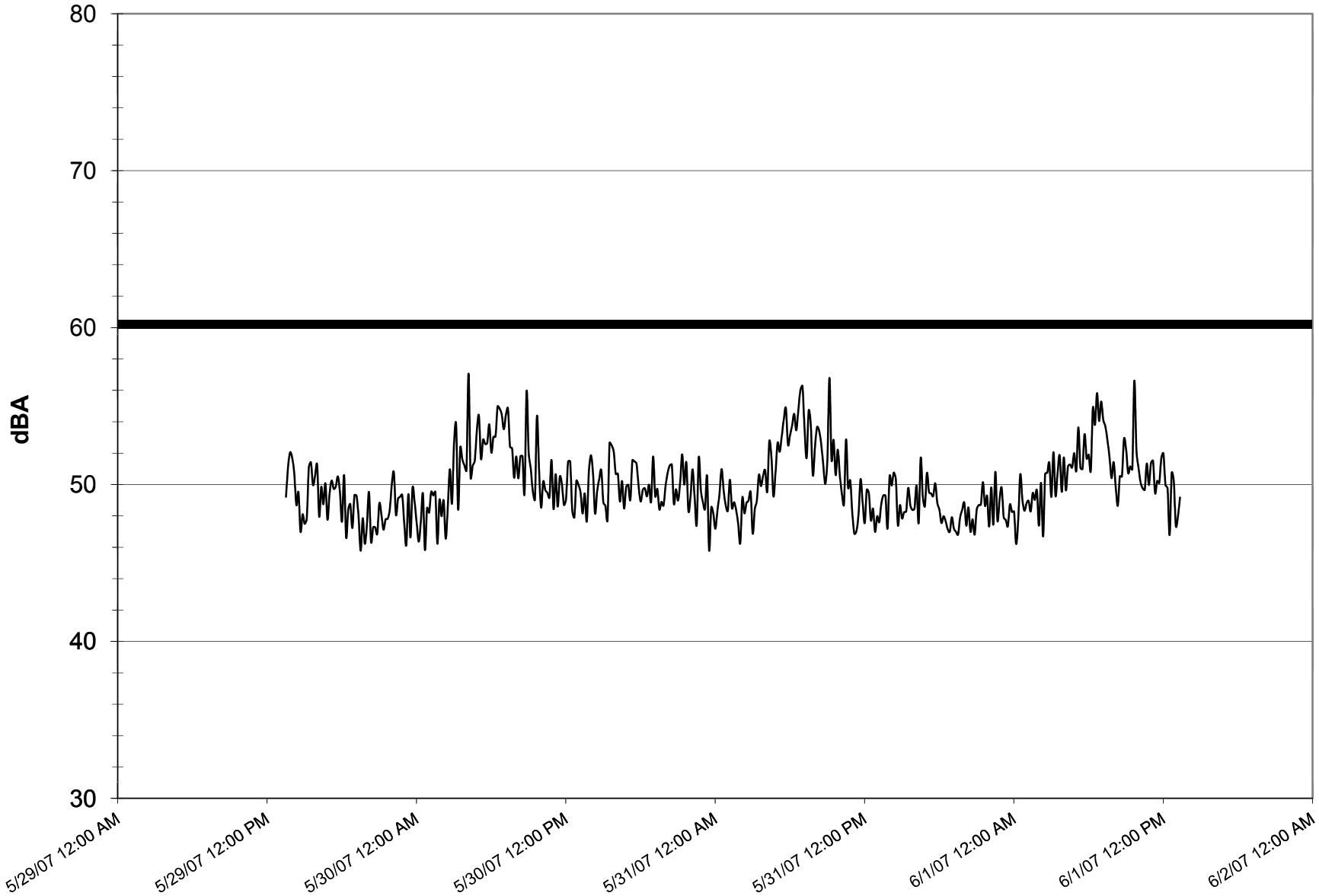


FIGURE 3.3.8-4.

WEST BOUNDARY L_{eq} 10-MINUTE INTERVALS

Source: ECT, 2007.

TECO TAMPA ELECTRIC

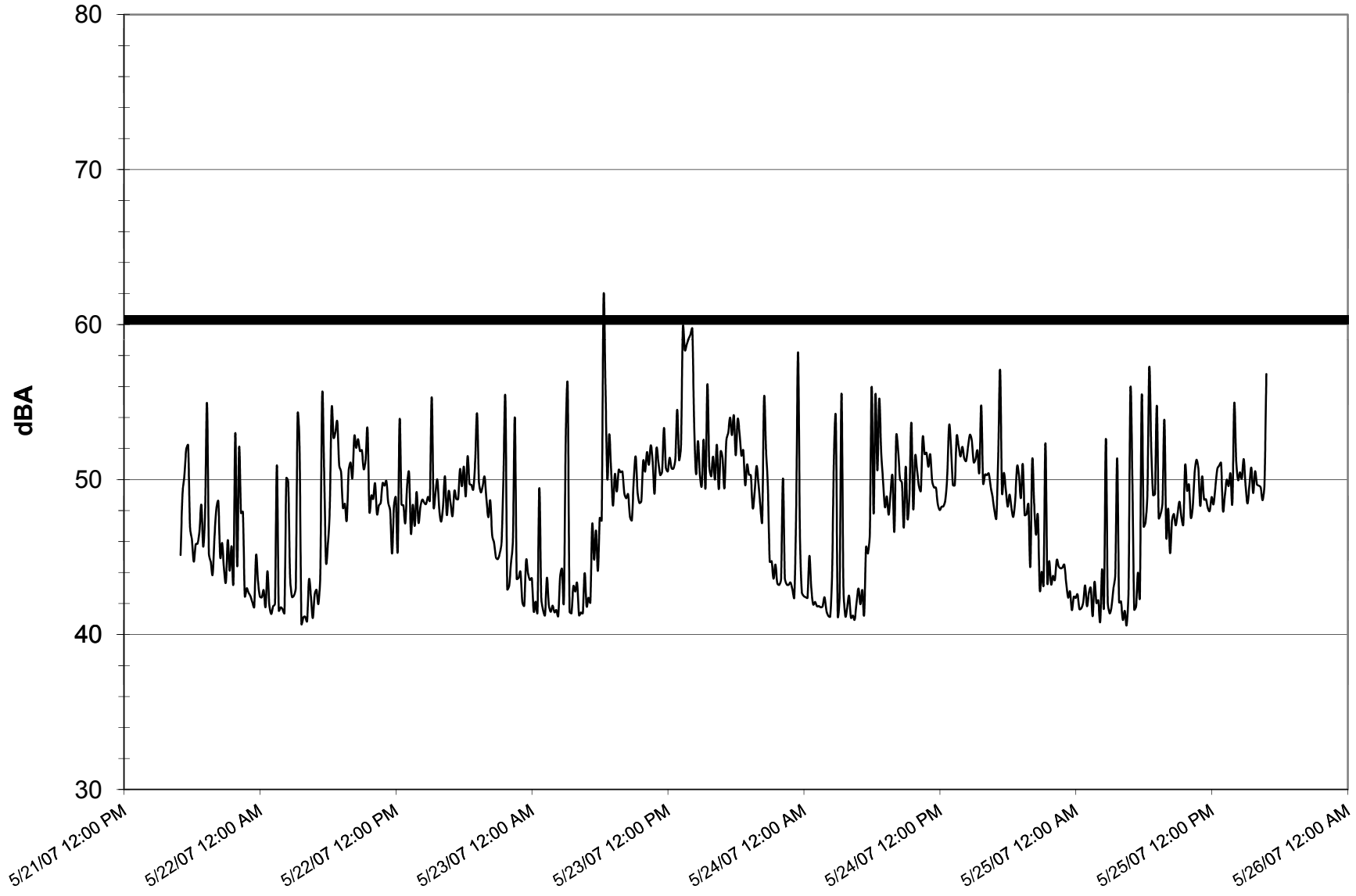


FIGURE 3.3.8-5.

EAST BOUNDARY L_{eq} 10-MINUTE INTERVALS

Source: ECT, 2007.

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Table 3.3.8-4. Typical Sound Levels

Activity	dBA
Threshold of pain	130
Chipping on metal	120
Loud rock band	110
Jackhammer	100
Jet airliner 0.5 mile away	95
Threshold of hearing damage	90
Freeway traffic—downtown streets	80
Urban residential area	70
Normal conversation	60
Normal suburban area	50
Quiet suburban area	40
Rural area	30
Wilderness area	25
Threshold of audibility	0

Source: Tech Environmental, 2002.

3.3.9 OTHER ENVIRONMENTAL FEATURES

The preceding subsections present relevant environmental information regarding the PPS Site and environs. Chapter 9.0 presents such information for the offsite linear facilities. No additional information has been determined to be necessary to describe the environmental characteristics of the proposed Polk 2-5 Conversion Project.

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