AIR PERMIT APPLICATION AND PREVENTION OF SIGNIFICANT DETERIORATION ANALYSIS FOR RAM TEST FACILITY PRATT & WHITNEY ROCKETDYNE PALM BEACH COUNTY, FLORIDA

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August 2009

0938-7550

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1.0 INTRODUCTION

United Technologies Corporation - Pratt & Whitney Rocketdyne (PWR) is located in rural northwest Palm Beach County on a site that is approximately 7,000 acres. The site resembles a triangle and is approximately centered at latitude 26°55"8.43"North, longitude 80°20"54.64"West. The front gate is located at street address 17900 Beeline Highway (State Road 71), Jupiter, Florida 33478. Refer to Figure 1-1 for map location.

Pratt & Whitney performs various aerospace related activities at this location. These activities mainly include rocket engine manufacturing, jet and rocket engine testing, and research and development for both engine types. The facility includes over 50 test stands specifically designed to evaluate rocket engines and jet engines, as well as individual components for each engine type. PWR also performs various support and ancillary operations associated with the large infrastructure of shops and offices.

The Palm Beach County Health Department (PBCHD) Air Pollution Control Section has been delegated authority by the Florida Department of Environmental Protection (FDEP) to review, process, and take appropriate action on most FDEP District-level permits in Palm Beach County. PWR was authorized by FDEP air construction permit to construct the RAM Test Facility to support jet engine testing at the West Palm Beach facility. The RAM Test Facility is so named because it is used to "ram" or force compressed air into the intakes of jet engines during testing. The "ram" effect simulates the high velocity of atmospheric air entering an engine when installed on an aircraft operating at high speed. The RAM Test Facility consists of two gas turbines fueled by JP-8 jet fuel, two air compressors, assorted air transfer ducting and valves, water-cooled heat exchangers, and a forced draft cooling tower. The ducting and valves direct the compressed air to the jet engine test stands and the coolers reduce the hot air temperatures back to ambient levels. The two GG4-9A turbine engines are the only air emission sources regulated by the air construction permit.

PWR received authorization from the PBCHD to relocate two existing GG4-9A JP-8 fired industrial turbine engines from the Pratt & Whitney facility in Hartford, Connecticut, to the West Palm Beach, Florida facility. The GG4-9A turbine engines were originally manufactured in 1966. The authorization to relocate the engines was issued May 1, 2006 by FDEP Air Construction Permit No. 0990021-008-AC. The air construction permit limited the hours of operation of each GG4-9A engine to 398 hours per 12 consecutive month period (796 hours per 12 consecutive month period for both engines) to avoid triggering a major modification under the Prevention of Significant Deterioration (PSD) regulations.

Nitrogen oxide (NO_x) and carbon monoxide (CO) emissions estimates were made based on emission factors previously developed during testing of similar Pratt & Whitney engines. Specifically, potential emissions were estimated based on emission factors of 0.563 pound per million British thermal units (lb/MMBtu) for NO_x and 0.083 lb/MMBtu for CO. The construction permit expiration date was extended by FDEP Permit No. 0990021-009-AC, issued April 22, 2008, and again by FDEP Permit No. 0990021-011-AC, issued October 8, 2008. Compliance testing was performed on July 31, 2008 by Air Consulting and Engineering, Inc. to quantify the NO_x and CO emissions generated during various phases of operation at the test stands. Specifically, stack testing of the units indicated a maximum emission factor of 0.646 lb/MMBtu for NO_x and 0.327 lb/MMBtu for CO (under normal operating conditions). In addition, the stack testing results indicated that the CO emission factor during idle load conditions was 7.463 lb/MMBtu. Using these unit-specific emission factors, the original air construction permit was revised to limit the hours of operation at the test stands to 347 hours per 12 consecutive month period (694 hours per 12 consecutive month period for both engines) to again avoid triggering a major modification under the PSD regulations.

The GG4-9A turbine engines are located adjacent to test stands A-8 and A-9, which are part of the eight sea level test stands used in the development testing of commercial and military jet engines. PWR has determined that additional hours of operation are needed in a 12-month period to effectively utilize the test stands. This increase in operating hours will require PSD approval, which in turn requires the submission of air quality assessments for determining the facility's compliance with state and federal new source review (NSR) regulations, including addressing applicable PSD requirements. The critical aspects of these assessments include the air quality impact analyses performed using appropriate air dispersion models and the Best Available Control Technology (BACT) analyses performed to evaluate the selected emission control technology. The locations of the test stands are presented in Figure 1-2.

The U.S. Environmental Protection Agency (EPA) has implemented regulations requiring a PSD review for new and modified sources with air emissions above certain threshold amounts. EPA's PSD regulations are promulgated under Title 40, Part 51, Section 166 of the Code of Federal Regulations (40 CFR 51.166). Florida's PSD regulations are codified in Rule 62-212.400 of the Florida Administrative Code (F.A.C.). The Florida PSD regulations incorporate the requirements of EPA's PSD regulations. The request to increase operating hours at the test stands will be considered a "major modification" of a major source under PSD rules.

Based on the potential emissions from the two GG4-9A turbine engines, emission increases above the PSD significant emission rates are estimated to occur for the following criteria pollutants:

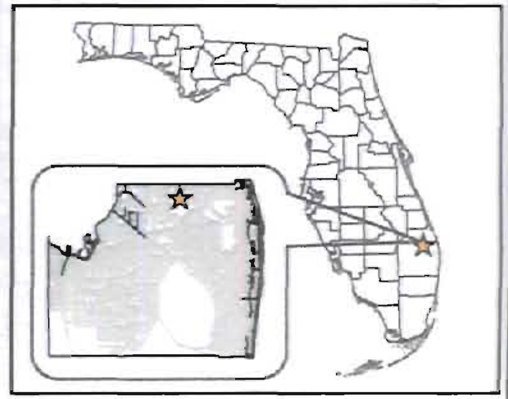
- CO;
- NO_x; and
- Sulfur dioxide (SO_2).

Palm Beach County has been designated as an attainment area for all criteria pollutants and is a PSD Class II area for nitrogen dioxide (NO_2). Therefore, the PSD review will follow regulations pertaining to this designation.

The remainder of this PSD Report is divided into six major sections:

- Section 2.0 presents a description of the GG4-9A turbine engines, including air emissions and stack parameters.
- Section 3.0 provides a review of the PSD and nonattainment requirements applicable to the GG4-9A turbine engines.
- Section 4.0 includes the control technology review with discussions on BACT.
- Section 5.0 discusses the ambient air monitoring analysis (pre-construction monitoring) required by PSD regulations.
- Section 6.0 presents a summary of the air modeling approach and results used in assessing compliance of the proposed facility with ambient air quality standards (AAQS) and PSD increments.
- Section 7.0 provides the additional impact analyses for soils, vegetation, and visibility.

AREA MAP



LEGEND

★ Site Location

Property Boundary

REFERENCES

Golder, 2009; Microsoft Virtual Earth, 2009

REV.	DATE	DES	REVISION DESCRIPTION	CAD	CHK	RVW

PROJECT

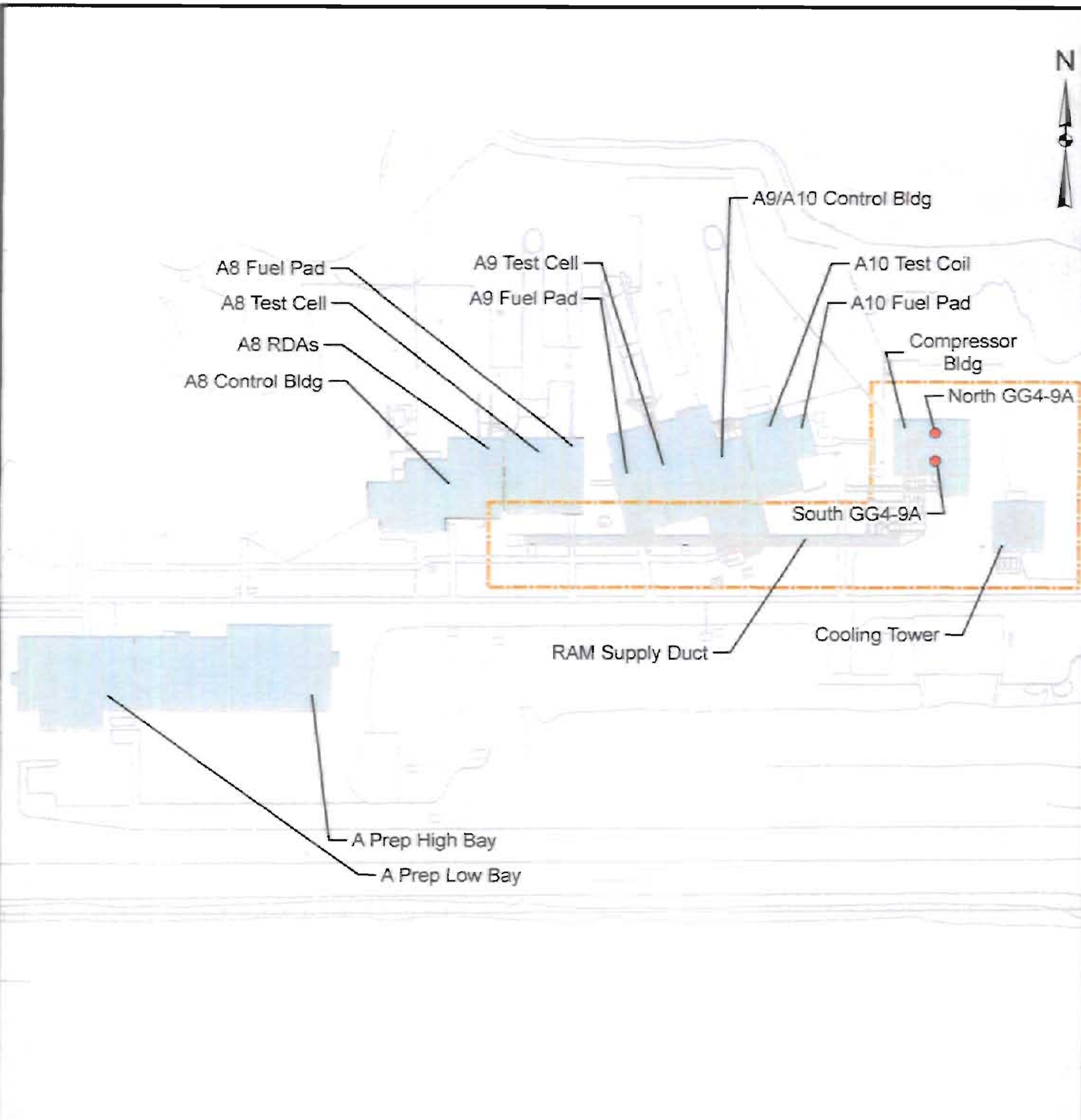
PRATT & WHITNEY
RAM TEST FACILITY

TITLE

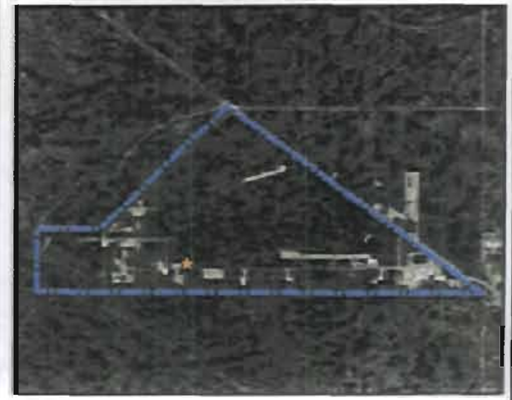
SITE LOCATION MAP

Golder Associates
Gainesville, Florida

FIGURE 1-1



PROPERTY BOUNDARY



LEGEND

- GG4-9A Engine Stacks
- Project Location
- A Area Buildings
- RAM Test Facility

REFERENCES

Golder, 2009

PROJECT

PRATT & WHITNEY
RAM TEST FACILITY

TITLE

PROJECT LAYOUT

Golder Associates
Gainesville, Florida

FIGURE 1-2

2.0 PROJECT DESCRIPTION

2.1 Site Description

The PWR facility encompasses 7,000 acres. The properties to the north, south, and west of the facility are owned by the Florida State Game and Fish Commission. The properties to the east of the facility are predominantly owned by Palm Beach County. The elevation at the facility is nominally 20 to 22 feet (ft) with respect to the national geodetic vertical datum (NGVD) of 1929. The terrain surrounding the facility is relatively flat.

2.2 RAM Test Facility

The GG4-9A turbine engines (emission sources of RAM Test Facility) are located adjacent to test stands A-8 and A-9, which are part of the eight sea level test stands used in the development testing of commercial and military jet engines. The two industrial turbine engines are utilized to drive two large air compressors and operate at a steady state temperature and pressure point throughout a given inlet condition. Airflow and temperature control are provided to the test engine through ductwork, controlled downstream of the compressor through a series of control valves. The GG4-9A turbine engines were originally manufactured by Pratt & Whitney in 1966. The engines, compressors, ducting, and coolers are collectively known as the RAM Test Facility.

During normal operations, various engine load conditions are established. The load conditions are expressed in terms of the compressor discharge pressure readings. Thus, as the compressor discharge pressure is varied, the load on the GG4-9A turbine engines will vary. During emissions testing, the GG4-9A turbine engines were operated at specific load conditions, based on estimated conditions expected during normal testing operations. Specifically, the facility estimates that the following load conditions will be required as part of the normal test stand operations with the estimated annual hours of operation for each load, expressed as a percentage of the total annual operating hours:

- Idle – 24 percent [720 hours per year (hr/yr)];
- 16 pounds per square inch, absolute (psia) – 3 percent (90 hr/yr);
- 18 psia – 6 percent (180 hr/yr);
- 20 psia – 16 percent (480 hr/yr);
- 23 psia – 30 percent (900 hr/yr);

- 26 psia – 16 percent (480 hr/yr), and
- 31 psia – 5 percent (150 hr/yr).

The total hours of operation at the test stands will be limited to 3,000 hr/yr.

The GG4-9A turbine engines are fueled by JP-8 fuel only. During idle load conditions, the fuel usage rate is approximately 5.0 gallons per minute (gpm). During all other load conditions the fuel usage rate is approximately 29.0 gpm. The total annual fuel usage is estimated to be 4,183,200 gallons per year (gal/yr), calculated as follows:

Annual fuel usage = (24% × 5.0 gpm + 76% × 29.0 gpm) × 60 minutes/hour × 3,000 hr/yr = 4,183,200 gal/yr

Based on a fuel analysis performed on JP-8 fuel by Hazen Research on June 13, 2008, the high heating value of the GG4-9A turbine engine fuel is 19,910 British thermal units per pound (Btu/lb). Assuming a fuel density of 6.7 pounds per gallon (lb/gal), the maximum heat input for the two GG4-9A turbine engines combined is estimated to be 558,026 million Btu per year (MMBtu/yr). Each unit is rated at 19.5 megawatts (MW), but the maximum power output is limited to 12.3 MW.

Emissions testing results indicate that the maximum CO emissions occur during idle load conditions, and maximum NO_x emissions occur during 31 psia load conditions. Refer to Section 2.3 for potential emissions estimates.

A process flow diagram is included as Figure 2-1.

2.3 Proposed Source Emissions and Stack Parameters

Hourly and annual emissions calculations for NO_x, CO, total particulate matter (PM), particulate matter smaller than 10 micrometers in size (PM_{10}), SO_2, and volatile organic compounds (VOCs) are provided in Tables 2-1 and 2-2. Hourly and annual emissions calculations of hazardous air pollutants (HAPs) are provided in Table 2-3. NO_x and CO emission factors were developed as a result of the July 31, 2008 stack testing data. PM, PM_{10}, SO_2, VOC, and HAP emission factors are based on published emission factors in EPA's *Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, AP-42 Fifth Edition, Chapter 3.1, Stationary Gas Turbines.*

Table 2-4 includes the potential criteria pollutant emissions resulting from the worst-case load conditions for CO and NO_x emissions. As previously mentioned, stack testing results indicate that the maximum (i.e., "worst-case") CO emissions occur during idle load conditions, and maximum NO_x emissions occur during 31 psia load conditions. The idle and 31 psia load conditions were used to estimate potential criteria pollutant emissions.

Stack and fuel information for the GG4-9A turbine engines is provided in Table 2-5.

2.4 Site Layout and Structures

The RAM Test Facility layout is included in Figure 1-2. The dimensions of the buildings and structures are presented in Section 6.0.

2.5 Excess Emissions

Using the emission factors developed during stack testing, NO_x and CO emissions can be quantified while at idle load conditions, which include start-up and shut-down operations; therefore, operating the GG4-9A turbine engines does not result in excess emissions.

TABLE 2-1
ESTIMATED HOURLY EMISSIONS FOR THE GG4-9A JP8 FIRED TURBINE ENGINES AT VARIOUS LOAD CONDITIONS
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

Test Condition	Fuel Usage[a]			Emission Factor[b] (lb/MMBtu)						Hourly Emissions (lb/hr)					
(psia)	(GPM)	(lb/hr)	(MMBtu/hr)	CO	NO_x	PM	PM_{10}	SO_2	VOC	CO	NO_x	PM	PM_{10}	SO_2	VOC
Idle	5.0	2,010	40.02	7.463	0.062	7.20E-03	4.30E-03	0.114	4.10E-04	298.66	2.48	0.29	0.17	4.57	0.016
16	25.4	10,211	203.3	0.327	0.546	7.20E-03	4.30E-03	0.114	4.10E-04	66.48	111.0	1.46	0.87	23.20	0.083
18[c]	25.5	10,251	204.1	0.293	0.576	7.20E-03	4.30E-03	0.114	4.10E-04	59.80	117.6	1.47	0.88	23.29	0.084
20[c]	25.9	10,412	207.3	0.291	0.580	7.20E-03	4.30E-03	0.114	4.10E-04	60.32	120.2	1.49	0.89	23.66	0.085
23	26.6	10,693	212.9	0.261	0.596	7.20E-03	4.30E-03	0.114	4.10E-04	55.57	126.9	1.53	0.92	24.30	0.087
26[c]	27.7	11,135	221.7	0.215	0.625	7.20E-03	4.30E-03	0.114	4.10E-04	47.67	138.6	1.60	0.95	25.30	0.091
31	29.0	11,658	232.1	0.190	0.646	7.20E-03	4.30E-03	0.114	4.10E-04	44.10	149.9	1.67	1.00	26.49	0.095
Maximum Hourly Emissions, One Engine (lb/hr)										**298.7**	**149.9**	**1.67**	**1.00**	**26.5**	**0.095**
Maximum Hourly Emissions, Two Engines (lb/hr)										**597.3**	**299.9**	**3.34**	**2.00**	**53.0**	**0.190**

[a] Fuel usage based on reported fuel usage during source testing conducted by Air Consulting and Engineering, Inc. on July 31, 2008.
High Heating Value (HHV) = 19,910 Btu/lb and fuel density = 6.70 lb/gal, based on fuel analysis performed on JP-8 fuel by Hazen Research on June 13, 2008.

[b] NO_x and CO emission factors are based on source testing conducted by Air Consulting and Engineering, Inc. on July 31, 2008. SO_2, PM, PM_{10}, and VOC emission factors are based on AP-42, Chapter 3.1, Table 3.1-2a. SO_2 emission factor is based on a JP8 sulfur content of 0.113%.

[c] Abbreviated load points (for informational purposes only).

TABLE 2-2
ESTIMATED ANNUAL EMISSIONS FOR THE GG4-9A JP8 FIRED TURBINE ENGINES AT VARIOUS LOAD CONDITIONS
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

Test Condition (psia)	Percentage of Total Operating Hours[a] (%)	Annual Operating Hours[b] (hr/yr)	Fuel Usage[c]			Emission Factor[d] (lb/MMBtu)						Annual Emissions (TPY)					
			(GPM)	(lb/hr)	(MMBtu/hr)	CO	NO_x	PM	PM_{10}	SO_2	VOC	CO	NO_x	PM	PM_{10}	SO_2	VOC
Idle	24	720	5.0	2,010	40.02	7.463	0.062	7.20E-03	4.30E-03	0.114	4.10E-04	107.52	0.89	1.04E-01	6.19E-02	1.64	5.91E-03
16	3	90	25.4	10,211	203.3	0.327	0.546	7.20E-03	4.30E-03	0.114	4.10E-04	2.99	5.00	6.59E-02	3.93E-02	1.04	3.75E-03
18[e]	6	180	25.5	10,251	204.1	0.293	0.576	7.20E-03	4.30E-03	0.114	4.10E-04	5.38	10.58	1.32E-01	7.90E-02	2.10	7.53E-03
20[e]	16	480	25.9	10,412	207.3	0.291	0.580	7.20E-03	4.30E-03	0.114	4.10E-04	14.48	28.86	3.58E-01	2.14E-01	5.68	2.04E-02
23	30	900	26.6	10,693	212.9	0.261	0.596	7.20E-03	4.30E-03	0.114	4.10E-04	25.01	57.10	6.90E-01	4.12E-01	10.93	3.93E-02
26[e]	16	480	27.7	11,135	221.7	0.215	0.625	7.20E-03	4.30E-03	0.114	4.10E-04	11.44	33.26	3.83E-01	2.29E-01	6.07	2.18E-02
31	5	150	29.0	11,658	232.1	0.190	0.646	7.20E-03	4.30E-03	0.114	4.10E-04	3.31	11.25	1.25E-01	7.49E-02	1.99	7.14E-03
	Total Hours	**3,000**							**Total Annual Emission, One Engine (TPY)**			**170.1**	**146.9**	**1.86**	**1.11**	**29.5**	**0.106**
									Total Annual Emissions, Two Engines (TPY)			**340.2**	**293.9**	**3.72**	**2.22**	**58.9**	**0.212**

[a] Represents the percentage of the testing hours and on an estimation of the planned testing cycle.

[b] Annual operating hours are based on 8,760 hours per year (continuous operations).

[c] Fuel usage based on reported fuel usage during source testing conducted by Air Consulting and Engineering, Inc. on July 31, 2008.
High Heating Value (HHV) = 19,910 Btu/lb and fuel density = 6.70 lb/gal, based on fuel analysis performed on JP-8 fuel by Hazen Research on June 13, 2008.

[d] NO_x and CO emission factors are based on source testing conducted by Air Consulting and Engineering, Inc. on July 31, 2008. SO_2, PM, PM_{10}, and VOC emission factors are based on AP-42, Chapter 3.1, Table 3.1-2a. SO_2 emission factor is based on a JP-8 sulfur content of 0.113%.

[e] Abbreviated load points (for informational purposes only).

TABLE 2-3
ESTIMATED HOURLY AND ANNUAL HAZARDOUS AIR POLLUTANT (HAP) EMISSIONS SUMMARY[a]
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

Pollutant	Pollutant Abbreviation	Emission Factors (lb/MMBtu)		Emissions Estimates			
				Hourly Emissions (lb/hr)		Annual Emissions (TPY)	
		Idle	All Other	1 Engine	2 Engines	1 Engine	2 Engines
Arsenic	H015	1.10E-05	1.10E-05	2.55E-03	5.11E-03	3.07E-03	6.14E-03
Beryllium	H021	3.10E-07	3.10E-07	7.20E-05	1.44E-04	8.65E-05	1.73E-04
Cadmium	H027	4.80E-06	4.80E-06	1.11E-03	2.23E-03	1.34E-03	2.68E-03
Chromium	H046	1.10E-05	1.10E-05	2.55E-03	5.11E-03	3.07E-03	6.14E-03
Lead	H110	1.40E-05	1.40E-05	3.25E-03	6.50E-03	3.91E-03	7.81E-03
Manganese	H113	7.90E-04	7.90E-04	1.83E-01	3.67E-01	2.20E-01	4.41E-01
Mercury	H114	1.20E-06	1.20E-06	2.79E-04	5.57E-04	3.35E-04	6.70E-04
Nickel	H133	4.60E-06	4.60E-06	1.07E-03	2.14E-03	1.28E-03	2.57E-03
Selenium	H162	2.50E-05	2.50E-05	5.80E-03	1.16E-02	6.98E-03	1.40E-02
1,3-Butadiene	H026	1.60E-05	1.60E-05	3.71E-03	7.43E-03	4.46E-03	8.93E-03
Benzene	H017	5.50E-05	5.50E-05	1.28E-02	2.55E-02	1.53E-02	3.07E-02
Formaldehyde	H095	2.80E-04	2.80E-04	6.50E-02	1.30E-01	7.81E-02	1.56E-01
Naphthalene	H132	3.50E-05	3.50E-05	8.12E-03	1.62E-02	9.77E-03	1.95E-02
PAH	H151	4.00E-05	4.00E-05	9.28E-03	1.86E-02	1.12E-02	2.23E-02
Total HAP	Total HAP	NA	NA	2.99E-01	5.98E-01	3.59E-01	7.19E-01

[a] The following operating conditions were used to estimate the hourly and annual emissions "worst-case" scenarios described in Section 2.3.

Parameter	Operating Condition		
	Idle	All Other	Total
Percentage of Total Operating Hours	24	76	100
Operating Hours	720	2,280	3,000
Fuel Usage (GPM)	5.0	29.0	34.0
Fuel Usage (MMBtu/hr)	40.0	232.1	272.1
Fuel Usage (MMBtu/yr)	28,813.8	529,212.6	558,026.3

Fuel usage based on reported fuel usage during source testing conducted by Air Consulting and Engineering, Inc. on July 31, 2008.
High Heating Value (HHV) = 19,910 Btu/lb and fuel density = 6.70 lb/gal, based on fuel analysis performed on JP-8 fuel by Hazen Research on June 13, 2008.

TABLE 2-4
HOURLY AND ANNUAL CRITERIA POLLUTANT EMISSIONS SUMMARY, MAXIMUM LOAD CONDITIONS[a]
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

		Emission Factors[b] (lb/MMBtu)		Emissions Estimates			
	Pollutant			Hourly Emissions (lb/hr)		Annual Emissions (TPY)	
Pollutant	Abbreviation	Idle	All Other	1 Engine	2 Engines	1 Engine	2 Engines
Carbon Monoxide	CO	7.463	0.327	298.7	597.3	194.0	388.1
Nitrogen Oxides	NO_X	0.062	0.646	149.9	299.9	171.8	343.7
Particulate Matter	PM	7.20E-03	7.20E-03	1.67	3.34	2.01	4.02
Particulate Matter <10 microns	PM_{10}	4.30E-03	4.30E-03	1.00	2.00	1.20	2.40
Sulfur Dioxide	SO_2	0.114	0.114	26.5	53.0	31.8	63.7
Volatile Organic Compounds	VOC	4.10E-04	4.10E-04	0.0952	0.190	0.114	0.229

[a] The following operating conditions were used to estimate the hourly and annual emissions "worst-case" scenarios described in Section 2.3.

	Operating Condition		
Parameter	Idle	All Other	Total
Percentage of Total Operating Hours	24	76	100
Operating Hours	720	2,280	3,000
Fuel Usage (GPM)	5.0	29.0	34.0
Fuel Usage (gal/yr)	NA	NA	6,120,000
Fuel Usage (MMBtu/hr)	40.0	232.1	272.1
Fuel Usage (MMBtu/yr)	28,813.8	529,212.6	558,026.3

Fuel usage based on reported fuel usage during source testing conducted by Air Consulting and Engineering, Inc. on July 31, 2008.
High Heating Value (HHV) = 19,910 Btu/lb and fuel density = 6.70 lb/gal, based on fuel analysis performed on JP-8 fuel by Hazen Research on June 13, 2008.

[b] NO_x and CO emission factors are based on source testing conducted by Air Consulting and Engineering, Inc. on July 31, 2008. All other emission factors are based on AP-42, Chapter 3.1. SO_2 emission factor is based on a JP-8 sulfur content of 0.113%.

TABLE 2-5
SUMMARY OF STACK AND FUEL INFORMATION
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

Fuel Parameter[a]	Value
Water (%)	0.02
Ash (%)	0.015
Sulfur (%)	0.113
Carbon (%)	87.49
Hydrogen (%)	12.2
Nitrogen (%)	0.06
Oxygen (%)	0.1
Volatile matter (%)	99.98
Fixed carbon (%)	<0.01
Calorific value (Btu/lb)	19,910
Stack Information	**Value**
Stack diameter (ft)	5.9
Stack height (ft)	26.0
Exhaust temperature (°F)	750
Exhaust flow rate (acfm)	328,000

[a] Based on fuel analysis performed on JP-8 fuel by Hazen Research on June 13, 2008.

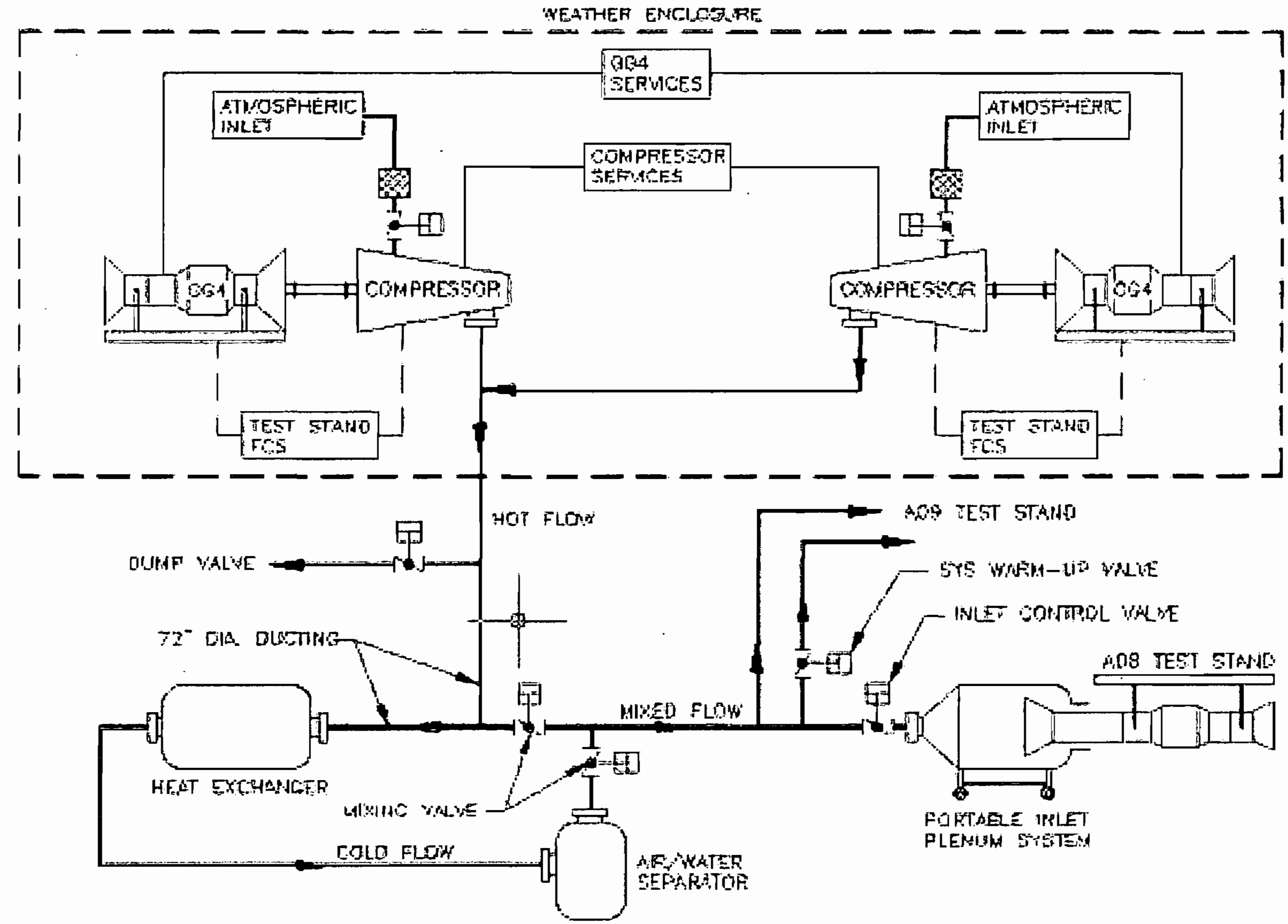


Figure 2-1
Process Flow Diagram
RAM Test Facility

Source: Golder, 2006.

Golder Associates

3.0 AIR QUALITY REVIEW REQUIREMENTS AND APPLICABILITY

The following discussion pertains to the federal, State, and local air regulatory requirements and their applicability to the GG4-9A turbine engines.

3.1 National, State, and Local AAQS

The national and State of Florida AAQS are presented in Table 3-1. Primary national AAQS were promulgated to protect the public health with an adequate margin of safety, and secondary national AAQS were promulgated to protect the public welfare from any known or anticipated adverse effects associated with the presence of pollutants in the ambient air. Areas of the country in compliance with AAQS are designated as attainment areas. New sources to be located in or near these areas may be subject to more stringent air permitting requirements.

3.2 PSD Requirements

3.2.1 General Requirements

Under federal and State of Florida PSD review requirements, all major new or modified sources of air pollutants regulated under the Clean Air Act (CAA) must be reviewed, and a pre-construction permit issued.

PSD review is applicable to a "major facility" and certain "modifications" that occur at a major facility. A "major facility" is defined as any 1 of 28 named source categories that have the potential to emit 100 tons per year (TPY) or more, or any other stationary facility that has the potential to emit 250 TPY or more, of any pollutant regulated under the CAA. "Potential to emit" means the capability, at maximum design capacity, to emit a pollutant after the application of control equipment. Net emission increases from a modification at a major facility that exceed the PSD significant emission rates are also subject to PSD review.

EPA has promulgated regulations providing that certain increases above an air quality baseline concentration level of SO_2, PM_{10}, and NO_2 concentrations would constitute significant deterioration. The EPA class designations and allowable PSD increments are presented in Table 3-1. The State of Florida has adopted the EPA class designations and allowable PSD increments for SO_2, PM_{10}, and NO_2.

PSD review is used to determine whether significant air quality deterioration will result from the new or modified facility. Federal PSD requirements are contained in 40 CFR 51.166, *Prevention of Significant Deterioration of Air Quality.* The State of Florida's PSD regulations are found in Rule 62-212.400, F.A.C. Major new facilities are required to undergo the following analysis related to PSD for each pollutant emitted in significant amounts (refer to Table 3-2):

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

In addition to these analyses, a review with respect to Good Engineering Practice (GEP) stack height regulations must be conducted. Discussions concerning each of these requirements are presented in the following sections.

3.2.2 Control Technology Review

The control technology review requirements of the federal and state PSD regulations require that all applicable federal and state emission-limiting standards be met, and that BACT be applied to control emissions from the source (Rule 62-212.400, F.A.C.). The BACT requirements are applicable to all regulated pollutants for which the increase in emissions from the facility or modification exceeds the significant emission rate (refer to Table 3-2).

BACT is defined in Rule 62-210.200(39), F.A.C., as:

> *(a) An emission limitation, including a visible emissions standard, based on the maximum degree of reduction of each pollutant emitted which the Department, on a case by case basis, taking into account:*
>
> *1. Energy, environmental and economic impacts, and other costs;*
>
> *2. All scientific, engineering, and technical material and other information available to the Department; and*
>
> *3. The emission limiting standards or BACT determinations of Florida and any other state;*
>
> *determines is achievable through application of production processes and available methods, systems and techniques (including fuel cleaning or treatment or innovative fuel combustion techniques) for control of each such pollutant.*
>
> *(b) If the Department determines that technological or economic limitations on the application of measurement methodology to a particular part of an emissions unit or facility would make the imposition of an emission standard infeasible, a design, equipment, work practice, operational standard or combination thereof, may be*

prescribed instead to satisfy the requirement for the application of BACT. Such standard shall, to the degree possible, set forth the emissions reductions achievable by implementation of such design, equipment, work practice or operation.
(c) Each BACT determination shall include applicable test methods or shall provide for determining compliance with the standard(s) by means which achieve equivalent results.
(d) In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60, 61, and 63.

BACT requirements were promulgated within the framework of the PSD provisions in the 1977 amendments of the CAA [Public Law 95-95; Part C, Section 165(a)(4)]. The primary purpose of BACT is to optimize consumption of PSD air quality increments and thereby enlarge the potential for future economic growth without significantly degrading air quality (EPA, 1978; 1980). Guidelines for the evaluation of BACT can be found in *Guidelines for Determining Best Available Control Technology (BACT)* (EPA, 1978) and in the *New Source Review Workshop Manual* Prevention of Significant Deterioration and Nonattainment Areas (EPA, 1990a). These guidelines were issued by EPA to provide a consistent approach to BACT and to ensure that the impacts of alternative emission control systems are measured by the same set of parameters. However, BACT in one area may not be identical to BACT in another area. According to EPA (1980), "BACT analyses for the same types of emissions unit and the same pollutants in different locations or situations may determine that different control strategies should be applied to the different sites, depending on site-specific factors. Therefore, BACT analyses must be conducted on a case-by-case basis."

The BACT requirements are intended to ensure that the control systems incorporated in the design of a proposed facility reflect the latest in control technologies used in a particular industry and take into consideration existing and future air quality in the vicinity of the proposed facility. BACT must, as a minimum, demonstrate compliance with new source performance standards (NSPS) for a source (if applicable). An evaluation of the air pollution control techniques and systems, including a cost-benefit analysis of alternative control technologies capable of achieving a higher degree of emission reduction than the proposed control technology, is required. The cost-benefit analysis requires the documentation of the materials, energy, and economic penalties associated with the proposed and alternative control systems, as well as the environmental benefits derived from these systems. A decision on BACT is to be based on sound judgment, balancing environmental benefits with energy, economic, and other impacts.

Historically, a "bottom-up" approach, consistent with the BACT Guidelines and the NSR Workshop Manual, was used. With this approach, an initial control level, which is usually NSPS, is evaluated against successively more stringent controls until a BACT level is selected. However, EPA developed a concern that the bottom-up approach was not providing the level of BACT decisions originally intended. As a result, in December 1987, the EPA Assistant Administrator for Air and Radiation mandated changes in the implementation of the PSD program, including the adoption of a new "top-down" approach to BACT decision making.

The top-down BACT approach essentially starts with the most stringent (or top) technology and emission limits that have been applied elsewhere to the same or a similar source category. The applicant must next provide a basis for rejecting this technology in favor of the next most stringent technology or propose using it. Rejection of control alternatives may be based on technical or economic infeasibility. Such decisions are made on the basis of physical differences (e.g., fuel type), locational differences (e.g., availability of water), or significant differences that may exist in the environmental, economic, or energy impacts. The differences between the proposed facility and the facility for which the control technique was applied previously must be justified. EPA has issued a draft guidance document on the top-down approach entitled *Top-Down Best Available Control Technology Guidance Document* (EPA, 1990). FDEP utilizes the "top-down" BACT approach.

FDEP performs BACT reviews based on EPA's regulations and guidance in which the most stringent control alternatives are evaluated to identify the "best available control technology" and a related appropriate emissions limitation for each pollutant requiring a BACT determination. This procedure is referred to as the "top down" approach. EPA's BACT guidelines establish a specific five-step analytical process for conducting a BACT determination. The five steps consist of: 1) identifying the potentially applicable control technologies for the proposed process or source, 2) evaluating the technical options for feasibility taking into consideration source specific factors, 3) comparing the remaining control technologies based on effectiveness, 4) evaluating the remaining options taking into consideration energy, environmental, and economic impacts, and 5) selecting BACT based on the above analyses.

3.2.3 Source Impact Analysis

A source impact analysis required pursuant to Rule 62-212.400(5), F.A.C., must be performed for a proposed major source or major modification subject to PSD review for each pollutant for which emissions exceed the significant emission rate (Table 3-2). The PSD regulations specifically provide for the use of atmospheric dispersion models in performing impact analyses, estimating baseline and future air quality levels, and determining compliance with AAQS and allowable PSD increments. Designated EPA models normally must be used in performing the impact analysis, as required by Rule 62-212.400(6), F.A.C. Specific applications for other than EPA-approved models require EPA's consultation and prior approval. Guidance for the use and application of dispersion models is presented in the EPA publication *Guideline on Air Quality Models (Revised)* (EPA, 2005). The source impact analysis for criteria pollutants to address compliance with AAQS and PSD Class II increments may be limited to the modification if the impacts, as a result of the modification, are below significant impact levels, as presented in Table 3-1.

The EPA has proposed significant impact levels for Class I areas as follows:

Pollutant	**Averaging Time**	**Proposed EPA PSD Class I Significant Impact Levels (μg/m³)[a]**
SO_2	3-hour	1
	24-hour	0.2
	Annual	0.1
PM_{10}	24-hour	0.3
	Annual	0.2
NO_2	Annual	0.1

[a] μg/m³ = micrograms per cubic meter.

Although these levels have not been officially promulgated as part of the federal PSD regulations and may not be binding for states in performing PSD reviews, the levels serve as a guideline in assessing a source's impact in a Class I area. FDEP has accepted the use of these significant impact levels.

Various lengths of meteorological data records can be used for impact analysis. A 5-year period can be used with corresponding evaluation of highest, second-highest short-term concentrations for comparison to AAQS or PSD increments. The term "highest, second-highest" (HSH) refers to the highest of the second-highest concentrations at all receptors (i.e., the highest concentration at each receptor is discarded). The second-highest concentration is significant because short-term AAQS specify that the standard should not be exceeded at any location more than once a year. If fewer than

5 years of meteorological data are used in the modeling analysis, the highest concentration at each receptor normally must be used for comparison to air quality standards.

The term "baseline concentration" refers to a concentration level corresponding to a specified baseline date and certain additional baseline sources. By definition, in the PSD regulations as amended August 7, 1980, baseline concentration means the ambient concentration level that existed in the baseline area at the time of the applicable baseline date. A baseline concentration is determined for each pollutant for which a baseline date is established and includes:

- The actual emissions representative of facilities in existence on the applicable baseline date; and
- The allowable emissions of major stationary facilities that commenced construction before January 6, 1975, for SO_2 and PM [total suspended particulate (TSP)] concentrations or February 8, 1988, for NO_2 concentrations, but that were not in operation by the applicable baseline date.

The following emissions are not included in the baseline concentration and, therefore, will affect PSD increment consumption.

- Actual emissions from any major stationary facility on which construction commenced after January 6, 1975, for SO_2 and PM (TSP) concentrations and after February 8, 1988, for NO_2 concentrations; and
- Actual emission increases and decreases at any stationary facility occurring after the baseline date.

In reference to the baseline concentration, the term "baseline date" actually includes three different dates:

- The major facility baseline date, which is January 6, 1975, in the cases of SO_2 and PM (TSP) and February 8, 1988, in the case of NO_2.
- The minor facility baseline date, which is the earliest date after the trigger date on which a major stationary facility or major modification subject to PSD regulations submits a complete PSD application.
- The trigger date, which is August 7, 1977, for SO_2 and PM (TSP) and February 8, 1988, for NO_2.

The minor source baseline date for SO_2 and PM (TSP) has been set as December 27, 1977, for the entire State of Florida [Rules 62-204.200(22) and 204.360, F.A.C.]. The minor source baseline for

NO_2 has been set as March 28, 1988 in Florida [Rules 62-204.200(22) and 204.360, F.A.C.]. It should be noted that references to PM (TSP) are also applicable to PM_{10}.

3.2.4 Air Quality Monitoring Requirements

In accordance with requirements of Rule 62-212.400(7), F.A.C., any application for a PSD permit must contain an analysis of continuous ambient air quality data in the area affected by the proposed major stationary facility. For a major modification, the affected pollutants are those that the facility potentially would emit in significant amounts.

Ambient air monitoring for a period of up to 1 year generally is appropriate to satisfy the PSD monitoring requirements. Data for a minimum of 4 months are required. Existing data from the vicinity of the proposed source may be used, if the data meet certain quality assurance requirements; otherwise, additional data may need to be gathered. Guidance in designing a PSD monitoring network is provided in *Ambient Monitoring Guidelines for Prevention of Significant Deterioration* (EPA, 1987).

The regulations include an exemption that excludes or limits the pollutants for which an air quality analysis must be conducted. This exemption states that a proposed major stationary facility is exempt from the monitoring requirements with respect to a particular pollutant, if the emissions of the pollutant from the facility would cause, in any area, air quality impacts less than the *de minimis* levels presented in Rule 62-212.400(3)(e), F.A.C. If a facility's predicted impacts are less than the *de minimis* levels, then preconstruction monitoring is not required.

3.2.5 Source Information/GEP Stack Height

Source information must be provided to adequately describe the proposed facility according to Rule 62-212.400(4), F.A.C. The general information required for this facility is presented in Section 2.0.

The 1977 CAA Amendments require that the degree of emission limitation required for control of any pollutant can not be affected by a stack height that exceeds GEP or any other dispersion technique. On July 8, 1985, EPA promulgated final stack height regulations. Identical regulations have been adopted by FDEP (Rule 62-210.550, F.A.C.). GEP stack height is defined as the highest of:

- 65 meters; or

- A height established by applying the formula:

$$H_g = H + 1.5L$$

where: H_g = GEP stack height,

H = Height of the structure or nearby structure, and

L = Lesser dimension (height or projected width) of nearby structure(s); or

- A height demonstrated by a fluid model or field study.

"Nearby" is defined as a distance up to 5 times the lesser of the height or width dimensions of a structure or terrain feature, but not greater than 0.8 kilometers (km). Although GEP stack height regulations require that the stack height used in modeling for determining compliance with AAQS and PSD increments not exceed the GEP stack height, the actual stack height may be greater.

The stack height regulations also allow increased GEP stack height beyond that resulting from the above formula in cases where plume impaction occurs. Plume impaction is defined as concentrations measured or predicted to occur when the plume interacts with elevated terrain. Elevated terrain is defined as terrain that exceeds the height calculated by the GEP stack height formula.

3.2.6 Additional Impact Analyses

In addition to air quality impact analyses, federal and State of Florida PSD regulations require analyses of the impairment to visibility and the impacts on soils and vegetation that would occur as a result of the proposed source or modification [Rule 62-212.400(8), F.A.C.]. Impacts as a result of general commercial, residential, industrial, and other growth associated with the source also must be addressed. These analyses are required for each pollutant emitted in significant amounts (refer to Table 3-2).

3.2.7 Air Quality Related Values

An Air Quality Related Value (AQRV) analysis is required to assess the potential impact on AQRVs in PSD Class I areas. The Everglades National Park (NP) is the closest Class I area to the PWR facility, and is located about 127.7 km (79.3 miles) south of the site.

The U.S. Department of the Interior in 1978 administratively defined AQRVs to be:

> *All those values possessed by an area except those that are not affected by changes in air quality and include all those assets of an area whose vitality, significance, or*

> *integrity is dependent in some way upon the air environment. These values include visibility and those scenic, cultural, biological, and recreational resources of an area that are affected by air quality.*
>
> *Important attributes of an area are those values or assets that make an area significant as a national monument, preserve, or primitive area. They are the assets that are to be preserved if the area is to achieve the purposes for which it was set aside (Federal Register, 1978, Vol. 43, #69, p. 15016).*

The AQRVs include visibility, freshwater and coastal wetlands, dominant plant communities, unique and rare plant communities, soils and associated periphyton, and the wildlife dependent on these communities for habitat. Rare, endemic, threatened, and endangered species of the national park and bioindicators of air pollution (e.g., lichens) must also be evaluated.

3.3 Nonattainment Rules

FDEP has nonattainment provisions (Rule 62-212.500, F.A.C.) that apply to all major new facilities located in a nonattainment area. In addition, for major facilities that are located in an attainment or unclassifiable area, the nonattainment review procedures apply if the source or modification is located within the area of influence of a nonattainment area. The PWR facility is located in Palm Beach County, which is classified as an attainment area for all criteria pollutants. Therefore, nonattainment new source requirements are not applicable.

3.4 Emission Standards

3.4.1 New Source Performance Standards

The NSPS are a set of national emission standards that apply to specific categories of new sources. As stated in the 1977 CAA Amendments, these standards "shall reflect the degree of emission limitation and the percentage reduction achievable through application of the best technological system of continuous emission reduction the Administrator determines has been adequately demonstrated." EPA's NSPS for stationary gas turbines include 40 CFR 60, Subparts GG and KKKK.

40 CFR 60, Subpart GG was promulgated on September 10, 1979 for stationary gas turbines. The rule is applicable for all stationary gas turbines which commence construction, modification, or reconstruction after October 3, 1977; and have a heat input at peak load equal to or greater than 10 million British thermal units per hour (MMBtu/hr).

40 CFR 60, Subpart KKKK was promulgated on July 6, 2006. The rule is applicable for new gas turbines with a heat input at peak load equal to or greater than 10 MMBtu per hour, based on the higher heating value of the fuel, which commenced construction, modification, or reconstruction after February 18, 2005.

3.4.2 National Emission Standards for Hazardous Air Pollutants

Section 112 of the CAA requires EPA to establish National Emission Standards for Hazardous Air Pollutants (NESHAP) for the control of HAPs from both new and existing major sources. The CAA requires the NESHAP to reflect the maximum degree of reduction in emissions of HAPs that is achievable. This level of control is commonly referred to as the maximum achievable control technology or MACT.

40 CFR 63, Subpart YYYY establishes national emission limitations of HAP emissions from stationary turbines located at major sources of HAP emissions, such as the PWR facility. Combustion turbine engine test cells and stands do not have to meet the requirements of Subpart YYYY, in accordance with 40 CFR 63.6090(5), but may have to meet the requirements of 40 CFR 63, Subpart A, if subject to another NESHAP subpart.

3.4.3 Florida Rules

The facility is a major source of NO_x emissions and is subject to Rule 62-296.570, F.A.C., for Reasonably Available Control Technology (RACT) requirements for major VOC and NO_x emitting facilities. The fuel-specific NO_x emission limits established under this rule includes a NO_x emissions limit of 0.90 lb/MMBtu when firing fuel oil.

Compliance with the NO_x emission limit, for units that are not equipped with a continuous emission monitoring system (CEMS), shall be demonstrated by annual emission testing in accordance with applicable EPA Reference Methods from Rule 62-297.401, F.A.C., or other methods approved by FDEP in accordance with the requirements of Rule 62-297.620, F.A.C., except as otherwise provided in paragraph 62-296.570(4)(b), F.A.C.

3.4.4 Florida Air Permitting Requirements

The FDEP regulations require any new source to obtain an air permit prior to construction. Major new sources must meet the appropriate PSD and nonattainment requirements as discussed previously. Required permits and approvals for air pollution sources include NSR for nonattainment areas, PSD, NSPS, NESHAP, Permit to Construct, and Permit to Operate. The requirements for construction permits and approvals are contained in Rules 62-4.030, 62-4.050, 62-4.210, 62-210.300(1), and 62-212.400, F.A.C. Specific emission standards are set forth in Chapter 62-296, F.A.C.

3.4.5 Local Air Regulations

The PBCHD is the air compliance authority for the County, implementing FDEP regulations. As conditions of the land development approval for the site, the County established a sulfur limit on light oil of 0.0015 percent.

3.5 Source Applicability

3.5.1 New Source Performance Standards

As previously mentioned, 40 CFR 60, Subpart GG, is applicable to all stationary gas turbines that commence construction, modification, or reconstruction after October 3, 1977; and 40 CFR 60, Subpart KKKK is applicable to all new stationary gas turbines that commenced construction, modification, or reconstruction after February 18, 2005. Because the GG4-9A turbine engines were constructed prior to 1966, they are therefore not subject to 40 CFR 60, Subparts GG or KKKK.

3.5.2 National Emissions Standards for Hazardous Air Pollutants

In accordance with 40 CFR 63.6090(5), the GG4-9A turbine engines are located at a test stand, and are not subject to any other NESHAP subparts. Therefore, the GG4-9A turbine engines are not subject to 40 CFR 63, Subpart YYYY.

3.5.3 Area Classification

The project is located in Palm Beach County, which has been designated by EPA and FDEP as an attainment area (includes unclassifiable) for all criteria pollutants. Palm Beach County and the surrounding counties are designated as PSD Class II areas for SO_2, PM (TSP), and NO_2. The nearest Class I area is the Everglades NP, located about 127.7 km (79.3 miles) to the south of the site.

3.5.4 PSD Review

3.5.4.1 Pollutant Applicability

PWR is considered to be a major facility because the emissions of several regulated pollutants are estimated to exceed 100 TPY. The A-8 and A-9 test stand operation is defined as a major modification under the PSD rules, and PSD review is required for CO, NO_x, and SO_2, as shown in

Table 3-3. Impacts for these pollutants that are predicted to be above the significant impact levels require a modeling analysis incorporating the impacts from other sources. (Note: EPA no longer requires PSD review for HAPs from PSD review. The pollutants vinyl chloride, asbestos, and beryllium are no longer evaluated in PSD review because they are addressed through the NESHAP program.)

As part of the PSD review, a PSD Class I increment analysis is required if the proposed facility's impacts are greater than the proposed EPA Class I significant impact levels. Because the Class I area of the Everglades NP is about 127.7 km (79.3 miles) from the site, a PSD Class I increment analysis and an evaluation of impacts to AQRVs are required. Because other PSD Class I areas are located more than 200 km from the site, the project's impacts are expected to be minimal and impact evaluations for those areas were not performed.

3.5.4.2 Ambient Monitoring

Based on the potential emissions from the GG4-9A turbine engines (see Table 3-4), a pre-construction ambient monitoring analysis is required for NO_2, CO, and ozone (O_3) (based on NO_x emissions). If the net increase in impact of pollutants is less than the applicable *de minimis* monitoring concentration (100 TPY of NO_x in the case of O_3), then an exemption from the pre-construction ambient monitoring requirement is available by Rule 62-212.400(3)(e), F.A.C. In addition, if an acceptable ambient monitoring method for the pollutant has not been established by EPA, monitoring is not required.

As shown in Table 3-4, the impacts of the GG4-9A turbine engines are predicted to be below the applicable *de minimis* monitoring concentration levels for all pollutants. Therefore, pre-construction monitoring is not required to be submitted for those pollutants for this facility.

3.5.4.3 GEP Stack Height Impact Analysis

The GEP stack height regulations allow any stack to be at least 65 meters (213 ft) high without the need to justify the height based on building dimensions. The stacks for the GG4-9A turbine engines will be 26 ft high. These stack heights do not exceed the GEP stack height. However, as discussed in Section 6.0, Air Quality Impact Analysis, since the stack heights are less than GEP, building downwash effects must be considered in the modeling analysis. As a result, the potential for downwash of the GG4-9A engine emissions caused by nearby structures is included in the modeling analysis.

TABLE 3-1
NATIONAL AND STATE AAQS, ALLOWABLE PSD INCREMENTS, AND SIGNIFICANT IMPACT LEVELS
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

		National AAQS (μg/m³)			PSD Increments[a] (μg/m³)		Significant Impact Levels[b] (μg/m³)	
Pollutant	Averaging Time	Primary	Secondary	Florida	Class I	Class II	Class I	Class II
Carbon Monoxide	8-Hour Maximum	10,000	10,000	10,000	NA	NA	NA	500
	1-Hour Maximum	40,000	40,000	40,000	NA	NA	NA	2,000
Nitrogen Dioxide	Annual Arithmetic Mean	100	100	100	2.5	25	0.1	1
Particulate Matter[c]								
PM_{10}	Annual Arithmetic Mean	NA	NA	50	4	17	0.2	1
	24-Hour Maximum	150	150	150	8	30	0.3	5
$PM_{2.5}$	Annual Arithmetic Mean	15	15	NA	NA	NA	NA	NA
	24-Hour Maximum	35	35	NA	NA	NA	NA	NA
Sulfur Dioxide	Annual Arithmetic Mean	80	NA	60	2	20	0.1	1
	24-Hour Maximum	365	NA	260	5	91	0.2	5
	3-Hour Maximum	NA	1,300	1,300	25	512	1	25
Ozone[d]	1-Hour Maximum[e]	235	235	235	NA	NA	NA	NA
	8-Hour Maximum	147	147	NA	NA	NA	NA	NA
Lead	Calendar Quarter Arithmetic Mean	1.5	1.5	1.5	NA	NA	NA	NA

Notes:
NA = Not applicable, i.e., no standard exists.
Particulate matter (PM_{10}) = particulate matter with aerodynamic diameter less than or equal to 10 micrometers.
Particulate matter ($PM_{2.5}$) = particulate matter with aerodynamic diameter less than or equal to 2.5 micrometers.

[a] Short-term maximum concentrations are not to be exceeded more than once per year except for the PM_{10} and ozone AAQS. The 24-hour PM_{10} AAQS is attained when the expected number of days per year with a 24-hour concentration above 150 μ/m³ is equal to or less than 1. For modeling purposes, compliance is based on the sixth highest 24-hour concentration over a 5-year period. For ozone, the daily maximum 1-hour concentration cannot be exceeded an average of more than one per year.

[b] Maximum concentrations are not to be exceeded.

[c] On July 18, 1997, EPA promulgated revised AAQS for particulate matter and ozone. For particulate matter, $PM_{2.5}$ standards were introduced with a 24-hour standard of 65 g/m³ (3-year average of 98th percentile) and an annual standard of 15 g/m³ (3-year average at community monitors).

[d] The ozone standard was modified to be 0.08 ppm; achieved when 3-year average of 99th percentile is 0.08 ppm 157 μ/m³ or less. FDEP has not yet adopted these standards.

[e] 0.12 ppm; achieved when the expected number of days per year with concentrations above the standard is fewer than 1.

Sources: Federal Register, Vol. 43, No. 118, June 19, 1978, 40 CFR 50; 40 CFR 52.21, Florida Chapter 62.204, F.A.C.

TABLE 3-2
PSD SIGNIFICANT EMISSION RATES AND
***DE MINIMIS* MONITORING CONCENTRATIONS**
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

Pollutant	Regulated Under	Significant Emission Rate (TPY)	*De Minimis* Monitoring Concentration[a] ($\mu g/m^3$)
Carbon Monoxide	NAAQS, NSPS	100	575, 8-hour
Nitrogen Dioxide	NAAQS, NSPS	40	14, annual
Particulate Matter [PM (TSP)]	NSPS	25	10, 24-hour
Particulate Matter (PM_{10})	NAAQS	15	10, 24-hour
Sulfur Dioxide	NAAQS, NSPS	40	13, 24-hour
Lead	NAAQS	0.6	0.1, 3-month
Mercury	NESHAP	0.1	0.25, 24-hour
Reduced Sulfur Compounds	NSPS	10	10, 1-hour
Sulfuric Acid Mist	NSPS	7	NM
Hydrogen Sulfide	NSPS	10	0.2, 1-hour
Total Fluorides	NSPS	3	0.25, 24-hour
Total Reduced Sulfur	NSPS	10	10, 1-hour
Volatile Organic Compounds (Ozone)	NAAQS, NSPS	40	100 TPY[b]

Notes:
Ambient monitoring requirements for any pollutant may be exempted if the impact of the increase in emissions is below de minimis monitoring concentrations.
NAAQS = National Ambient Air Quality Standards.
NM = No ambient measurement method established; therefore, no de minimis concentration has been established.
NSPS = New Source Performance Standards.
NESHAP = National Emission Standards for Hazardous Air Pollutants.
$\mu g/m^3$ = micrograms per cubic meter.

[a] Short-term concentrations are not to be exceeded.
[b] No de minimis concentration; an increase in VOC or NOx emissions of 100 TPY or more will require monitoring analysis for ozone.
Sources: 40 CFR 52.21; Rule 62-212.400.

TABLE 3-3
MAXIMUM ESTIMATED PROPOSED EMISSIONS
COMPARED TO THE PSD SIGNIFICANT EMISSION RATES
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

	Pollutant Emissions (TPY)		
Pollutant	Potential Emissions from Project[a]	Significant Emission Rate	PSD Review
Carbon Monoxide	388.1	100	Yes
Nitrogen Dioxide	343.7	40	Yes
Particulate Matter [PM (TSP)]	4.02	25	No
Particulate Matter (PM_{10})	2.40	15	No
Sulfur Dioxide	63.7	40	Yes
Lead	7.81E-03	0.6	No
Mercury	6.70E-04	0.1	No
Reduced Sulfur Compounds	NEG	10	No
Sulfuric Acid Mist	NEG	7	No
Hydrogen Sulfide	NEG	10	No
Total Fluorides	NEG	3	No
Total Reduced Sulfur	NEG	10	No
Volatile Organic Compounds (Ozone)	0.229	40	No

Notes:
NEG = Negligible.

[a] Refer to Tables 2-3 and 2-4.

TABLE 3-4
PREDICTED NET INCREASE IN IMPACTS DUE TO THE PROPOSED PROJECT COMPARED TO PSD *DE MINIMIS* MONITORING CONCENTRATIONS PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

Pollutant	Predicted Increase in Impacts[a] (μg/m^3)	*De Minimis* Monitoring (μg/m^3)
Carbon Monoxide	110.0	575, 8-hour
Nitrogen Dioxide[b]	0.66	14, annual
Nitrogen Dioxide (as a precursor to O_3)[c]	343.7 TPY	100 TPY
Sulfur Dioxide	4.40	13, 24-hour

[a] See Section 6.0 for air dispersion modeling results.

[b] Based on worst case load conditions and 8,760 hours per year. This is a conservative estimate of maximum annual impacts since the requested maximum hours/year of operation is 3,000.

[c] No *de minimis* concentration; an increase in NO_x emissions of 100 TPY or more will require monitoring analysis for O_3.

4.0 CONTROL TECHNOLOGY REVIEW

4.1 Applicability

The PSD regulations require new major stationary sources to undergo a control technology review for each pollutant that may potentially be emitted above significant amounts. The control technology review requirements of the PSD regulations are applicable to the GG4-9A turbine engines for CO, NO_x, and SO_2 (refer to Section 3.0), which require that BACT be applied for these pollutants.

This section presents the proposed BACT for these pollutants. The approach to the BACT analysis is based on the regulatory definitions of BACT, as well as consideration of EPA's current policy guidelines requiring a top-down approach. A BACT determination requires an analysis of the economic, environmental, and energy impacts of the proposed and alternative control technologies [Rules 62-210.200(40) and 62-212.400(4)(c), F.A.C.]. The analysis must, by definition, be specific to the turbine engines (i.e., case by case).

4.2 Overview of Proposed BACT

The project's GG4-9A turbine engines drive large compressors to supply air to the engine components that are being tested on the test stands A-8 and A-9. They are not industrial gas turbines used for stationary power generation with continuous base-load operation.

As described in Section 2.0, various engine load conditions are created for the test engines by varying the compressor discharge pressure. As the compressor discharge pressure is varied, the load on the GG4-9A turbine engines also varies. During normal test stand operations, the engines operate at various loads based on the test need, usually remaining at idle between tests. During testing, the test engines are subjected to extreme operating conditions such as the use of "rapid transients". To simulate rapid transients, the GG4-9A engines are taken from idle to full power or from full power to idle within a time period of a few seconds. Due to these rapid load changes, pre- or post-combustion CO, NO_x, or SO_2 emissions control technologies are considered to be technically infeasible for these engines.

EPA's RACT/BACT/LAER Clearinghouse (RBLC) database in their Clean Air Technology Center (CATC) website was searched for potentially applicable control options for turbines at test facilities. The search results presented in Table 4-1 show that no controls were applied.

Since control technologies are not feasible, none are proposed for the Project's two GG4-9A turbine engines. As part of the five-step BACT analysis, however, potential control technologies are identified followed by technical feasibility analysis in the following sections for the pollutants subject to BACT.

4.3 BACT Analysis

The approach to the BACT analysis is based on the regulatory definitions of BACT, as well as consideration of EPA's current policy guidelines requiring a top-down approach. A BACT determination requires analyses of the economic, environmental, and energy impacts of the proposed and alternative control technologies. The analyses must, by definition, be specific to the project (i.e., case-by-case).

4.3.1 Summary of Top-Down Process

The control technology review process and the "top-down" approach for BACT determination are described in Section 3.2. This procedure includes a five-step process for considering all available control technologies from most stringent to least stringent. The most stringent control technology is considered BACT unless the applicant demonstrates, and the permitting authority agrees, that technical considerations or energy, environmental, or economic impacts justify elimination of the most stringent technology and selection of a less stringent technology.

A summary of each of the five steps in the top-down process is described below. This process was repeated for each pollutant emitted from the turbine engines (CO, NO_x, and SO_2).

Step 1 – Identify All Control Technologies

The primary objective of Step 1 is to identify all potentially applicable control options. Potentially applicable control options are those air pollution control technologies, or techniques, with a practical potential for application to the emission unit and regulated pollutant under evaluation. Potentially applicable control options are categorized as lower emitting processes/practices or add-on controls.

A lower polluting process/practice is considered applicable if it has been demonstrated in a similar application. An add-on control is considered applicable if it can properly function given the physical and chemical characteristics of the pollutant-bearing emission stream. Combinations of control options should be considered whenever such combinations would provide more effective emissions control.

Step 2 – Eliminate Technically Infeasible Options

The objective of Step 2 is to refine the list of potentially applicable control technology options developed in Step 1 by evaluating the technical feasibility of each of the control technology options.

Per the EPA's Draft NSR Workshop Manual (EPA, 1990, New Source Review Workshop Manual, Chapter B, Section III.B.), control technologies that have been installed and operated successfully on the type of source under review are "demonstrated" and are considered technically feasible. For technologies that have not been demonstrated for a particular source type, EPA's Draft Manual states the following regarding technical feasibility:

Two key concepts are important in determining whether an undemonstrated technology is feasible: "availability" and "applicability." As explained in more detail below, a technology is considered "available" if it can be obtained by the applicant through commercial channels or is otherwise available within the common sense meaning of the term. An available technology is "applicable" if it can reasonably be installed and operated on the source type under construction. A technology that is available and applicable is technically feasible (EPA, 1990, New Source Review Workshop Manual, Chapter B, Section IV.B).

Per this guidance, a technology is considered technically infeasible if it is not available or not applicable. EPA's Draft NSR Manual provides additional guidance on availability and applicability of a given technology for a particular source type:

A control technique is considered available if it has reached the licensing and commercial sales stage of development. A source would not be required to experience extended time delays or resources penalties to allow research to be conducted on a new technique. Neither is it expected that an applicant would be required to experience extended trials to learn how to apply a technology on a totally new and dissimilar source type. Consequently, technologies in the pilot scale testing stages of development would be considered available for BACT review (EPA, 1990, New Source Review Workshop Manual, Chapter B, Section IV.B).

Commercial availability by itself, however, is not necessarily sufficient basis for concluding a technology to be applicable and, therefore, technically feasible. Technical feasibility, as determined in Step 2, also means a control option may reasonably be deployed on or "applicable" to the source type under consideration. Technical judgment on the part of the applicant and the review authority is to be exercised in determining whether a control alternative is applicable to the source type under consideration.

In general, a commercially available control option will be presumed applicable if it has been or is soon to be deployed (e.g., is specified by permit) on the same or similar source type. Absent a showing of this type, technical feasibility would be based on examination of the physical and chemical characteristics of the pollutant-bearing gas stream and comparison to the gas stream characteristics of the source types to which the technology has been applied previously. Deployment of the control technology on an existing source with similar gas stream characteristics is generally sufficient for concluding technical feasibility, barring a demonstration to the contrary.

In the Step 2 analysis, each technology presented in Step 1 is evaluated to determine whether the technology is both available and applicable. Control technologies that are not available or not applicable are determined to be technically infeasible.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

In Step 3 of the "top-down" approach, control technologies not eliminated in Step 2 are ranked in order of control effectiveness.

The ranking of the control options initially involves the establishment of appropriate units of emission performance. Once measure of performance is established, factors such as the operational characteristics of each of the control technologies and any operating assumptions are considered in establishing emissions reduction potential.

After identifying the appropriate performance units and establishing the emissions performance levels for each control technology, a table is developed to rank the control technology options by their respective emissions performance from lowest to highest emissions level (highest to lowest control effectiveness).

Step 3 of the analysis also includes a list of energy, environmental, and economic impacts associated with each control option. These impacts are evaluated in the next step of the analysis.

Step 4 – Evaluate the Most Effective Controls and Document Results

The purpose of Step 4 is to either confirm the suitability of the top ranked control technology option as BACT, or provide clear justification for determination that a lower-ranked control technology option is BACT for the case under consideration. In order to establish the suitability of a control technology option, a case-by-case evaluation of energy, environmental, and economic impacts of the control technology is performed.

The energy impacts analysis determines whether the energy requirements of the control technology would result in any significant energy penalties or benefits. The environmental impacts analysis considers site-specific impacts of the solid, liquid, and gaseous discharges that would result from implementation of the control technology. The economic impacts analysis considers the cost effectiveness and the incremental cost effectiveness to establish whether the control technology would result in a negative economic impact.

The case-by-case determinations consider both beneficial and adverse direct impacts from energy, environmental, and economic standpoints. In cases where the determination establishes that there are significant energy, environmental, and/or economic issues that would preclude the selection of the evaluated alternative as BACT, the basis for this determination is clearly documented, and the next most effective alternative is similarly evaluated. This process continues until the evaluated alternative is not rejected and is selected as BACT.

Step 5 – Most Effective Control Alternative not Eliminated Selected as BACT

In Step 5, the highest ranked control technology not eliminated in Step 4 is selected as BACT.

4.4 BACT Analysis for the GG4-9A Turbine Engines

This section contains the BACT analysis for the CO, NO_x, and SO_2 emissions from the turbine engines.

4.4.1 Carbon Monoxide

Step 1 – Identification of CO Control Technologies

CO emissions are a result of incomplete thermal oxidation of carbon contained within the fuel. When the turbine engines are operating at full load, the combustion system operates at high firing temperatures and most of the CO is oxidized to carbon dioxide (CO_2). But at low loads, when the firing temperature is lower, the CO to CO_2 oxidation reaction is quenched by the cool regions near the walls of the combustion chamber. This results in increased CO emissions at low loads. The GG4-9A turbine engines at the PWR Palm Beach test facility idle for 24 percent of the total annual operating hours, but CO emissions due to idling are more than 60 percent of the annual CO emissions.

The EPA's RBLC database was queried for CO BACT determinations for turbines at test facilities; the results are presented in Table 4-1. As shown, control technologies were not applied for CO emissions.

The following potential control options are identified and discussed in the following paragraphs:

- Combustion controls,
- Oxidation catalyst, and
- $SCONO_x$™ process.

Combustion Controls

CO emissions are generated from the incomplete combustion of carbon in the fuel and organic compounds. Optimization of the combustion chamber designs and operation practices that improve the oxidation process and minimize incomplete combustion is the primary mechanism available for lowering CO emissions. This process is often referred to as combustion controls.

Oxidation Catalyst

Catalytic oxidation technology is primarily designed to reduce CO emissions. Oxidation catalysts operate at elevated temperatures. In the presence of an oxidation catalyst, excess oxygen (O_2) in the exhaust reacts with CO to form CO_2. No chemical reagent is necessary. The oxidation catalyst is typically a precious metal catalyst. None of the catalyst components are considered toxic.

Oxidation catalysts are susceptible to fine particles suspended in the exhaust gases that can foul and poison the catalyst. Catalyst poisoning reduces catalyst activity and pollutant removal efficiencies. The catalytic oxidation of CO in the combustion gases to CO_2 takes place in temperatures ranging from 500 to 1,100 degrees Fahrenheit (°F).

$SCONO_x$™ Process

The $SCONO_x$™ system, described in detail in Subsection 4.4.2, also controls CO. The $SCONO_x$™ system employs a single catalyst to simultaneously oxidize CO to CO_2 and NO to NO_2. The $SCONO_x$™ operates at a temperature range of 300 to 700°F.

Step 2 – Technical Feasibility Analysis

Technical feasibility of the potential control options is evaluated below:

- **Combustion Controls.** Turbine combustors typically have high combustion temperature. As a result, CO emissions from the turbine combustor units are inherently low. However, at low load conditions, high CO emissions are a result of low combustion temperature and combustion chamber design has no effect on it. Most of the CO emissions from the GG4-9A turbine engines are due to idling and low load conditions. The idling is necessary so that the turbines don't have to be started before every test.

  As a result, combustion controls is considered to be not technically feasible for the GG-4A turbine engines at the PWR facility.

- **Oxidation Catalyst.** The oxidation catalyst system is effective within the temperature window of 500 to 1,100°F. Most of the CO emissions from the GG4-9A turbine engines are due to idling when the exhaust temperature is also below the optimum temperature range.

  Since most of the CO emissions will not be controlled, an oxidation catalyst system is considered to be not feasible for the GG4-9A turbine engines at the PWR test facility.

- **$SCONO_x$™.** As described in the BACT evaluation for NO_x in Section 4.4.2, $SCONO_x$™ is considered to be not technically feasible for the GG4-9A turbines.

Step 3 – Rank Control Technologies by Control Effectiveness

In Step 3 of the "top-down" approach, control technologies not eliminated in Step 2 are ranked in order of control effectiveness. All the control technologies considered in Step 2 are considered as not technically feasible.

Step 4 – Evaluate the Most Effective Controls

Since all the control technologies considered in Step 2 are considered as technically infeasible, no evaluation was done.

Step 5 – Select BACT

In the absence of any feasible control technologies currently available, direct atmospheric exhaust with no controls is determined to be the BACT for CO.

4.4.2 Nitrogen Oxides

Step 1 – Identification of NO_x Control Technologies

In addition to searching the EPA's RBLC database, the following resources were used as references:

- PSD Permit Application for Test Cell 2 and 5 Modification, GE Aviation, Lynn, MA, CH2MHill, September 2007.
- Nitrogen Oxide Emissions and Their Control from Uninstalled Aircraft Engines in Enclosed Test Cell, Joint EPA – U.S. Department of Transportation (DOT) Report, Report No. EPA 453/R-94-068, October 1994.
- Regulatory Support Document, Control of Air Pollution from Aircraft and Aircraft Engines, from the Direct Final Review of Aircraft Emission Standards, U.S. EPA, February 1997.
- Best Available Control Technology Analysis for Modification of Engine Test Cells at Tinker Air Force Base, Oklahoma, Air Force Center for Environmental Excellence (AFCEE), July 2006.

The report entitled "Nitrogen Oxide Emissions and Their Control from Uninstalled Aircraft Engines in Enclosed Test Cell," Report No. EPA-453/R-94-068, October 1994, concludes that there are no existing technologies for control of NO_x that have been applied (full scale) to aircraft engine test cells in the United States.

The EPA's RBLC database was queried for NO_X BACT determinations for turbines at test facilities; the results are presented in Table 4-2.

The following control technologies were identified as potentially available and are discussed in the following paragraphs:

- Water or steam injection;
- Selective Catalytic Reduction (SCR);
- $SCONO_x$™ process; and
- Selective Non-Catalytic Reduction (SNCR).

Water or Steam Injection

The injection of water or steam in the combustion zone reduces the flame temperature with a corresponding decrease of thermal NO_x emissions. It is an effective mechanism to control NO_x emissions during steady-state operation. The amount of NO_x reduction possible depends on the combustor design and the water-to-fuel ratio employed. An increase in the water to fuel ratio will cause a concomitant decrease in NO_x emissions until flame instability occurs. At this point, operation of the turbine becomes inefficient and unreliable, and significant increases in products of incomplete combustion (i.e., CO and VOC emissions) result. In modern applications, wet injection is used only for units firing fuel oil.

Selective Catalytic Reduction

Selective catalytic reduction (SCR) is a process for controlling emissions of NO_x from stationary sources. The basic principle of SCR is the reduction of NO_x to N_2 and H_2O by the reaction of NO_x and ammonia (NH_3) within a catalyst bed. The primary reactions occurring in SCR require O_2, so that the catalyst performs more effectively at O_2 levels above 2 to 3 percent.

Several different catalysts are available for use at different exhaust gas temperatures. In use the longest and most common are base metal catalysts, which typically contain titanium and vanadium oxides, and which also may contain molybdenum, tungsten, and other elements. Base metal catalysts are useful between 450 and 800°F. For high temperature operation (675°F to over 1,100°F), zeolite catalysts may be used. In clean, low temperature (350 to 550°F) applications, catalysts containing precious metals such as platinum and palladium are useful (Institute of Clean Air Companies, description of NO_x control technologies).

The mechanical operation of an SCR system is quite simple. It consists of a reactor chamber with a catalyst bed, composed of catalyst modules, and an NH_3 handling and injection system, with the NH_3 injected into the flue gas upstream of the catalyst. There are no moving parts. Other than spent catalyst, the SCR process produces no waste products.

In principle, SCR can provide reductions in NO_x emissions approaching 100 percent. (Simple thermodynamic calculations indicate that a reduction of well over 99 percent is possible at 650°F.) In practice, commercial SCR systems have met control targets of over 90 percent in many cases.

$SCONO_x$™ Process

Goal Line Environmental Technologies (GLET) developed the $SCONO_x$™, a relatively new post combustion technology, which utilizes a coated oxidation catalyst to oxidize and remove both NO_x and CO without a reagent such as NH_3. Now offered by EmeraChem (formerly Goal Line), the technology is marketed under the name EMx. EMx is described as the next generation of the $SCONO_x$™ technology.

The SCONO$_x$™ system consists of a platinum-based catalyst coated with potassium carbonate (K_2CO_3) to oxidize CO to CO_2 and NO to NO_x. CO_2 generated in the catalyst bed is exhausted to the atmosphere with the flue gas, while NO_2 absorbs onto the catalyst to form potassium nitrite (KNO_2) and potassium nitrate (KNO_3). Periodically, dilute hydrogen gas is passed across the catalyst to regenerate the potassium carbonate coating. The regeneration step converts KNO_2 and KNO_3 into K_2CO_3, water, and nitrogen gas. In order to maintain continuous operation during catalyst regeneration, the system is furnished in arrays of 5-module catalyst sections. During operation, four of the five modules are online and treating flue gas, while one module is isolated from the flue gas for regeneration. NO_x reduction in the system occurs in an operating temperature range of 300 to 700°F.

A regeneration cycle is typically set to last for 3 to 5 minutes. Regeneration gas is produced by reacting natural gas with O_2 present in ambient air. The SCONO$_x$™ system uses a gas generator to produce hydrogen and CO_2.

The SCONO$_x$™ system catalyst is subject to reduced performance and deactivation due to exposure to sulfur oxides. For this reason, an additional catalytic oxidation/absorption system (SCOSO$_x$™) to remove sulfur compounds is installed upstream of the SCONO$_x$™ catalyst. The SO_2 is oxidized to sulfur trioxide (SO_3) by the SCOSO$_x$™ catalyst. The SO_3 is then deposited on the catalyst and removed from the catalyst when it is regenerated. The SCOSO$_x$™ catalyst is regenerated along with the SCONO$_x$™ catalyst.

The SCONO$_x$™ catalyst must be recoated, or "washed", every 6 to 12 months. The frequency of washing is dependent on the sulfur content of the fuel and the effectiveness of the SCOSO$_x$ catalyst. The "washing" consists of removing the catalyst modules from the unit and placing each module in a K_2CO_3 reagent tank, which is the active ingredient of the catalyst. The SCOSO$_x$ catalyst also requires washing.

EmeraChem states that their EMx technology (the second-generation of the SCONO$_x$™ NO_x absorber technology) is capable of reducing gas-fired NO_x emissions to less than 1.0 part per million (ppm), release undetectable levels of CO, reduce VOC emissions by > 90 percent, reduce fine particle matter by 30 percent, and reduce sulfur emissions by 95 percent (EmeraChem's SCONO$_x$™ white paper dated January 5, 2004; Multipollutant Emission Reduction Technology for Stationary Gas Turbines and IC Engines).

Commercial experience with the $SCONO_x$™ control system is limited. The NO_x reduction system was commercially demonstrated first at the 32-MW (GE LM2500 turbine) Sunlaw Federal Cogeneration Facility located in Vernon, California. NO_x emissions from the process were < 2 ppm during 100 percent of operation, and < 1 ppm for 90 percent of operation. Other installations of the technology include a 15-MW (Solar Titan 130 turbines) installation at the University of California, San Diego, CA, and a 45-MW (Alstom GTX100 turbine) installation at the City of Redding Municipal Electric Plant, Redding, CA. A number of smaller installations are also operating – two 5-MW installations at the Wyeth BioPharma cogeneration facility, Andover, MA, and a 5-MW installation at the Montefiore Medical Center, Bronx, NY. Actual NO_x emissions from these smaller installations are typically below 1.5 ppm, with substantial periods below 1.0 ppm.

EmeraChem states that the process is scalable. Alstom Power, one of the EMx licensees, engineered and installed the technology on one of their GTX100 (43 MW class) gas turbines. This size and design is a reproducible module that would be replicated several times for larger installations. Alstom has already produced preliminary designs for several standard size plants that match standard sizes of larger turbines.

The number of permitted and operating EMx installations is growing and the future of the EMx technology is very promising. Cummins Engine Company, one of EmeraChem's equity investors, has helped apply the technology to internal combustion engines – particularly diesel engines. Despite the future promise, commercial experience to date with the $SCONO_x$™ control system is limited to just a few small units.

Selective Non-Catalytic Reduction

SNCR is a post-combustion NO_x control technology that reduces NO_x into nitrogen gas and water vapor by reacting the flue gas with a reagent. SNCR systems can either use NH_3 or urea as reagents. The chemical reaction for this technology is driven by high temperatures, typically from 1,600 to 2,100°F, normally found in combustion sources. SNCR is "selective" in that the reagent reacts primarily with NO_x.

SNCR is a proven and reliable technology. SNCR was first applied commercially in 1974 and has been installed on approximately 400 applications worldwide. Applications include utility boilers and a broad range of industrial applications including installations on the following: wood-fired boilers, coal-fired boilers, co-generation boilers, pulp and paper boilers, steel industry furnaces, refinery process units, process heaters, cement kilns, municipal waste combustors, glass-melting furnaces, hazardous waste incinerators, and other combustion sources. Urea-based SNCR has been applied commercially to sources ranging in size from a 60-MMBtu/hr (gross heat input) paper mill sludge incinerator to a 640-MW pulverized coal-fueled, wall-fired electric utility boiler (Description for SNCR, Institute of Clean Air Companies; Typical Installation Timelines for NO_x Emissions Control Technologies on Industrial Sources, December 2006).

Step 2 – Technical Feasibility Analysis

Technical feasibility of the potential control options is evaluated below.

- **Water or Steam Injection.** Water injection is an effective mechanism to control NO_x emissions during steady-state operations. However, the GG4-9A turbine engines are not operated at a steady-state load condition. PWR has investigated the feasibility of using water injection during quality control testing of certain engines. It was found that the technology is impractical during testing. The addition of water caused the engine to become unstable during acceleration and deceleration. The engine speed surged out of control, engine exhaust temperature exceeded the recommended limit, and engine "flameout" occurred. Engine flameout was also encountered when the engines were rapidly returned to idle from high power.

  Because of this, water injection is considered to be technically infeasible for turbines associated with test stands.

- **SCR.** SCR is a proven technology for controlling NO_x emissions from stationary gas turbines in steady state operation in power plants. There is significant difference between these turbines and the GG4-9A turbine engines at the PWR test facility. The exhaust temperature of the GG4-9A turbine engines varies significantly as the turbines are subjected to rapid transients in order to create the extreme test conditions at the test stands. SCR catalysts are effective only within a small window of temperature.

  Furthermore, the NO_x mass emission rate would vary significantly with the widely varying load conditions. As a result, NO_x concentration in the exhaust air would have to be continuously tracked and the NH_3 injection rate would have to be adjusted accordingly. The rapid load changes in the GG4-9A turbine engines would make the NH_3 control challenging. Failure to track the NO_x concentration and control the NH_3 injection would result in inefficient NO_x control and/or excessive NH_3 slip.

  Because of these technical difficulties, SCR is considered technically infeasible for the GG4-9A turbine engines at the facility.

- **$SCONO_x$™.** Similar to SCR, the $SCONO_x$™ system is based on catalytic oxidation to oxidize and remove NO_x, which works best within an optimum temperature window of 300 to 700°F. The exhaust temperature of the GG4-9A turbine engines are varies widely and goes up to 750°F based on test data. The $SCONO_x$™ system catalyst is also subject to reduced performance and deactivation due to exposure to sulfur oxides and a separate catalyst bed to control SO_2 emissions prior to the SCONO$_x$™ catalyst bed is recommended. Despite promising technology, the application of the SCONO$_x$™ system has been limited to only eight stationary turbines in the U.S.

The control technology has never been applied to a turbine in a test stand and is considered not technically feasible for the GG4-9A turbines.

- **SNCR.** The chemical reaction of the SNCR technology is driven by high temperature, typically between 1,600 and 2,100°F. The NO_x reduction efficiency of a SNCR system decreases rapidly at temperatures outside the optimum window. This technology has been demonstrated on utility boilers with high exhaust temperature. The exhaust temperature of the GG4-9A turbine engines is significantly below the optimum temperature range.

  Therefore, SNCR is not technically feasible for the project's GG4-9A turbine engines.

Based on the preceding discussion, there are no feasible control technologies for the control of NO_x emissions from the GG4-9A turbine engines.

Step 3 – Rank Control Technologies by Control Effectiveness

In Step 3 of the "top-down" approach, control technologies not eliminated in Step 2 are ranked in order of control effectiveness. All the control technologies considered in Step 2 are considered as not technically feasible.

Step 4 – Evaluate the Most Effective Controls

Since all the control technologies considered in Step 2 are considered as technically infeasible, no evaluation was done.

Step 5 – Select BACT

In the absence of any feasible control technologies currently available, direct atmospheric exhaust with no controls is determined to be BACT.

4.4.3 Sulfur Dioxide

Step 1 – Identification of SO_2 Control Technologies

SO_2 is generated during the combustion process as a result of the thermal oxidation of the sulfur contained in the fuel. While the SO_2 generally remains in a gaseous phase throughout the flue gas flow path, a small portion of the SO_2 may be oxidized to SO_3. The SO_3 can subsequently combine with water vapor to form sulfuric acid (H_2SO_4). Technologies employed to control SO_2 from combustion sources consist of fuel treatment and post-combustion add-on controls that rely on chemical reactions within the control device to reduce the concentration of SO_2 in the flue gas [also referred to as flue gas desulfurization (FGD) systems].

The EPA's RBLC database was queried for SO_2 BACT determinations for turbines at test facilities; the results are presented in Table 4-3. As shown, control technologies were not applied for SO_2 emissions.

The following potential control options are identified and are discussed in the following paragraphs:

- Fuel treatment, and
- FGD systems.

Fuel Treatment

Fuel treatment technologies are applied to gaseous, liquid, and solid fuels to reduce their sulfur contents prior to delivery to the end user. The only fuel currently burned in the GG4-9A turbines is JP-8 jet fuel. The sulfur content of the JP-8 fuel is very low at 0.11 percent. Therefore, additional treatment of the fuel is not warranted.

Flue Gas Desulfurization Systems

FGD systems are post-combustion control technologies that rely on chemical reactions within the control device to reduce the concentration of SO_2 in the flue gas. The chemical reaction with an alkaline chemical, which can be performed in a wet or dry contact system, converts the SO_2 to sulfite or sulfate salts. The following FGD systems are discussed:

Wet Scrubber – The wet scrubber is a once-through wet technology. In a wet scrubber system, a reagent is slurried with water and sprayed into the flue gas stream in an absorber vessel. The SO_2 is removed from the flue gas by sorption and reaction with the slurry. The by-products of the sorption and reaction are in a wet form upon leaving the system and must be dewatered prior to transport/disposal.

The wet scrubber can be further classified on the basis of the reagents used and the by-products generated. The typical reagents are lime and limestone. Additives, such as magnesium, may be added to the lime or limestone to increase the reactivity of the reagent. Seawater has also been used as a reagent since it has a high concentration of dissolved limestone. The reaction by-products are calcium sulfite and/or calcium sulfate. The calcium sulfite to calcium sulfate reaction is a result of oxidation, which can be inhibited or forced depending on the desired by-product. The most common wet scrubber application utilizes limestone as the reagent and forced oxidation of the reaction by-products to form calcium sulfate.

SO_2 control efficiencies for wet limestone FGD range from 50 to 98 percent, depending on the type of device and design, with an average of 90 percent.

Spray Dryer Absorber (Dry Scrubber) – The dry scrubber is a once-through dry technology. In a dry scrubber system, lime, the reagent, is slurried with water and sprayed into the flue gas stream in an absorber vessel. The SO_2 is removed from the flue gas by sorption and reaction with the slurry. The by-products of the sorption and reaction are in a dry form upon leaving the system and are subsequently captured in a downstream particulate collection device, typically a baghouse.

A dry scrubber can use either lime or sodium carbonate as reagent. A typical dry scrubber will use lime as the reagent because it is more readily available than sodium carbonate and the sodium-based reactions produce a soluble by-product that requires special handling.

Lime spray drying efficiency ranges from 70 to 96 percent, with an average of 90 percent. The use of a PM control device after the dry scrubber (in which the slurry leaving the wet system must be dewatered and the gas cooled to adiabatic saturation temperature) differs from the wet scrubber system (which requires the particulate control device to be located upstream of the scrubber). The dry byproduct from the dry scrubber system is generally not marketable, since the byproducts includes fly ash and reacted SO_2 and calcium compounds. In contrast, the wet limestone FGD system can produce a marketable byproduct (i.e., gypsum).

Because the dry scrubber absorber construction material is usually carbon steel, the capital costs are usually less expensive as compared with wet scrubbers. However, the necessary use of lime in the process increases its annual operational costs.

Regenerative Process – Regenerative FGD systems can be either wet or dry and result in a concentrated stream of SO_2, which can then be sold. These systems include sodium sulfite, magnesium oxide, sodium carbonate, and amine.

In regenerative processes, the sorbent is regenerated chemically or thermally and re-used. Elemental sulfur or H_2SO_4 is recovered from the SO_2 removed. The revenue from these by-products can compensate partially for the higher capital cost required in such systems. In general, regenerative processes require no waste disposal, produce little waste water, and have low sorbent make-up requirements. However, in most systems, a pre-scrubber is essential to control chlorides. Although these processes can achieve high SO_2 removal efficiencies (> 95 percent), they have in general high capital costs and power consumption.

Step 2 – Technical Feasibility Analysis

Technical feasibility of the potential control options is evaluated below.

- **Fuel Treatment.** The sulfur content of the JP-8 fuel is already very low, and therefore, additional fuel treatment is not considered as an option for the JP-8 fuel currently burned in the GG4-9A turbine engines.
- **Flue Gas Desulfurization.** The removal efficiency of a FGD system decreases with decreasing inlet SO_2 concentration. FGD technology has been shown to function efficiently on emissions streams with relatively high uncontrolled sulfur levels (for example, for boilers firing high-sulfur coal). There have been no applications of FGD technology to low SO_2 emitting sources, such as natural gas-fired turbines. The low sulfur content of the JP-8 fuel also results in a low SO_2 concentration in the exhaust gas.

  As a result, the FGD technology is not considered to be technically feasible for the GG4-9A turbine engines.

Step 3 – Rank Control Technologies by Control Effectiveness

All the control technologies considered in Step 2 are considered as not technically feasible.

Step 4 – Evaluate the Most Effective Controls

Since all the control technologies considered in Step 2 are considered as technically infeasible, no evaluation was done.

Step 5 – Select BACT

In the absence of any feasible control technologies currently available, direct atmospheric exhaust with no controls is determined to be the BACT for SO_2.

TABLE 4-1
SUMMARY OF CO BACT DETERMINATIONS FOR JET FUEL-FIRED CTS (1999-2009)
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

Facility Name	State	Permit Issued	Process Info	Control Method	CO Limit 1	CO Limit 2	Basis
General Electric Aircraft Engines Peebiles Test Facility	OH	02/05/2008	Test Stand for Jet Engines	None	480 lb/hr	159.8 TPY[a]	BACT-PSD
John C Stennis Space Center - NASA	MS	08/06/2007	Rocket Test Stand	Good Operating Practices	558,600 lb/test		
General Electric Aircraft Engines Peebiles Test Facility	OH	02/15/2007	Test Stand for Jet Engines	None	480 lb/hr	228.4 TPY[a]	BACT-PSD
General Electric Aircraft Engines Peebiles Test Facility	OH	09/27/2005	Test Stand for Jet Engines	None	850 lb/hr	164.3 TPY[a]	BACT-PSD
National Aeronautics Space Administration (NASA)	MS	03/26/2000	Rocket Test Stands	Good Operating Practices	558,600 lb/test		

[a] Rolling 12 month total

Source: EPA, 2009 (RBLC database).

TABLE 4-2
SUMMARY OF NO_X BACT DETERMINATIONS FOR JET FUEL-FIRED CTS (1999-2009)
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

Facility Name	State	Permit Issued	Process Info	Control Method	NO_x Limit	Basis
General Electric Aircraft Engines Peebiles Test Facility	OH	2/5/2008	Test Stand for Jet Engines	None	257.8 TPY[a]	BACT-PSD
General Electric Aircraft Engines Peebiles Test Facility	OH	02/15/2007	Test Stand for Jet Engines	None	797.2 TPY[a]	BACT-PSD
General Electric Aircraft Engines Peebiles Test Facility	OH	09/27/2005	Test Stand for Jet Engines	None	797.2 TPY[a]	BACT-PSD

[a] Rolling 12 month total

Source: EPA, 2009 (RBLC database).

TABLE 4-3
SUMMARY OF SO_2 BACT DETERMINATIONS FOR JET FUEL-FIRED CTS (1999-2009)
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

Facility Name	State	Permit Issued	Process Info	Control Method	SO_2 Limit	Basis
General Electric Aircraft Engines Peebiles Test Facility	OH	2/5/2008	Test Stand for Jet Engines	None	42.6 lb/hr	BACT-PSD
General Electric Aircraft Engines Peebiles Test Facility	OH	02/15/2007	Test Stand for Jet Engines	None	70.1 lb/hr	BACT-PSD
General Electric Aircraft Engines Peebiles Test Facility	OH	09/27/2005	Test Stand for Jet Engines	None	153.2 lb/hr	BACT-PSD

Source: EPA 2009 (RBLC database)

5.0 AMBIENT MONITORING ANALYSIS

The PSD rules require that an air quality analysis be conducted for each criteria and non-criteria pollutant subject to regulation under the CAA before a major stationary source or major modification at a major stationary source is constructed. Criteria pollutants are those pollutants for which AAQS have been established. Non-criteria pollutants are those pollutants that may be regulated by emission standards, for which AAQS have not been established. This analysis may be performed by the use of modeling and/or by monitoring the air quality. In addition, if EPA has not established an acceptable ambient monitoring method for the pollutant, monitoring is not required.

Based on the potential emissions from the project (see Table 3-3), pre-construction ambient monitoring analyses for SO_2, NO_2, CO, and O_3 (based on NO_x emissions) may be required as part of the application. Ambient monitoring analyses may not be required if it can be demonstrated that the proposed source's maximum air quality impacts will not exceed the PSD *de minimis* concentration levels, and, for O_3 (based on VOC and NO_x emissions), VOC or NO_x emissions of 100 TPY.

As shown in Section 6.9, the project's maximum impacts are predicted to be below the PSD *de minimis* concentration levels for SO_2, NO_x, and CO. As a result, an exemption from the preconstruction ambient monitoring requirements is requested for these pollutants for this application.

For O_3, the project's NO_x emissions are greater than 100 TPY and a preconstruction ambient monitoring analysis for O_3 is required as part of the application.

5.1 O_3 Ambient Monitoring Analyses

Palm Beach County and adjacent counties are classified as attainment for O_3. The nearest monitor to the site that measures O_3 concentrations is located at Royal Palm Beach (AIRS No. 12-099-0009) in Palm Beach County, approximately 23.4 km (14.5 miles) to the east of the project site. This station is operated by the Palm Beach County Health Department and measures concentrations according to EPA procedures. Since O_3 is a regional pollutant, O_3 monitoring data collected in Palm Beach County are considered to be representative of O_3 concentrations for the region and are used to satisfy this requirement for the project.

As shown in Table 5-1, from 2006 through 2008, the maximum of the second-highest 1-hour average O_3 concentrations measured at Royal Palm Beach was 182 μg/m^3. This maximum concentration is less than the existing 1-hour average O_3 AAQS of 235 μg/m^3. In addition, the maximum of the 3-year averages of the fourth-highest 8-hour average O_3 concentrations was 131 μg/m^3, which is below the revised 8-hour average O_3 AAQS of 147 μg/m^3.

PWR requests that these O_3 monitoring data be used to satisfy the preconstruction monitoring requirement for the project.

TABLE 5-1
SUMMARY OF MAXIMUM MEASURED O_3 CONCENTRATIONS FOR PALM BEACH COUNTY, 2006 TO 2008

					Concentration (μg/m³)				
					1-Hour		8-Hour		
			Measurement Period			2nd		2nd	3-year Average
Site No.	Operator	Location	Year	Months	Highest	Highest	Highest	Highest	4th Highest
Ozone [a]		**Florida AAQS**			**NA**	**235**	**NA**	**NA**	**147**
12-099-0009	PBCHD	Royal Palm Beach	2006	Jan-Dec	198.1	182.4	164.8	155.0	131.4
			2007	Jan-Dec	155.0	153.0	135.3	133.4	129.5
			2008	Jan-Dec	164.8	145.2	156.9	135.4	129.5
12-099-0020	PBCHD	Lantana	2006	Jan-Dec	186.4	168.7	153.0	153.0	111.8
			2007	Jan-Dec	192.2	180.5	141.2	137.3	129.5
			2008	Jan-Dec	206.0	137.3	182.4	127.5	131.4

Note: NA = not applicable.
AAQS = ambient air quality standard.
PBCHD = Palm Beach County Health Department.

[a] On March 27, 2008, EPA promulgated revised AAQS for ozone. The O_3 standard was modified to be 0.075 ppm (147 μg/m³) for the 8-hour average; achieved when the 3-year average of 99th percentile values is 0.075 ppm or less. FDEP has not yet adopted the revised standards.

Source: EPA, 2008.

6.0 AIR QUALITY IMPACT ANALYSIS

6.1 Significant Impact Analysis Approach

6.1.1 PSD Class II Areas (Near-Field)

The general modeling approach for the significant impact analysis for PWR in the PSD Class II areas followed EPA and FDEP modeling guidelines for determining compliance with AAQS and PSD increments. For all criteria pollutants that will be emitted in excess of the PSD significant emission rate due to a proposed project, a significant impact analysis is performed to determine whether the emission and/or stack configuration changes due to the project alone will result in impacts that are predicted to be greater than the EPA PSD Class II significant impact levels (see Table 3-1). For this project, emission increases above the PSD significant emission rates are estimated to occur for the following criteria pollutants:

- CO;
- NO_x; and
- SO_2.

Current FDEP policies stipulate that the highest annual average and highest short-term (i.e., 24-hour or less) concentrations are to be compared to the applicable significant impact levels. If project-only impacts are predicted to be above the significant impact levels in the vicinity of the facility, then two additional and more detailed air modeling analyses are required. The first analysis must demonstrate that the project's impacts with those from background PSD sources are in compliance with national and Florida AAQS. The second analysis must demonstrate that the project's impacts with those from background PSD sources are in compliance with allowable PSD Class II increments.

6.1.2 PSD Class I Areas (Far-Field)

Generally, if a major new facility or major modification to a major facility is located within 200 km of a PSD Class I area, then a significant impact analysis is performed to evaluate the impacts of the project alone at the PSD Class I area. The existing PWR site is located approximately 128 km north of the Everglades NP PSD Class I area and 292 km from the Chassahowitzka National Wildlife Area (NWA) PSD Class I area. As a result, the PSD Class I analysis addressed impacts only at the Everglades NP. The maximum project impacts are compared to EPA's proposed significant impact levels for PSD Class I areas (see Table 3-1). These recommended levels are the currently accepted criteria to determine whether a proposed project is predicted to have a significant impact on a PSD Class I area.

If the maximum project-only impacts at Everglades NP are predicted to be above the proposed EPA PSD Class I significant impact levels, then a cumulative source analysis is performed to demonstrate compliance with allowable PSD Class I increments.

6.2 Pre-Construction Monitoring Analysis Approach

The project's maximum impacts are compared to the *de minimis* monitoring levels to determine whether the project is subject to pre-construction monitoring requirements. For all applicable pollutants that have emission increases greater than the PSD significant emission rates, an impact analysis is performed to determine whether the project alone will result in predicted impacts that will exceed the EPA *de minimis* monitoring levels at any off-plant property locations in the vicinity of the plant. Current FDEP policies stipulate that the predicted highest annual average and highest short-term concentrations are to be compared to the applicable *de minimis* monitoring levels (see Table 3-2).

A proposed major stationary facility or major modification at a major facility may be exempt from pre-construction ambient monitoring requirements with respect to a particular pollutant if the emissions increase of that pollutant due to the project would result in air quality impacts less than the *de minimis* monitoring levels. If the project's maximum predicted impacts are less than the *de minimis* monitoring level for a pollutant, an exemption from the preconstruction monitoring requirements can be requested for that pollutant.

6.3 AAQS and PSD Increment Analysis Approach

6.3.1 PSD Class II Areas (Near-Field)

If the project-only impacts are predicted to be greater than the significant impact levels, the air modeling analyses must consider other nearby sources and background concentrations, and determine the cumulative impact of these sources for comparison to AAQS and PSD increments.

In general, when 5 years of meteorological data are used in the analysis, the highest annual and the HSH short-term concentrations are compared to the applicable AAQS and allowable PSD increments. The HSH concentration is calculated each year for a receptor field by:

- Eliminating the highest concentration predicted at each receptor,
- Identifying the second-highest concentration at each receptor, and
- Selecting the highest concentration among these second-highest concentrations.

The approach is consistent with AAQS and allowable PSD increments, which permit a short-term average concentration to be exceeded once per year at each receptor.

It should be noted that for determining compliance with the 24-hour AAQS for PM_{10}, the highest of the sixth-highest concentrations predicted at each receptor over 5 years of meteorological data (i.e., H6H), instead of the HSH concentration predicted for each year, is used to compare to the applicable 24-hour AAQS.

The AAQS analysis is a cumulative source analysis that evaluates whether the air quality impact concentrations from all sources will comply with the AAQS. These concentrations would include the modeled impacts from sources at the site and from other nearby facility sources, added to a background concentration. The background concentration accounts for sources not included in the modeling analysis.

The PSD Class II analysis is a cumulative source analysis that evaluates whether the air quality impact concentrations for increment-affecting sources will comply with the allowable PSD Class II increments. These concentrations would include the modeled impacts from PSD increment-affecting sources at the site, plus nearby PSD increment-affecting sources at other facilities.

6.3.2 PSD Class I Areas (Far-Field)

If the project only impacts are predicted to be greater than the proposed Class I significant impact levels, a cumulative source PSD Class I analysis is required. The PSD Class I cumulative source analyses evaluate whether the air quality impact concentrations from all increment-affecting sources located within 200 km of the PSD Class I area will comply with the allowable PSD Class I increments. These concentrations would include the impacts from PSD increment-affecting sources at the site, plus the impacts from PSD increment-affecting sources at other facilities.

6.4 Model Selection

The selection of one or more air quality models to estimate maximum air quality impacts must be based on the model's ability to simulate impacts in all key areas surrounding a project site. For predicting concentrations at receptors that are located within 50 km of a project site, FDEP recommends using the American Meteorological Society and EPA Regulatory Model (AERMOD) dispersion model. The AERMOD model was selected and used for predicting concentrations in the vicinity of the PWR site. For predicting concentrations at receptors that are located more than 50 km from a project site, the California Puff model (CALPUFF) is recommended for use by FDEP and the Federal Land Manager (FLM).

The AERMOD model calculates hourly concentrations based on hourly meteorological data and is applicable for most applications, since it is recognized as containing the latest scientific algorithms for simulating plume behavior in all types of terrain. AERMOD Version 07026 is the most recent available version on EPA's Internet web site: Support Center for Regulatory Air Models (SCRAM) within the Technology Transfer Network (TTN). A listing of AERMOD features is presented in Table 6-1.

CALPUFF, Version 5.8, is the current EPA-approved model recommended for use by the EPA on the SCRAM internet website. A listing of CALPUFF features is presented in Table 6-2. CALPUFF is a long-range transport model applicable for estimating the air quality impacts in areas that are more than 50 km from a source. The methods and assumptions used in CALPUFF are based on the latest recommendations for modeling analyses as presented in the following reports:

- The Interagency Workgroup on Air Quality Models (IWAQM), Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts (EPA, 1998);
- The Federal Land Manager's Air Quality Relative Values Workgroup (FLAG) Phase I Report (December 2000); and
- The Interagency Monitoring of Protected Visual Environments (IMPROVE), Revised IMPROVE Algorithm for Estimating Light Extinction from Particle Speciation DataNovember 2006.

Since the entire Everglades NP PSD Class I area is beyond 50 km from the project site, CALPUFF was used to predict maximum pollutant impacts at that area. In addition, CALPUFF was used to predict the project's potential impact on visibility in the form of regional haze and the annual deposition of total sulfur and nitrogen at the Everglades NP.

For modeling analyses that will undergo regulatory review, such as PSD permit applications, the following modeling features are recommended by EPA and are incorporated as the regulatory default options in AERMOD and, where applicable, CALPUFF:

- Use the elevated terrain algorithms requiring input of terrain height data;
- Use stack-tip downwash (except for building downwash cases);
- Use calms processing routines;
- Use the missing data processing routines; and
- Use a 4-hour half life for exponential decay of SO_2 for urban sources.

For this project, the EPA regulatory default options were used to address maximum impacts.

6.5 Meteorological Data

6.5.1 Site Vicinity

Meteorological data used with the AERMOD model to determine maximum air quality impacts in the vicinity of the PWR site consisted of a concurrent 5-year period of hourly surface weather observations from the National Weather Service (NWS) office located at the Palm Beach International Airport (PBI). The period of record is 2001 through 2005. The NWS office at PBI is located approximately 36 km (22 miles) east-northeast of the site and is the closest primary weather station to the study area considered to have meteorological data representative of the project site. As the PBI meteorological station is only 36 km from the project site and the terrain between the two sites is mostly flat, the wind direction and wind speed frequencies that are experienced at PBI are considered to be very similar to that experienced at the PWR site. As such, the PBI wind direction and wind speed frequencies are considered to be representative of the site.

AERMOD incorporates land use parameters for determining boundary layer parameters that are used for dispersion. AERSURFACE reads land use files developed by the U.S. Geological Survey (USGS) and provides average land use values for albedo, Bowen ratio, and surface roughness within a specified radius. Current air modeling guidance suggests that the land use parameters should be representative of the data measurement site (i.e., PBI). In March 2009, EPA updated their recommendations for determining the surface land use characteristics in its AERMOD Implementation Guide. The Guide recommends the following procedures:

- Surface roughness length should be based on an inverse-distance weighted geometric mean for the default upwind distance of 1 km relative to the measurement site.
- The Bowen ratio should be based on a simple, unweighted geometric mean over a default 10-km by 10-km domain. There should be no direction or distance dependency for the data.
- The albedo should be based on a simple unweighted arithmetic mean for the same domain used for the Bowen ratio.

AERSURFACE Version 08009 (EPA, January 9, 2008) was used to calculate these surface characteristics. Land cover data were obtained from the USGS National Land Cover Data 1992 archives (NLCD92) in the form of a GeoTIFF file covering the entire state of Florida. The USGS data were downloaded from the following website:
http://edcftp.cr.usgs.gov/pub/data/landcover/states/

Land use data values in the vicinity of PBI and the PWR site were extracted from the land use data using the AERSURFACE program. AERSURFACE was used to extract land use data for 12 wind direction sectors covering 360 degrees. The average land use values obtained for each site area are as follows.

Average land use around PBI:

- Albedo – 0.17
- Bowen ratio – 0.82
- Surface roughness – 0.104 meter

Average land use around the PWR site:

- Albedo – 0.14
- Bowen ratio – 0.13
- Surface roughness – 0.33 meter

While the average albedos for the two sites are considered similar, the Bowen ratios and surface roughness values are somewhat different. Therefore, while the wind direction and wind speed frequencies are considered quite representative of the PWR site, the average Bowen ratio and surface roughness values at PBI ware considered to be less representative of those at the PWR site. It should be noted that in spite of the very flat terrain that is characteristic of south Florida, such differences in land use within even 36 km are not uncommon or unexpected in this area. Consequently, unless a project site is very close to where surface observations are measured, the two sites will not necessarily have similar land use characteristics.

To assess the potential effect that the differences in land use values between the PBI and PWR site may have on the maximum predicted concentrations in the vicinity of the PWR site, the PBI meteorological data were processed with the land use values developed for the PWR site. An air modeling analysis was then performed using these data and the results compared with those predicted using the PBI land use values.

The results indicated that use of the project site's land use parameters in the air modeling analysis resulted in predicted air quality impacts up to 11 percent higher than those predicted using the PBI land use parameters. A summary of these results is presented in Section 6.9. As such, the PBI meteorological data with the land use values from the PWR site were selected for the modeling analysis. It should be noted that the PBI meteorological data have been approved by the FDEP and used for numerous air modeling studies located in Palm Beach County.

6.5.2 PSD Class I Area of the Everglades NP

The CALPUFF air modeling analysis was conducted using 4-km resolution gridded meteorological data sets originally developed by the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) for the purpose of conducting visibility impairment analyses under the Best Available Retrofit Technology (BART) rule. The FLM recompiled these data sets with the California Meteorological Model (CALMET), Version 5.8, for use in PSD applications. Golder obtained these datasets from FDEP and both FDEP and FLM have recommended their use for PSD projects. The period of record is from 2001 to 2003.

6.6 Emission Inventory

Summaries of criteria pollutant emission rates, physical stack parameters, and stack operating parameters for the proposed project that were used in the air modeling analysis are presented in Tables 6-3 and 6-4, respectively.

For the significant impact analysis, a generic emission rate of 2.0 grams per second (g/s) was used to represent the emissions of the proposed engines. Each engine was modeled at one half of these emissions, or 1.0 g/s. These modeling results produced relative concentrations as a function of the modeled emission rate (i.e., $\mu g/m^3$ per 2.0 g/s). These impacts are referred to as generic pollutant impacts. Maximum air quality impacts for CO, NO_2, and SO_2 were then determined by multiplying the respective pollutant-specific emission rate, in pounds per hour (lb/hr), by the maximum predicted generic impact divided by 15.87 lb/hr (i.e., 2.0 g/s).

For the Everglades NP PSD Class I area, a significant impact analysis as well as the visibility and deposition analyses were performed for the proposed project using the CALPUFF model.

PWR has proposed 3,000 hr/yr as the maximum hours of operation for the proposed project. However, as a conservative approach, the modeling analyses were performed using 8,760 hr/yr. This was done to demonstrate a worst-case scenario for the modeling analyses in the PSD Class I and II areas.

6.7 Building Downwash Effects

Aerodynamic forces in the vicinity of structures and obstacles, such as buildings, disturb atmospheric flow fields. This flow disturbance near buildings and other structures can enhance the dispersion of emissions from stacks affected by the disturbed flow. The disturbance can also reduce the effective height of emissions from stacks located near buildings and obstacles. The height of these disturbances can be compared to the release points of modeled sources. For sources with release points above these disturbances, the effect on dispersion is not significant.

The AERMOD model specifically incorporates the effects of atmospheric downwash by utilizing downwash algorithms based on stack and building locations and heights which are input to the model. Significant existing and proposed building structures at PWR are identified in the site plot plan (see Figure 2-2). Building dimensions for the structures were entered into the EPA's Building Profile Input Program (BPIPPRM, Version 04274) for the purpose of developing wind direction-specific building dimensions for input to AERMOD. The dimensions of the existing structures are presented in Table 6-5.

6.8 Receptor Locations

6.8.1 Site Vicinity

Receptor locations used in the modeling analysis were based on Universal Transverse Mercator (UTM) coordinates from Zone 17, North American Datum 1983 (NAD83). The air modeling origin was assumed to be located at the test stand A09 stack, which has UTM east and north coordinates of 563,280 and 2,976,201 meters, respectively.

A Cartesian receptor grid was used extending from the plant property boundary out to 10 km. Receptors were located at the following intervals and distances from the air modeling origin:

- Every 50 meters along the PWR property boundary;
- Every 100 meters from the plant property to 2,000 meters;
- Every 250 meters from 2,000 to 5,000 meters;
- Every 500 meters from 5,000 to 7,500 meters; and
- Every 1,000 meters from 7,500 to 10,000 meters.

The heights above mean sea level (msl) for all receptors were extracted from available 1-degree digital elevation model (DEM) data from the USGS website and AERMOD's terrain preprocessing program AERMAP.

6.8.2 PSD Class I area at the Everglades NP

The air modeling origin was also assumed to be located at the test stand A09 stack with x and y Lambert Conformal Coordinates of 1,670.001 and −1,300.840 meters, respectively, for CALPUFF modeling.

The project's impacts at the Everglades NP were predicted using an array of 901 discrete receptors obtained from the National Park Service (NPS) extraction program.

6.9 Model Results

6.9.1 PSD Class II Significant Impact Analysis

The maximum pollutant concentrations predicted for the proposed project, using the PWR and PBI site land use data, are compared to the PSD Class II significant impact levels in Tables 6-6 and 6-7, respectively. As shown in the tables, the maximum pollutant impacts for the project predicted when using PWR land use data are up to 11 percent higher than the impacts predicted when using PBI land use data.

The modeling results indicate that maximum concentrations due to the proposed project alone are predicted to be less than the significant impact levels for the modeled pollutants. No additional modeling with background sources is required. As a result, the project's impacts are determined to comply with the AAQS and PSD Class II increments.

6.9.2 PSD Class I Significant Impact Analysis

The maximum NO_2 and SO_2 concentrations predicted for the proposed project at the Everglades NP are presented in Table 6-8. As shown, the maximum impacts are predicted to be less than the proposed PSD Class I significant impact levels for all pollutants. As a result, the project's impacts are determined to comply with the PSD Class I increments. No additional modeling with background sources is required.

6.9.3 *De Minimis* Monitoring Analysis Results

The project's maximum pollutant impacts are predicted to be less than the *de minimis* monitoring concentration levels for CO, NO_x, and SO_2. Therefore, an exemption from the preconstruction ambient monitoring requirements is requested for this project for each applicable pollutant.

6.10 Conclusions

Based on the air quality modeling analyses, the maximum pollutant concentrations due to the project are predicted to be less than the PSD Class II and I significant impact levels. As a result, the proposed project will comply with all applicable AAQS and PSD Class I and II increments and is not expected to have an adverse effect on human health and welfare.

TABLE 6-1
MAJOR FEATURES OF THE AERMOD MODEL, VERSION 07026

AERMOD Model Features
• Plume dispersion/growth rates are determined by the profile of vertical and horizontal turbulence, vary with height, and use a continuous growth function.
• In a convective atmosphere, uses three separate algorithms to describe plume behavior as it comes in contact with the mixed layer lid; in a stable atmosphere, uses a mechanically mixed layer near the surface.
• Polar or Cartesian coordinate systems for receptor locations can be included directly or by an external file reference.
• Urban model dispersion is input as a function of city size and population density; sources can also be modeled individually as urban sources.
• Stable plume rise: uses Briggs equations with winds and temperature gradients at stack top up to half-way up to plume rise. Convective plume rise: plume superimposed on random convective velocities.
• Procedures suggested by Briggs (1974) for evaluating stack-tip downwash.
• Has capability of simulating point, volume, area, and multi-sized area sources.
• Accounts for the effects of vertical variations in wind and turbulence (Brower et al., 1998).
• Uses measured and computed boundary layer parameters and similarity relationships to develop vertical profiles of wind, temperature, and turbulence (Brower et al., 1998).
• Concentration estimates for 1-hour to annual average times.
• Creates vertical profiles of wind, temperature, and turbulence using all available measurement levels.
• Terrain features are depicted by use of a controlling hill elevation and a receptor point elevation.
• Modeling domain surface characteristics are determined by selected direction and month/season values of surface roughness length, albedo, and Bowen ratio.
• Contains both a mechanical and convective mixed layer height, the latter based on the hourly accumulation of sensible heat flux.
• The method of Pasquill (1976) to account for buoyancy-induced dispersion.
• A default regulatory option to set various model options and parameters to EPA-recommended values.
• Contains procedures for calm-wind and missing data for the processing of short term averages.

Note: AERMOD = The American Meteorological Society and EPA Regulatory Model.

Source: Paine et al., 2007.

TABLE 6-2
MAJOR FEATURES OF THE CALPUFF MODEL, VERSION 5.8

CALPUFF Model Features
• Source types: Point, line (including buoyancy effects), volume, area (buoyant, non-buoyant).
• Non-steady-state emissions and meteorological conditions (time-dependent source and emission data; gridded 3-dimensional wind and temperature fields; spatially-variable fields of mixing heights, friction velocity, precipitation, Monin-Obukhov length; vertically and horizontally-varying turbulence and dispersion rates; time-dependent source and emission data for point, area, and volume sources; temporal or wind-dependent scaling factors for emission rates).
• Efficient sampling function (integrated puff formulation; elongated puff (slug) formation).
• Dispersion coefficient options (Pasquill-Gifford (PG) values for rural areas; McElroy-Pooler values (MP) for urban areas; CTDM values for neutral/stable; direct measurements or estimated values).
• Vertical wind shear (puff splitting; differential advection and dispersion).
• Plume rise (buoyant and momentum rise; stack-tip effects; building downwash effects; partial plume penetration above mixing layer).
• Building downwash effects (Huber-Snyder method; Schulman-Scire method, PRIME).
• Complex terrain effects (steering effects in CALMET wind field; puff height adjustments using ISC model method or plume path coefficient; enhanced vertical dispersion used in CTDMPLUS).
• Subgrid scale complex terrain (CTSG option) (CTDM flow module; dividing streamline as in CTDMPLUS).
• Dry deposition (gases and particles; options for diurnal cycle per pollutant, space and time variations with a resistance model, or none).
• Overwater and coastal interaction effects (overwater boundary layer parameters; abrupt change in meteorological conditions, plume dispersion at coastal boundary; fumigation; option to use Thermal Internal Boundary Layers (TIBL) into coastal grid cells).
• Chemical transformation options (Pseudo-first-order chemical mechanisms for SO_2, SO_4, HNO_3, and NO_3; Pseudo-first-order chemical mechanisms for SO_2, SO_4, NO, NO_2, HNO_3, and NO_3 (RIVAD/ARM3 method); user-specified diurnal cycles of transformation rates; no chemical conversions).
• Wet removal (scavenging coefficient approach; removal rate as a function of precipitation intensity and type).
• Graphical user interface.
• Interface utilities (scan ISC-PRIME and AUSPLUME meteorological data files for problems; translate ISC-PRIME and AUSPLUME input files to CALPUFF input files).

Note: CALPUFF = California Puff Model.

Source: EPA, 2007.

TABLE 6-3
MODEL PARAMETERS USED FOR THE SIGNIFICANT IMPACT ANALYSIS
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

				Stack Parameters[a]							
		UTM NAD83		Physical Data				Operating Data			
		East	North	Height		Diameter		Temperature		Velocity	
Source ID	Model ID	(m)	(m)	(ft)	(m)	(ft)	(m)	(°F)	(K)	(ft/s)	(m/s)
North GG4-9A Engine	STKA09	563,280	2,976,201	26.0	7.9	5.9	1.80	750	672	200.0	60.95
South GG4-9A Engine	STKA10	563,280	2,976,207	26.0	7.9	5.9	1.80	750	672	200.0	60.95

[a] Stack parameters are based on a load of 100%, which are used in the modeling analysis for all averaging times.

TABLE 6-4
MODELED EMISSION RATES USED FOR THE SIGNIFICANT IMPACT ANALYSIS
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

		Maximum Potential Emissions[a]									
		SO_2					CO		NO_x		
		Annual			Short-Term		Short-Term		Annual		
Description	Model ID	(TPY)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(TPY)	(lb/hr)	(g/s)
North GG4-9A Engine	STKA09	93.0	21.2	2.7	26.5	3.3	298.7	37.6	501.7	114.5	14.4
South GG4-9A Engine	STKA10	93.0	21.2	2.7	26.5	3.3	298.7	37.6	501.7	114.5	14.4

[a] Maximum short term emissions are based on worst-case conditions.

TABLE 6-5
BUILDING DIMENSIONS USED FOR THE MODELING ANALYSIS
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

		Height		Length		Width	
Building Description	Model ID	(ft)	(m)	(ft)	(m)	(ft)	(m)
A09 Fuel Pad	BLD_1	15.0	4.6	73.2	22.3	16.4	5.0
A09 Test Cell	BLD_2	37.0	11.3	73.2	22.3	40.0	12.2
A09/10 Control Building	BLD_3	30.7	9.3	108.7	33.1	40.3	12.3
A10 Test Cell	BLD_4	31.5	9.6	59.5	18.2	31.2	9.5
A10 Fuel Pad	BLD_5	14.0	4.3	30.2	9.2	14.6	4.5
Compressor Building	BLD_6	23.0	7.0	55.1	16.8	52.5	16.0
A08 Fuel Pad	BLD_7	13.0	4.0	55.1	16.8	13.8	4.2
A08 Test Cell	BLD_8	31.2	9.5	53.3	16.2	40.4	12.3
A08 RDAS	BLD_9	24.2	7.4	18.9	5.8	16.5	5.0
A08 Control Building	BLD_10	12.6	3.8	96.4	29.4	57.9	17.6
A Prep High Bay	BLD_11	22.5	6.9	142.4	43.4	59.7	18.2
A Prep Low Bay	BLD_12	13.3	4.0	87.2	26.6	66.6	20.3

TABLE 6-6
MAXIMUM CO, NO_2, AND SO_2 CONCENTRATIONS PREDICTED FOR THE SIGNIFICANT IMPACT ANALYSIS, SITE LAND USE PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

Pollutant	Averaging	Maximum Emission Rates (lb/hr)	Maximum Predicted Concentrations (ug/m^3) [a]	Receptor Location UTM Coordinates (m) East	North	Time Period (YYMMDDHH)	EPA Significant Impact Level (µg/m^3)
CO	8-Hour	597.3	110	563,180	2,975,401	04090324	500
	1-Hour	597.3	202	563,380	2,975,401	04090405	2,000
NO_2 [b]	Annual	229.1	0.66	561,030	2,975,451	01123124	1
SO_2	Annual	42.5	0.16	561,030	2,975,451	01123124	1
	24-Hour	53.0	3.8	563,180	2,975,401	04090324	5
	3-Hour	53.0	12.4	563,280	2,975,401	04090324	25
Generic [c]	Annual	15.87	0.061	561,030	2,975,451	01123124	--
(2 g/s)	24-Hour	15.87	1.131	563,180	2,975,401	04090324	--
	8-Hour	15.87	2.929	563,180	2,975,401	04090324	--
	3-Hour	15.87	3.707	563,180	2,975,401	04090321	--
	1-Hour	15.87	5.359	563,380	2,975,401	04090405	--

Note: YYMMDDHH = Year, Month, Day, Hour Ending.
UTM = Universal Transverse Mercator: Zone 17.

[a] Concentrations are based on the highest predicted concentrations from AERMOD using five years of meteorological data for 2001 to 2005 consisting of surface and upper air data from the National Weather Service stations at Palm Beach International and Florida International University, respectively. Land use parameters are based on the Pratt & Whitney site.

[b] NO_x to NO_2 conversion factor of 75% applied based on recommendations in EPA's Guideline on Air Quality Models.

[c] Pollutant concentrations were based on a modeled or generic concentration predicted using a modeled emission rate of 7.937 lb/hr (1.0 g/s) for each test stand for a total of 2 g/s. Pollutant-specific concentrations were then estimated by multiplying the total modeled concentration at 2.0 g/s by the ratio of the pollutant-specific emission rate.

TABLE 6-7
MAXIMUM CO, NO_2, AND SO_2 CONCENTRATIONS PREDICTED FOR THE SIGNIFICANT IMPACT ANALYSIS
PALM BEACH INTERNATIONAL AIRPORT AND FLORIDA INTERNATIONAL UNIVERSITY LAND USE
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

Pollutant	Averaging	Maximum Emission Rates (lb/hr)	Maximum Predicted Concentrations (ug/m^3) [a]	Receptor Location UTM Coordinates (m) East	North	Time Period (YYMMDDHH)	EPA Significant Impact Level (µg/m^3)
CO	8-Hour	597.3	105	563,280	2,975,401	04090324	500
	1-Hour	597.3	213	563,280	2,975,401	04090323	2,000
NO_2 [b]	Annual	229.1	0.60	561,030	2,975,451	01123124	1
SO_2	Annual	42.5	0.15	561,030	2,975,451	01123124	1
	24-Hour	53.0	3.7	563,180	2,975,401	04090324	5
	3-Hour	53.0	12.0	563,280	2,975,401	04090324	25
Generic [c]	Annual	15.87	0.055	561,030	2,975,451	01123124	--
(2 g/s)	24-Hour	15.87	1.101	563,180	2,975,401	04090324	--
	8-Hour	15.87	2.802	563,280	2,975,401	04090324	--
	3-Hour	15.87	3.583	563,280	2,975,401	04090324	--
	1-Hour	15.87	5.670	563,280	2,975,401	04090323	--

Note: YYMMDDHH = Year, Month, Day, Hour Ending.
UTM = Universal Transverse Mercator: Zone 17.

[a] Concentrations are based on the highest predicted concentrations from AERMOD using five years of meteorological data for 2001 to 2005 consisting of surface and upper air data from the National Weather Service stations at Palm Beach International and Florida International University, respectively. land use parameters are based on the Pratt & Whitney site.

[b] NO_x to NO_2 conversion factor of 75% applied based on recommendations in EPA's Guideline on Air Quality Models.

[c] Pollutant concentrations were based on a modeled or generic concentration predicted using a modeled emission rate of 7.937 lb/hr (1.0 g/s) for each test stand for a total of 2 g/s. Pollutant-specific concentrations were then estimated by multiplying the total modeled concentration at 2.0 g/s by the ratio of the pollutant-specific emission rate.

TABLE 6-8
MAXIMUM PREDICTED NO_2 AND SO_2 IMPACTS
COMPARED TO THE EPA CLASS I SIGNIFICANT IMPACT LEVELS
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

Pollutant	Averaging Time	Maximum Concentration ($\mu g/m^3$) [a]			EPA Class I Significant Impact Levels ($\mu g/m^3$)
		2001	2002	2003	
NO_2	Annual	0.0032	0.0029	0.0040	0.1
SO_2	Annual	0.0006	0.0007	0.0009	0.1
	24-Hour	0.035	0.040	0.034	0.2
	3-Hour	0.12	0.12	0.11	1.0

[a] Based on CALPUFF using 2001, 2002, and 2003 surface and upper air meteorological data.

7.0 ADDITIONAL IMPACT ANALYSIS

This section presents the impacts that the proposed project will have on associated growth; impacts to vegetation, soils, and visibility in the vicinity of the PWR test stands; and impacts at the PSD Class I area of the Everglades NP related to AQRVs. Specifically, this section addresses Rules 62-212.400(4)(e), (8)(a) and (b), and (9), F.A.C. These rules are:

- (4) Source Information. (e) The air quality impacts, and the nature and extent of any or all general commercial, residential, industrial, and other growth which has occurred since August 7, 1977, in the area the source or modification would affect.
- (8) Additional Impact Analyses.

  (a) The owner or operator shall provide an analysis of the impairment to visibility, soils and vegetation that would occur as a result of the source or modification and general commercial, residential, industrial and other growth associated with the source or modification. The owner or operator need not provide an analysis of the impact on vegetation having no significant commercial or recreational value.

  (b) The owner or operator shall provide an analysis of the air quality impact projected for the area as a result of general commercial, residential, industrial and other growth associated with the source or modification.
- (9) Sources Impacting Federal Class I Areas. Sources impacting Federal Class I areas are subject to the additional requirements provided in 40 CFR 52.21(p), adopted by reference in Rule 62-204.800, F.A.C.

7.1 Historical Growth and Impacts Due to Associated Growth in the Project Vicinity

7.1.1 Introduction

The PWR site is located in the rural, northwest portion of Palm Beach County. Palm Beach County is bounded by Martin County to the north, Broward County to the south, and Hendry County to the west. Palm Beach County is the largest county in Florida in land area, comprising 1,974 square miles.

The RAM Test Facility is an existing operation and there are a sufficient number of workers to sustain the operation even with proposed increase in hours. As a result, the increase in hours of operation for the RAM Test Facility will not increase the PWR workforce. Therefore, no change in vehicular traffic in the area is expected, resulting in minimal, if any, effect on local and regional air quality levels.

There are also expected to be no air quality impacts due to associated commercial and industrial growth, given the location of the test stands. The existing commercial and industrial infrastructure is adequate to provide any support services the test stands might require, and would not increase with the increased operation of the test stands. Thus, this project will have little effect on the increase of growth in the area. The surrounding area is expected to remain agricultural in the future.

The following sections present air emissions and air quality data for Palm Beach County. The air quality data measured in the region of PWR indicate that the maximum air quality concentrations are well below the AAQS. Based on the trends of these maximum concentrations, the air quality has generally improved in the region since the PSD baseline date of August 7, 1977. As demonstrated in Section 6.0, the maximum air quality impacts resulting from the project are predicted to be below the significant impact levels.

7.1.2 Air Quality Discussion

7.1.2.1 Air Emissions from Stationary Sources

Based on information from annual operating reports submitted to FDEP in 2007, total emissions from the largest stationary sources in the county are as follows:

- CO: 23,739 TPY
- NO_x: 5,814 TPY
- SO_2: 6,560 TPY

7.1.2.2 Air Emissions from Mobile Sources

The trends in the air emissions of CO, VOCs, and NO_x from mobile sources in Palm Beach County show significant decreases in these emissions from 1977. The decrease in CO, VOC, and NO_x emissions were about 1,238, 117, and 33 tons per day, respectively, which represent decreases from 1977 emissions of 70, 75, and 31 percent, respectively. Total emissions from mobile sources estimated for 2008 are 195,590 TPY for CO, 14,054 TPY for VOCs, and 26,169 TPY for NO_x.

7.1.2.3 Air Monitoring Data

Since 1977, Palm Beach County has been classified as attainment or maintenance for all criteria pollutants, except for O_3. Air quality monitoring data have been collected in Palm Beach County, primarily in the eastern portion of the county. For this evaluation, the air quality monitoring data collected at the monitoring station nearest to PWR were used to assess air quality trends since 1977. Air quality monitoring data were based on the following monitoring stations:

- CO concentrations – West Palm Beach and Palm Beach;
- NO_2 concentrations – West Palm Beach and Palm Beach;
- O_3 concentrations – West Palm Beach, Royal Palm Beach, and Lantana; and
- SO_2 concentrations – Riviera Beach, South Bay, and Belle Glade.

Data collected from these stations are considered to be representative of air quality in Palm Beach County. Because these monitoring stations are generally located in more urbanized areas than the PWR area, the reported concentrations are likely to be somewhat higher than those experienced at the site.

These data indicate that the maximum air quality concentrations currently measured in the region comply with and are well below the applicable AAQS. These monitoring stations are located in areas where the highest concentrations of a measured pollutant are expected due to the combined effect of emissions from stationary and mobile sources, as well as the effects of meteorology. Therefore, the ambient concentrations in areas not monitored are expected to have pollutant concentrations less than the monitored concentrations from these sites.

7.1.2.4 CO Concentrations

The trends in the 1- and 8-hour average CO concentrations since 1977 are presented in Figures 7-2 and 7-3, respectively. As shown in these figures, measured CO concentrations have been well below the AAQS.

7.1.2.5 NO_2 Concentrations

The trends in the annual average NO_2 concentrations measured at the nearest monitors to the PWR site are presented in Figure 7-4. As shown in this figure, measured NO_2 concentrations have been well below the AAQS.

7.1.2.6 O_3 Concentrations

The trends in the 1-hour average O_3 concentrations since 1977 are presented in Figure 7-5. The 8-hour average O_3 concentrations are presented in Figure 7-6. As shown in these figures, the measured O_3 concentrations have been below the AAQS even in the more urbanized areas of Palm Beach County.

7.1.2.7 SO_2 Concentrations

The trends in the annual, 24-hour, and 3-hour average SO_2 concentrations measured near the PWR site since 1977 to 2008 are presented in Figures 7-7 through 7-9, respectively. SO_2 concentrations have been measured at three stations for various time periods throughout these years. As shown in these figures, concentrations have been and continue to be well below the AAQS.

7.2 General Discussion of Potential Air Quality Effect Levels on Soils, Vegetation and Wildlife

7.2.1 Soils

The potential and hypothesized effects of atmospheric deposition on soils include:

- Increased soil acidification;
- Alteration in cation exchange;
- Loss of base cations; and
- Mobilization of trace metals.

The potential sensitivity of specific soils to atmospheric inputs is related to two factors. First, the physical ability of a soil to conduct water vertically through the soil profile is important in influencing the interaction with deposition. Second, the ability of the soil to resist chemical changes, as measured in terms of pH and soil cation exchange capacity (CEC), is important in determining how a soil responds to atmospheric inputs.

7.2.2 Vegetation

The concentrations of pollutants, duration of exposure, and frequency of exposure influence the response of vegetation to atmospheric pollutants. The pattern of pollutant exposure expected from the facility is that of a few episodes of relatively high ground-level concentration, which occur during certain meteorological conditions, interspersed with long periods of extremely low ground-level concentrations. If there are any effects of stack emissions on plants, they will be from the short-term, higher doses. A dose is the product of the concentration of the pollutant and duration of the exposure.

In general, the effects of air pollutants on vegetation occur primarily from SO_2, NO_2, O_3, and PM. Effects from minor air contaminants, such as fluoride, chlorine, hydrogen chloride, ethylene, NH_3, hydrogen sulfide, CO, and pesticides, have also been reported in the literature. The effects of air pollutants are dependent both on the concentration of the contaminant and the duration of the exposure. The term "injury," as opposed to damage, is commonly used to describe all plant responses to air contaminants and will be used in the context of this analysis. Air contaminants are thought to interact primarily with plant foliage, which is considered to be the major pathway of exposure.

Injury to vegetation from exposure to various levels of air contaminants can be termed acute, physiological, or chronic. Acute injury occurs as a result of a short-term exposure to a high contaminant concentration and is typically manifested by visible injury symptoms ranging from chlorosis (discoloration) to necrosis (dead areas). Physiological or latent injury occurs as the result of a long-term exposure to contaminant concentrations below those that result in acute injury symptoms. Chronic injury results from repeated exposure to low concentrations over extended periods of time, often without any visible symptoms, but with some effect on the overall growth and productivity of the plant. In this assessment, 100 percent of the particular air pollutant in the ambient air was assumed to interact with the vegetation, which is a very conservative approach.

7.2.2.1 Carbon Monoxide

Information pertaining to the effects of CO on plants is scarce. The main effect of high concentrations of CO is the inhibition of cytochrome *c* oxidase, the terminal oxidase in the mitochondrial electron transfer chain. Inhibition of cytochrome *c* oxidase depletes the supply of adenosine triphosphate (ATP), the principal donor of free energy required for cell functions. However, this inhibition only occurs at extremely high concentrations of CO. Pollok et al. (1989) reported that exposure to a $CO:O_2$ ratio of 25 (equivalent to an ambient CO concentration of 6.85×10^6 $\mu g/m^3$) resulted in stomatal closure in the leaves of the sunflower (*Helianthus annuus*). Naik et al. (1992) reported cytochrome *c* oxidase inhibition in corn, sorghum, millet, and Guinea grass at $CO:O_2$ ratios of 2.5 (equivalent to an ambient CO concentration of 6.85×10^5 $\mu g/m^3$). These plants were considered the species most sensitive to CO-induced inhibition of cytochrome *c* oxidase.

7.2.2.2 Nitrogen Dioxide

NO_2 can injure plant tissue with symptoms usually appearing as irregular white to brown collapsed lesions between the leaf veins and near the margins. Conversely, non-injurious levels of NO_2 can be absorbed by plants, enzymatically transformed into NH_3, and incorporated into plant constituents such as amino acids (Matsumaru et al., 1979).

For plants that have been determined to be more sensitive to NO_2 exposure than others, acute exposure (1, 4, and 8 hours) caused 5-percent predicted foliar injury at concentrations ranging from 3,800 to 15,000 $\mu g/m^3$ (Heck and Tingey, 1979). Chronic exposure of selected plants (some considered NO_2 sensitive) to NO_2 concentrations of 2,000 to 4,000 $\mu g/m^3$ for 213 to 1,900 hours caused reductions in yield of up to 37 percent and some chlorosis (Zahn, 1975). Short-term exposure to NO_x at concentrations of 564 $\mu g/m^3$ caused adverse effects in lichen species (Holopainen and Karenlampi, 1984).

7.2.2.3 Ozone

O_3 can cause various damage to broad-leaved plants including: tissue collapse, interveinal necrosis and markings on the upper surface leaves known as stippling (pigmented yellow, light tan, red brown, dark brown, red, or purple), flecking (silver or bleached straw white), mottling, chlorosis or bronzing, and bleaching. O_3 can also stunt plant growth and bud formation. On certain plants such as citrus, grape, and tobacco, it is common for leaves to wither and drop early.

7.2.2.4 Sulfur Dioxide and Sulfuric Acid Mist

Sulfur is an essential plant nutrient usually taken up as sulfate ions by the roots from the soil solution. When SO_2 in the atmosphere enters the foliage through pores in the leaves, it reacts with water in the leaf interior to form sulfite ions. Sulfite ions are highly toxic. They interact with enzymes, compete with normal metabolites, and interfere with a variety of cellular functions (Horsman and Wellburn, 1976). However, within the leaf, sulfite ions are oxidized to sulfate ions, which can then be used by the plant as a nutrient. Small amounts of sulfite may be oxidized before they prove harmful.

Observed SO_2 effect levels for several plant species and plant sensitivity groupings are presented in Tables 7-1 and 7-2, respectively. SO_2 gas at elevated levels has long been known to cause injury to plants. Acute SO_2 injury usually develops within a few hours or days of exposure, and symptoms include marginal, flecked, and/or intercostal necrotic areas that appear water-soaked and dullish green initially. This injury generally occurs to younger leaves. Chronic injury is usually evident by signs of chlorosis, bronzing, premature senescence, reduced growth, and possible tissue necrosis (EPA, 1982). Background levels of SO_2 range from 5.2 to 15.7 µg/m^3.

Many studies have been conducted to determine the effects of high-concentration, short-term SO_2 exposure on natural community vegetation. Sensitive plants include ragweed, legumes, blackberry, southern pine, and red and black oak. These species are injured by exposure to 3-hour SO_2 concentrations of 790 to 1,570 µg/m^3. Intermediate plants include locust and sweetgum. These species are injured by exposure to 3-hour SO_2 concentrations of 1,570 to 2,100 µg/m^3. Resistant species (injured at concentrations above 2,100 µg/m^3 for 3 hours) include white oak and dogwood (EPA, 1982).

A study of native Floridian species (Woltz and Howe, 1981) demonstrated that cypress, slash pine, live oak, and mangrove exposed to 1,300 µg/m^3 SO_2 for 8 hours were not visibly damaged. This finding supports the levels cited by other researchers on the effects of SO_2 on vegetation. Another study (McLaughlin and Lee, 1974) demonstrated that approximately 20 percent of a cross-section of plants ranging from sensitive to tolerant was visibly injured at 3-hour SO_2 concentrations of 920 µg/m^3. Jack pine seedlings exposed to SO_2 concentrations of 470 to 520 µg/m^3 for 24 hours demonstrated inhibition of foliar lipid synthesis; however, this inhibition was reversible (Malhotra and Kahn, 1978). Black oak exposed to 1,310 µg/m^3 SO_2 for 24 hours a day for 1 week demonstrated a 48-percent reduction in photosynthesis (Carlson, 1979).

SO_2 is considered to be the primary factor causing the death of lichens in most urban and industrial areas. The first indications of damage from SO_2 include the inhibition of nitrogen fixation, increased electrolyte leakage, and decreased photosynthesis and respiration, followed by discoloration and death of the algal component of the lichen (Fields, 1988). Sensitive species are damaged or killed by annual average levels of SO_2 ranging from 8 to 30 µg/m^3, and very few lichens can tolerate levels exceeding 125 µg/m^3 (Johnson, 1979; DeWit, 1976; Hawsworth and Rose, 1970; LeBlanc et al., 1972). In another study, two lichen species exhibited signs of SO_2 damage in the form of decreased biomass gain and photosynthetic rate as well as membrane leakage when exposed to concentrations of 200 to 400 µg/m^3 for 6 hours per week for 10 weeks (Hart et al., 1988).

Acidic precipitation is formed from SO_2 emissions during the burning of primarily fossil fuels. This pollutant is oxidized to SO_3 in the atmosphere and dissolves in rain to form sulfuric acid mist (SAM), which falls as acidic precipitation (Ravera, 1989). Although concentration data are not available, SAM has been reported to yield necrotic spotting on the upper surfaces of leaves (Middleton et al., 1950).

7.2.3 Wildlife

A wide range of physiological and ecological effects to fauna has been reported for gaseous and particulate pollutants (Newman, 1981; Newman and Schreiber, 1988). The most severe of these effects have been observed at concentrations above the secondary AAQS. Physiological and behavioral effects have been observed in experimental animals at or below these standards. For impacts on wildlife, the lowest threshold values of SO_2, NO_x, and particulates that are reported to cause physiological changes are shown in Table 7-3.

7.2.4 Impact Analysis Methodology

A modeling analysis was preformed showing the maximum predicted ambient concentrations of air pollutants of concern in the vicinity of the site and the Everglades NP PSD Class I Area with effect threshold limits for both vegetation and wildlife as reported in the scientific literature. A literature search was conducted to determine the effects of air contaminants on plant species as well as those species reported to occur in the vicinity of the site and in the PSD Class I area. It is recognized that effect threshold information is not available for all species found in these areas, although studies have been performed on a few of the common species and on other species known to be sensitive indicators of effects. Species of lichens, which are symbiotic organisms comprised of green or blue-green algae and fungi, have been used worldwide as air pollution monitors because relatively low levels of sulfur-, nitrogen-, and fluorine-containing pollutants adversely affect many species, altering lichen community composition, growth rates, reproduction, physiology, and morphological appearance (Blett et al., 2003).

7.3 Impacts on Soils, Vegetation, Wildlife, and Visibility in the Project's Vicinity

7.3.1 Impacts on Vegetation and Soils

The primary vegetation, as well as agricultural crop, in the vicinity of the PWR is sugar cane. The site is surrounded by sugar cane fields for a large distance in all directions. Other agricultural areas are common in the local area, including rice fields, vegetable farms, nurseries, and sod farms. The west edge of the Arthur R. Marshall Loxahatchee National Wildlife Refuge (NWR) is located about 17.3 miles to the east of the PWR; vegetative communities in this area include freshwater tree islands, marsh, shrubs, and cattails. Exotic species have extensively colonized the northern, southeastern, and western portions of the Loxahatchee NWR, most notably melaleuca (*Melaleuca quinquenervia*), Brazilian pepper (*Schinus terebinthifolius*), Old World climbing fern (*Lygodium microphyllum*), water lettuce (*Pistia stratioides*), and water hyacinth (*Eichhornia crassipes*).

Soils in the area are primarily histosols, which are peat soils with high amounts of organic matter. The agricultural lands surrounding the site are part of the Everglades Agricultural Area, which is noted for its "muck", i.e., rich, black soil that is very fertile.

According to the modeling results presented in Section 6.0, the maximum air quality impacts due to the project are predicted to be below the significant impact levels. Therefore, the impacts are well below the AAQS and PSD increments. The AAQS were established to protect both public health and welfare. Public welfare is protected by the secondary AAQS, which Florida has adopted. Secondary standards set limits to protect public welfare, including protection against visibility impairment, damage to animals, crops, vegetation, and buildings (EPA, 2007) (Federal Register, Vol. 72, #132, pp. 37867-37916, July 2007).

Since the project's impacts on the local air quality are predicted to be less than the significant impact levels and less than the effect levels on soils and vegetation, the project's impacts on soils, vegetation, and wildlife in the project's vicinity are expected to be negligible. With regard to O_3 concentrations, VOC and NO_x emissions are precursors to O_3 formation, and the project's VOC and NO_x emissions represent an insignificant increase in VOC and NO_x emissions for Palm Beach County (see Subsections 7.1.2.1 and 7.1.2.2). The project's maximum NO_x emissions are 1,003.5 TPY. These emissions represent an approximate increase in total county-wide NO_x emissions of 2.7 percent.

7.3.2 Impacts on Wildlife

The major air quality risk to wildlife in the United States is from continuous exposure to pollutants above the National AAQS. This occurs in non-attainment areas, e.g., Los Angeles Basin. Risks to wildlife also may occur for wildlife living in the vicinity of an emission source that experiences frequent upsets or episodic conditions resulting from malfunctioning equipment, unique meteorological conditions, or startup operations (Newman and Schreiber, 1988). Under these conditions, chronic effects (e.g., particulate contamination) and acute effects (e.g., injury to health) have been observed (Newman, 1981).

Although air pollution impacts to wildlife have been reported in the literature, many of the incidents involved acute exposures to pollutants, usually caused by unusual or highly concentrated releases or unique weather conditions. It is highly unlikely that emissions from PWR will cause adverse effects to wildlife due to the project's low impacts, well below the AAQS. Coupled with the mobility of wildlife, the potential for exposure of wildlife to the project's impacts is extremely unlikely.

7.4 Impacts to AQRVs in the Everglades NP PSD Class I Area

7.4.1 Identification of AQRVs and Methodology

An AQRV analysis was conducted to assess the potential risk to AQRVs at the Everglades NP due to the proposed emissions from the project. The Everglades NP is the closest PSD Class I area to the site, located approximately 128 km south of the PWR site.

The U.S. Department of the Interior in 1978 defined AQRVs to be:

> *All those values possessed by an area except those that are not affected by changes in air quality and include all those assets of an area whose vitality, significance, or integrity is dependent in some way upon the air environment. These values include visibility and those scenic, cultural, biological, and recreational resources of an area that are affected by air quality.*
>
> *Important attributes of an area are those values or assets that make an area significant as a national monument, preserve, or primitive area. They are the assets that are to be preserved if the area is to achieve the purposes for which it was set aside (Federal Register, 1978, Vol. 43, #69, p. 15016).*

The AQRVs include visibility, freshwater and coastal wetlands, dominant plant communities, unique and rare plant communities, soils and associated periphyton, and the wildlife dependent on these communities for habitat. Rare, endemic, threatened, and endangered species of the national park and bioindicators of air pollution (e.g., lichens) are also evaluated.

For each pollutant emitted in excess of the EPA significant emission rate, additional analyses are required to determine the project's maximum impacts on AQRVs at the PSD Class I area. For the Everglades NP PSD Class I area, the AQRVs that need to be addressed for the project are visibility impairment and sulfur and nitrogen deposition. The evaluation of visibility impairment is in the form of regional haze determined for a 24-hour averaging time. Total nitrogen and total sulfur deposition are predicted for an annual averaging time.

The maximum concentrations for CO, NO_2, and SO_2 are shown in Table 7-4 for the annual, 24-hour, 8-hour, 3-hour and 1-hour averaging times. These maximum concentrations were compared to the potential effect levels for vegetation and wildlife in Subsection 7.2.

7.4.2 Impacts to Soils

The soils of the Everglades NP are generally classified as histosols or entisols. Histosols (peat soils) are organic and have extremely high buffering capacities based on their CEC, base saturation, and bulk density. Therefore, they would be relatively insensitive to atmospheric inputs. The entisols are shallow sandy soils overlying limestone, such as the soils found in the pinelands. The direct connection of these soils with subsurface limestone tends to neutralize any acidic inputs. Moreover, the groundwater table is highly buffered due to the interaction with subsurface limestone formations, which results in high alkalinity (as calcium carbonate).

The relatively low sensitivity of the soils to acid inputs, coupled with the extremely low ground-level concentrations of air pollutants projected for the Everglades NP from the PWR project emissions, precludes any significant impact on soils.

7.4.3 Impacts to Vegetation

7.4.3.1 Carbon Monoxide

The maximum 1-hour average CO concentration due to the project is 4.4 $\mu g/m^3$ in the Class I area, which is 0.00006 percent of the minimum value that caused inhibition in laboratory studies (i.e., 6.85×10^6 $\mu g/m^3$, see Subsection 7.2.2.1). The amount of damage sustained at this level, if any, for 1 hour would have negligible effects over an entire growing season. The maximum predicted annual concentration of 0.012 $\mu g/m^3$ reflects a more realistic, yet conservative, CO impact level for the Class I area. This maximum concentration is predicted to be less than 0.000002 percent of the value that caused cytochrome *c* oxidase inhibition (6.85×10^5 $\mu g/m^3$).

7.4.3.2 Nitrogen Dioxide

The maximum 1-, 3-, and 8-hour average NO_2 concentrations due to the project are predicted to be 0.92, 0.71, and 0.57 $\mu g/m^3$, respectively, at the Class I area. These concentrations are approximately 0.004 to 0.024 percent of the levels that could potentially injure 5 percent of vascular plant foliage (i.e., 3,800 to 15,000 $\mu g/m^3$; see Subsection 7.2.2.2), and 0.16 percent of the concentration that caused adverse effects in lichen species in acute exposure scenarios (564 $\mu g/m^3$; see Subsection 7.2.2.2). For chronic exposure, the maximum annual NO_2 concentration due to the project is predicted to be

0.0040 μg/m^3 at the Class I area, which is less than 0.0002 percent of the level that caused minimal yield loss and chlorosis in plant tissue (2,000 μg/m^3; see Subsection 7.2.2.2).

Although it has been shown that simultaneous exposure to SO_2 and NO_2 results in synergistic plant injury (Ashenden and Williams, 1980), the magnitude of this response is generally only 3 to 4 times greater than either gas alone, and usually occurs at unnaturally high levels of each gas. Therefore, the project's concentrations within the Everglades NP are still far below the levels that potentially cause plant injury for either acute or chronic exposure.

7.4.3.3 NO_x Emissions and Impacts to Ozone

NO_x emissions are precursors to O_3 formation. Based on the O_3 monitoring concentrations measured in Palm Beach County, and NO_x emissions increases due to the project, the potential change in O_3 concentrations due to the project is expected to be minimal, with the maximum O_3 concentrations in the region to remain in compliance with the AAQS. As discussed in Subsection 7.3.1, the project is projected to increase county-wide NO_x emissions by less than 3 percent. These increases are even less when the total emissions from the southeast Florida air shed are considered.

7.4.3.4 Sulfur Dioxide

The maximum annual average SO_2 concentration at the Class I area resulting from the PWR project is 0.0009 μg/m^3, less than 0.01 percent of the concentration that damaged the most sensitive lichen species (8 μg/m^3; see Subsection 7.2.2.4). The maximum 3-, 8-, and 24-hour average SO_2 concentrations for the project are predicted to be 0.12, 0.097, and 0.040 μg/m^3, respectively, at the Class I area. The maximum 3-hour average SO_2 concentration predicted for the project at the Class I area is less than 0.02 percent of the acute exposure that caused damage to sensitive species of vegetation (i.e., 790 μg/m^3; see Subsection 7.2.2.4). The modeled annual incremental increase in SO_2 adds only slightly to background levels of this gas and poses no threat to vegetation within the Everglades NP.

7.4.3.5 Sulfuric Acid Mist

Although not required for PSD review, the project's SAM emissions are addressed because SO_2 concentrations can lead directly to the formation of SAM concentrations. No significant adverse effects on vegetation are expected from the project's SAM emissions, since the SO_2 concentrations are predicted to be well below levels that have been documented as adversely affecting vegetation. Acidic deposition is an ecosystem-level problem that affects vegetation because of some alterations of soil conditions such as increased leaching of essential base cations or elevated concentrations of aluminum in the soil water (Goldstein et al., 1985). Although effects of acid rain in eastern North America have been well published and publicized, detrimental effects of acid rain on Florida vegetation are lacking documentation.

7.4.3.6 Summary

In summary, the phytotoxic effects of the project's emissions within the Everglades NP are expected to be minimal. It is important to note that emissions were evaluated with the assumption that 100 percent was available for plant uptake. This is rarely the case in a natural ecosystem.

7.4.4 Impacts to Wildlife

The project's low emissions are well below the AAQS, which are protective of soils, vegetation, and wildlife resources. The maximum predicted impacts of the project in the Class I area are up to 6 orders of magnitude lower than values of potential impacts to wildlife shown in Table 7-3. No significant effects on wildlife AQRVs from SO_2, NO_x, and CO are expected.

7.4.5 Impacts upon Visibility

7.4.5.1 Introduction

The CAA Amendments of 1977 provide for implementation of guidelines to prevent visibility impairment in mandatory Class I areas. The guidelines are intended to protect the aesthetic quality of these pristine areas from reduction in visual range and atmospheric discoloration due to various pollutants. Sources of air pollution can cause visible plumes if emissions of PM_{10} and NO_x are sufficiently large. A plume will be visible if its constituents scatter or absorb sufficient light so that the plume is brighter or darker than its viewing background (e.g., the sky or a terrain feature, such as a mountain). PSD Class I areas, such as national parks and wilderness areas, are afforded special visibility protection designed to prevent plume visual impacts to observers within a Class I area.

Visibility is an AQRV for the Everglades NP. Visibility can take the form of plume blight for nearby areas, or regional haze for long distances (e.g., distances beyond 50 km). Because the Everglades NP lies more than 50 km from the PWR site, the change in visibility is analyzed as regional haze.

Currently there are several air quality modeling approaches recommended by the IWAQM to perform these analyses. The IWAQM consists of EPA and FLMs of Class I areas who are responsible for ensuring that AQRVs are not adversely impacted by new and existing sources. These recommendations have been summarized in the IWAQM Phase 2 report and the FLAG document. The methods and assumptions recommended in these documents were used to assess visibility impairment due to the project.

7.4.5.2 Visibility Analysis at Everglades NP

Methodology

Based on the FLAG document, current regional haze guidelines characterize a change in visibility by the change in the light-extinction coefficient (b_{ext}). The b_{ext} is the attenuation of light per unit distance due to the scattering and absorption by gases and particles in the atmosphere. A change in the extinction coefficient produces a perceived visual change. An index that simply quantifies the percent change in visibility due to the operation of a source is calculated as:

$$\Delta\% = (b_{exts} / b_{extb}) \times 100$$

where: b_{exts} is the extinction coefficient calculated for the source, and
b_{extb} is the background extinction coefficient.

The purpose of the visibility analysis is to calculate the extinction at each receptor for each day (24-hour period) of the year due to the proposed project. The FLMs have recommended that a project's impacts be compared to a screening criterion based on a change in extinction of 5 percent or greater for any day of the year. If a project's impacts were less than the screening criterion, the project's impacts are assumed not to have an adverse impact on regional haze and no additional analyses would be required.

Processing of visibility impairment for this study was performed with the CALPUFF model and the CALPUFF post-processing program CALPOST. The analysis was conducted in accordance with the most recent guidance from the FLAG document. The CALPUFF postprocessor model CALPOST is used to calculate the combined visibility effects from the different pollutants that are emitted from the project. Daily background extinction coefficients are calculated on an hour-by-hour basis using hourly relative humidity data from CALMET and hygroscopic and non-hygroscopic extinction components specified in the FLAG document (i.e., Visibility Method 2). For the Everglades NP, the hygroscopic and non-hygroscopic components are 0.9 and 8.5 inverse megameters (Mm^{-1}).

CALPOST then calculates the percent extinction change for each day of the year. The visibility impairment criterion is 5.0 percent. Prior correspondence with the NPS, the FLM for the Everglades NP, has indicated that visibility results using monthly relative humidity factors (i.e., Visibility Method 6) can also be provided. It is noted that Visibility Method 6 is currently used for visibility impact analyses associated with BART regulations and is proposed for visibility assessment for PSD applications in the recent draft revised FLM's AQRV Workgroup (FLAG) Phase I Report (June 27, 2008 Draft), referred to as the proposed FLAG document.

Results

The results of the visibility analysis at the Everglades NP are presented in Table 7-5. Using Method 2, the project's maximum change in visibility is predicted to be approximately 3.99 percent. Using Method 6, which is the preferred method under the proposed FLAG document, the project's maximum change in visibility is predicted to be approximately 1.67 percent, well below the FLM's recommended screening criterion of 5 percent change. As a result, the project is not expected to have an adverse impact on existing regional haze at the PSD Class I area of the Everglades NP.

7.4.6 Sulfur and Nitrogen Deposition

7.4.6.1 General Methods

As part of the AQRV analyses, total nitrogen (N) and sulfur (S) deposition rates were predicted for the project at the Everglades NP. The deposition analysis criterion is based on the annual averaging period. The total deposition is estimated in units of kilograms per hectare per year (kg/ha/yr) of N or S. The CALPUFF model is used to predict wet and dry deposition fluxes of various oxides of these elements.

For N deposition, the species include:

- Particulate ammonium nitrate (from species NO_3), wet and dry deposition;
- Nitric acid (species HNO_3), wet and dry deposition;
- Nitrogen oxides (NO_x), dry deposition; and
- Ammonium sulfate (species SO_4), wet and dry deposition.

For S deposition, the species include:

- Sulfur dioxide (SO_2), wet and dry deposition; and
- Ammonium sulfate (SO_4), wet and dry deposition.

The CALPUFF model produces results in units of micrograms per square meter per second ($\mu g/m^2/s$), which are then converted to units of kg/ha/yr.

Deposition analysis thresholds (DATs) for total N and S deposition of 0.01 kg/ha/yr were provided by the FLM. A DAT is the additional amount of N or S deposition within a Class I area below which estimated impacts from a new or modified source are considered insignificant. The FLM has recommended DATs of 0.01 kg/ha/yr for both N and S deposition. The maximum N and S depositions predicted for the project are, therefore, compared to these DATs or significant impact levels.

7.4.6.2 Results

The maximum predicted total annual N and S depositions predicted for the project in the PSD Class I area of the Everglades NP are summarized in Table 7-6. The maximum annual N and S deposition rates for the project are predicted to be 0.0018 and 0.0007 kg/ha/yr, respectively. The deposition rates are well below the N and S DATs of 0.01 kg/ha/yr.

TABLE 7-1
SO_2 EFFECTS LEVELS FOR VARIOUS PLANT SPECIES
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

Plant Species	Observed Effect Level (μg/m^3)	Exposure (Time)	Reference
Sensitive to tolerant	920 (20 percent displayed visible injury)	3 hours	McLaughlin and Lee, 1974
Lichens	200 to 400	6 hr/wk for 10 weeks	Hart et al., 1988
Cypress, slash pine, live oak, mangrove	1,300	8 hours	Woltz and Howe, 1981
Jack pine seedlings	470-520	24 hours	Malhotra and Kahn, 1978
Black oak	1,310	Continuously for 1 week	Carlson, 1979

TABLE 7-2
SENSITIVITY GROUPINGS OF VEGETATION BASED ON VISIBLE INJURY AT DIFFERENT SO_2 EXPOSURES[a]
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

Plant Species	Observed Effect Level ($\mu g/m^3$)	Exposure (Time)	Reference
Sensitive	1,310 - 2,620 $\mu g/m^3$	790 - 1,570 $\mu g/m^3$	Ragweeds
	(0.5 - 1.0 ppm)	(0.3 - 0.6 ppm)	Legumes
			Blackberry
			Southern pines
			Red and black oaks
			White ash
			Sumacs
Intermediate	2,620 - 5,240 $\mu g/m^3$	1,570 - 2,100 $\mu g/m^3$	Maples
	(1.0 - 2.0 ppm)	(0.6 - 0.8 ppm)	Locust
			Sweetgum
			Cherry
			Elms
			Tulip tree
			Many crop and garden species
Resistant	>5,240 $\mu g/m^3$	>2,100 $\mu g/m^3$	White oaks
	(>2.0 ppm)	(>0.8 ppm)	Potato
			Upland cotton
			Corn
			Dogwood
			Peach

[a] Based on observations over a 20-year period of visible injury occurring on over 120 species growing in the vicinities of coal-fired power plants in the southeastern United States.

Source: EPA, 1982a.

TABLE 7-3
EXAMPLES OF REPORTED EFFECTS OF AIR POLLUTANTS AT CONCENTRATIONS
BELOW NATIONAL SECONDARY AMBIENT AIR QUALITY STANDARDS
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

Plant Species	Observed Effect Level (µg/m^3)	Exposure (Time)	Reference
Sulfur Dioxide[a]	Respiratory stress in guinea pigs	427 to 854	1 hour
	Respiratory stress in rats	267	7 hours/day; 5 day/week for 10 weeks
	Decreased abundance in deer mice	13 to 157	continually for 5 months
Nitrogen Dioxide[b,c]	Respiratory stress in mice	1,917	3 hours
	Respiratory stress in guinea pigs	96 to 958	8 hours/day for 122 days
Particulates[a]	Respiratory stress, reduced respiratory disease defenses	120 PbO_3	continually for 2 months
	Decreased respiratory disease defenses in rats, same with hamsters	100 $NiCl_2$	2 hours

[a] Source, Newman and Schreiber, 1988.

[b] Gardner and Graham, 1976.

[c] Trzeciak et al., 1977.

TABLE 7-4
MAXIMUM POLLUTANT CONCENTRATIONS PREDICTED AT THE EVERGLADES NATIONAL PARK
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

Pollutant	Averaging Time	Maximum Predicted Concentration[a,b] (ug/m^3)		
		2001	2002	2003
CO	Annual	0.0093	0.0094	0.0122
	24-Hour	1.0700	1.0008	0.8921
	8-Hour	3.0253	1.9360	2.4796
	3-Hour	3.7745	3.2617	2.9838
	1-Hour	4.0086	4.2012	4.4416
NO_2	Annual	0.0032	0.0029	0.0040
	24-Hour	0.2029	0.1797	0.1951
	8-Hour	0.4600	0.4812	0.5698
	3-Hour	0.7102	0.6415	0.6111
	1-Hour	0.7927	0.9182	0.8308
SO_2	Annual	0.0006	0.0007	0.0009
	24-Hour	0.0353	0.0399	0.0342
	8-Hour	0.0939	0.0803	0.0972
	3-Hour	0.1243	0.1205	0.1112
	1-Hour	0.1393	0.1696	0.1733

[a] Concentrations are based on highest predicted concentrations from CALPUFF using 3 years of meteorological data for 2001 to 2003.

[b] Based on the worst case emission rate.

TABLE 7-5
MAXIMUM 24-HOUR VISIBILITY IMPAIRMENT PREDICTED FOR THE PROPOSED PROJECT AT THE EVERGLADES NP PSD CLASS I AREA
PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

	Visibility Impairment (%) [a]			Visibility Impairment
Background Extinction Method	2001	2002	2003	Criterion (%)
Method 2 with RHMAX = 95 Percent	2.85	3.94	3.74	5.0
Method 6 with monthly F(RH) factors	1.07	1.64	1.50	5.0

Note: RHMAX is the maximum relative humidity used in the model; F(RH) is the relative humidity factor.

[a] Concentrations are highest predicted using CALPUFF V5.8 with CALMET V5.8 4-km Domains, 2001 to 2003. Background extinctions calculated using FLAG Document (December 2000) and stated method.

TABLE 7-6
ANNUAL TOTAL NITROGEN AND SULFUR DEPOSITION PREDICTED FOR THE PROPOSED PROJECT AT THE EVERGLADES NP PSD CLASS I AREA PRATT & WHITNEY ROCKETDYNE, WEST PALM BEACH, FLORIDA

Species	Year	Total Deposition (Wet & Dry) ($g/m^2/s$)	(kg/ha/yr)[a]	Deposition Analysis Threshold[b] (kg/ha/yr)
Nitrogen (N) Deposition	2001	3.48E-12	0.0011	0.01
	2002	5.57E-12	0.0018	0.01
	2003	4.55E-12	0.0014	0.01
Sulfur (S) Deposition	2001	1.71E-12	0.0005	0.01
	2002	2.25E-12	0.0007	0.01
	2003	1.70E-12	0.0005	0.01

[a] Conversion factor is used to convert $g/m^2/s$ to kg/hectare (ha)/yr with the following units:

$g/m^2/s$ x 0.001 kg/g
x 10,000 m^2/hectare
x 3,600 sec/hr
x 8,760 hr/yr = kg/ha/yr
or
$g/m^2/s$ x 3.154E+08 = kg/ha/yr

[b] Deposition analysis thresholds (DATs) for nitrogen deposition provided by the U.S. Fish and Wildlife Service, January 2002. A DAT is the additional amount of N or S deposition within a Class I area, below which estimated impacts from a proposed new or modified source are considered insignificant.

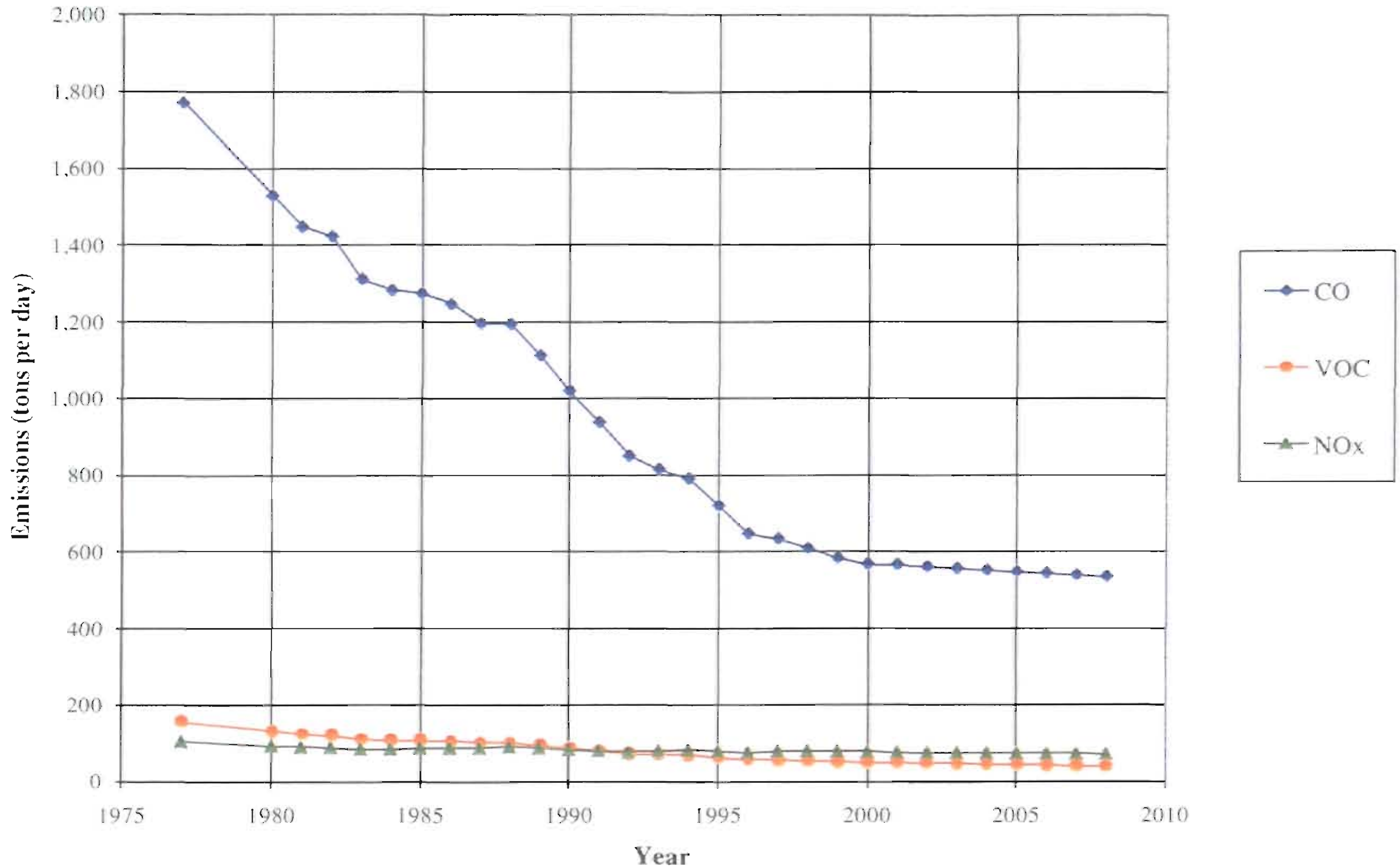


Figure 7-1
Mobile Source Emissions (tons per day) of CO, VOCs and NO_x in Palm Beach County

Source: Golder, 2009.

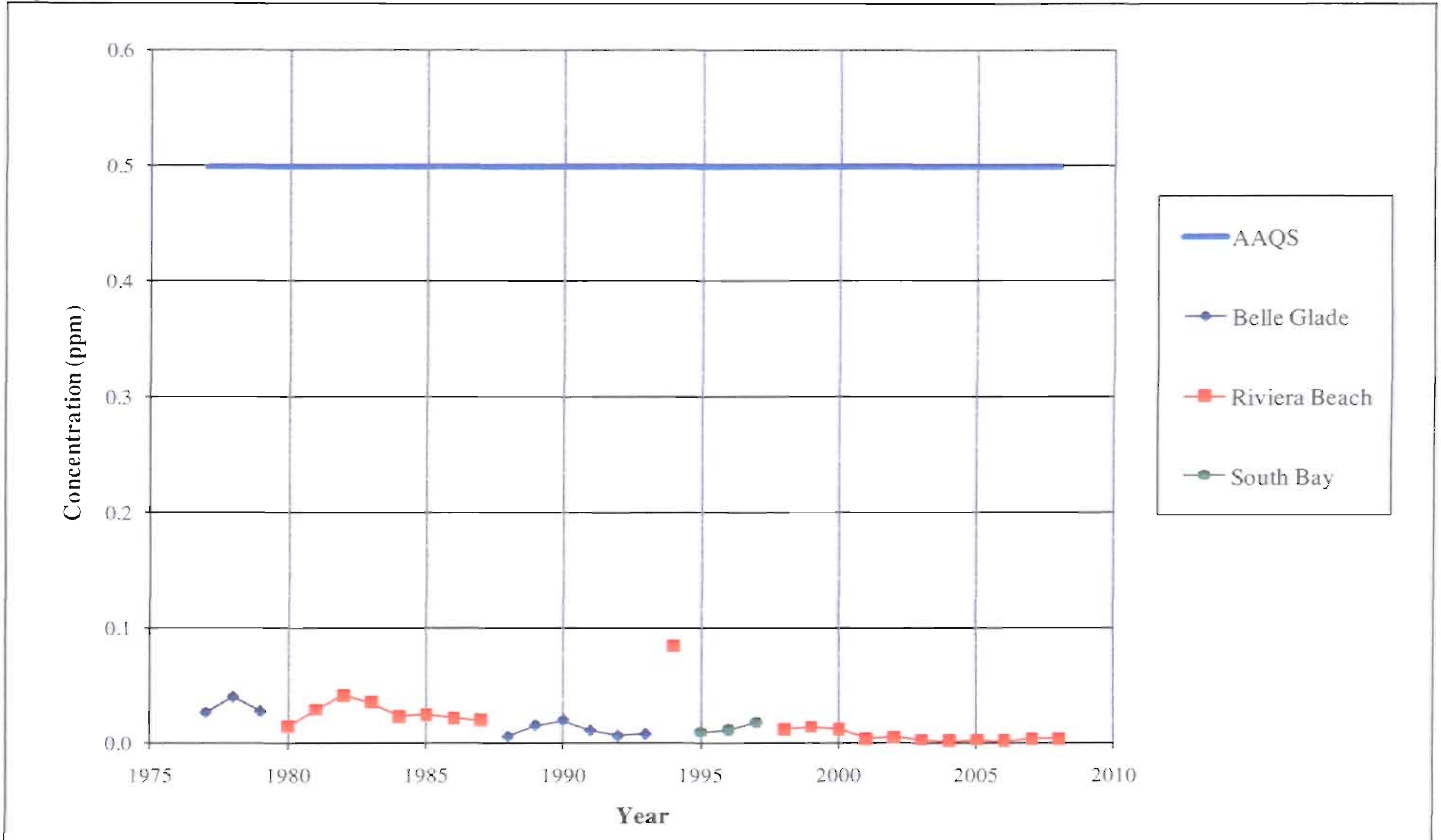


Figure 7-2
1-Hour Average Carbon Monoxide Concentrations (2nd Highest Values) Measured from 1977 to 2007 – Palm Beach County

Source: Golder, 2009.

Golder Associates

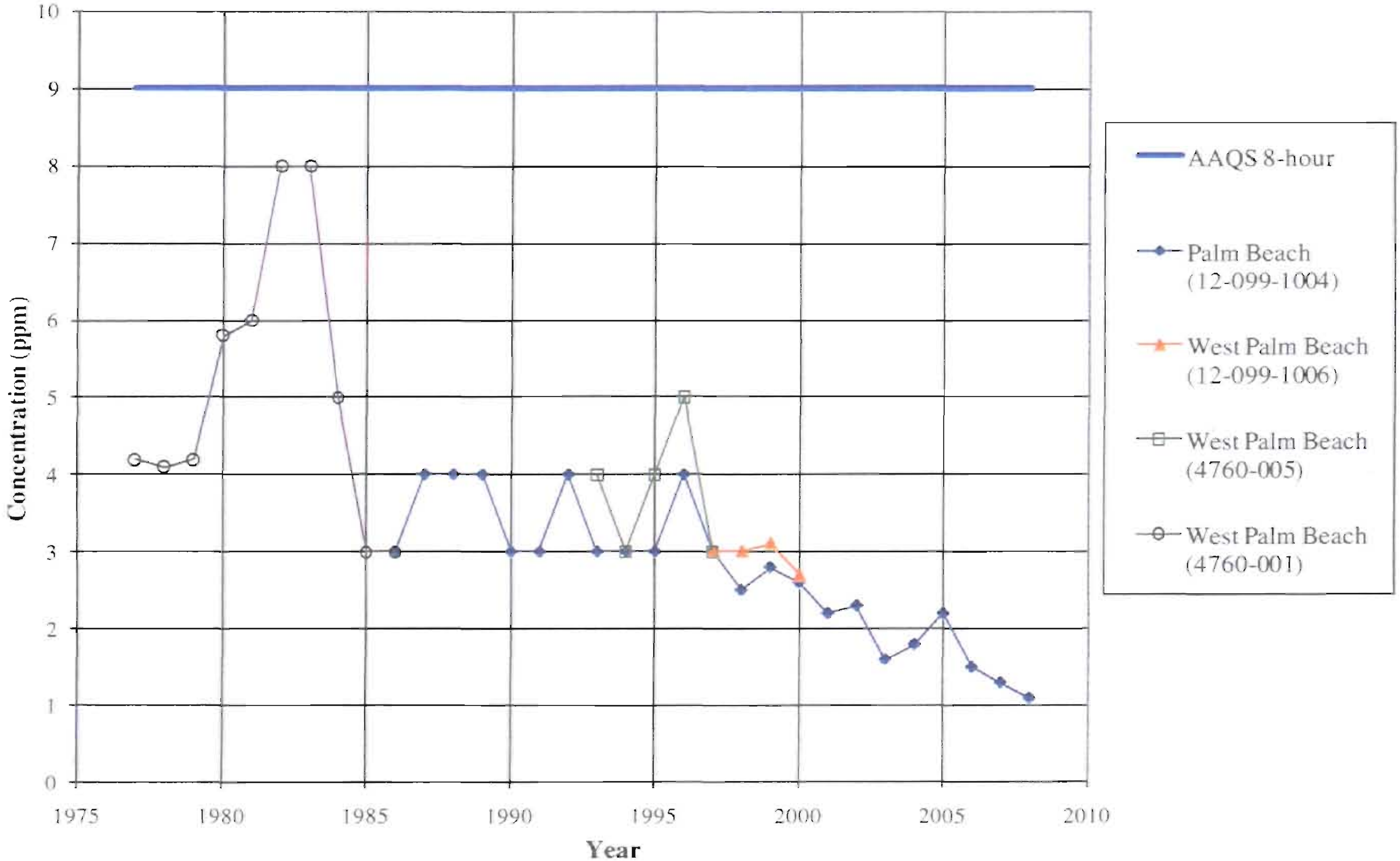


Figure 7-3
8-Hour Average Carbon Monoxide Concentrations (2nd Highest Values) Measured from 1977 to 2007 – Palm Beach County

Source: Golder, 2009.

Golder Associates

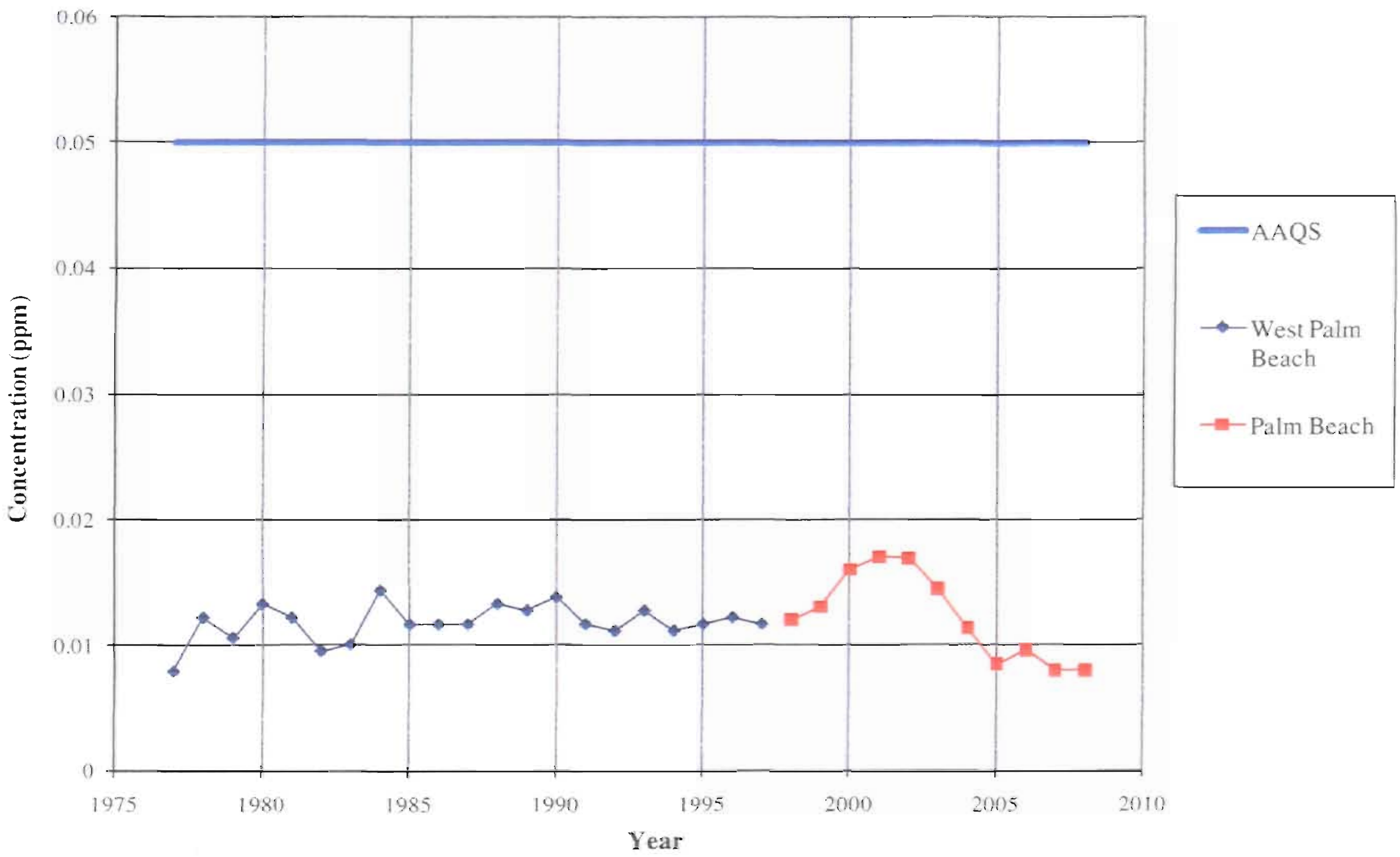


Figure 7-4
Measured Annual Average Nitrogen Dioxide Concentrations from 1977 to 2007 – Palm Beach County

Source: Golder, 2009.

Golder Associates

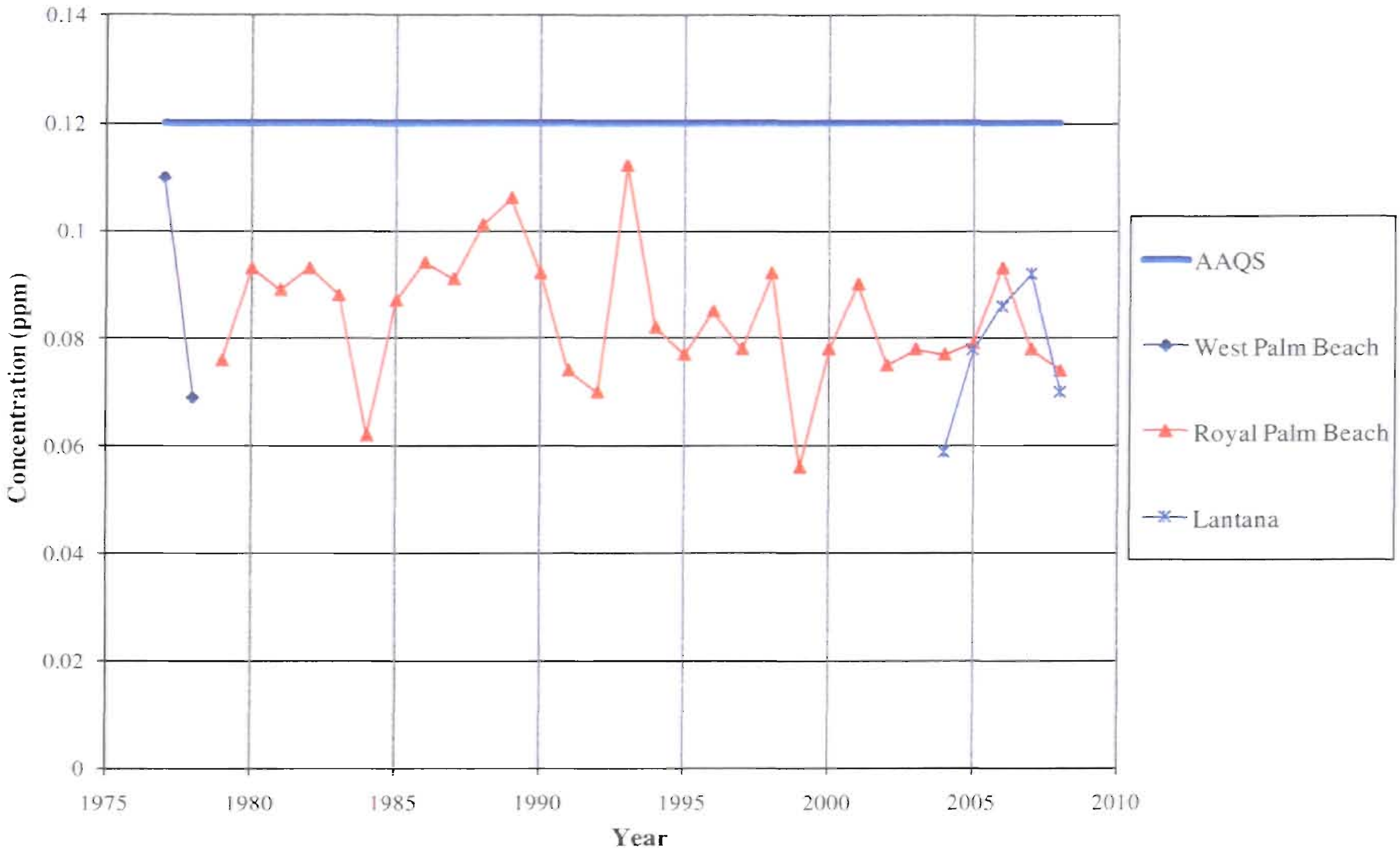


Figure 7-5
1-Hour Average Ozone Concentrations (2[nd] Highest Values) Measured from 1977 to 2007 – Palm Beach County

Source: Golder, 2009.

Golder Associates

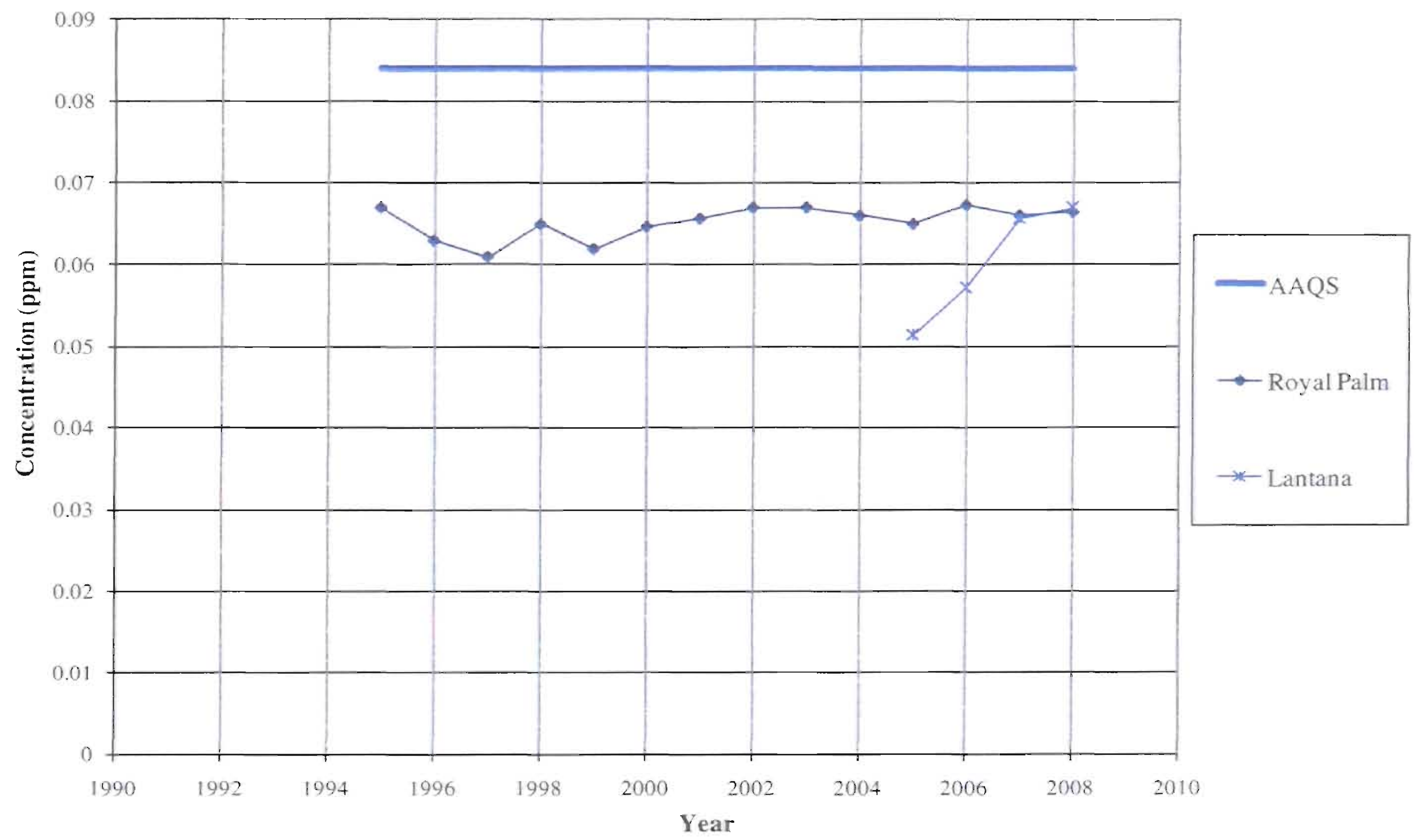


Figure 7-6
8-Hour Average Ozone Concentrations (3-year Average of the 4th Highest Values)
Measured from 1995 to 2007 - Palm Beach County

Source: Golder. 2009.

Golder Associates

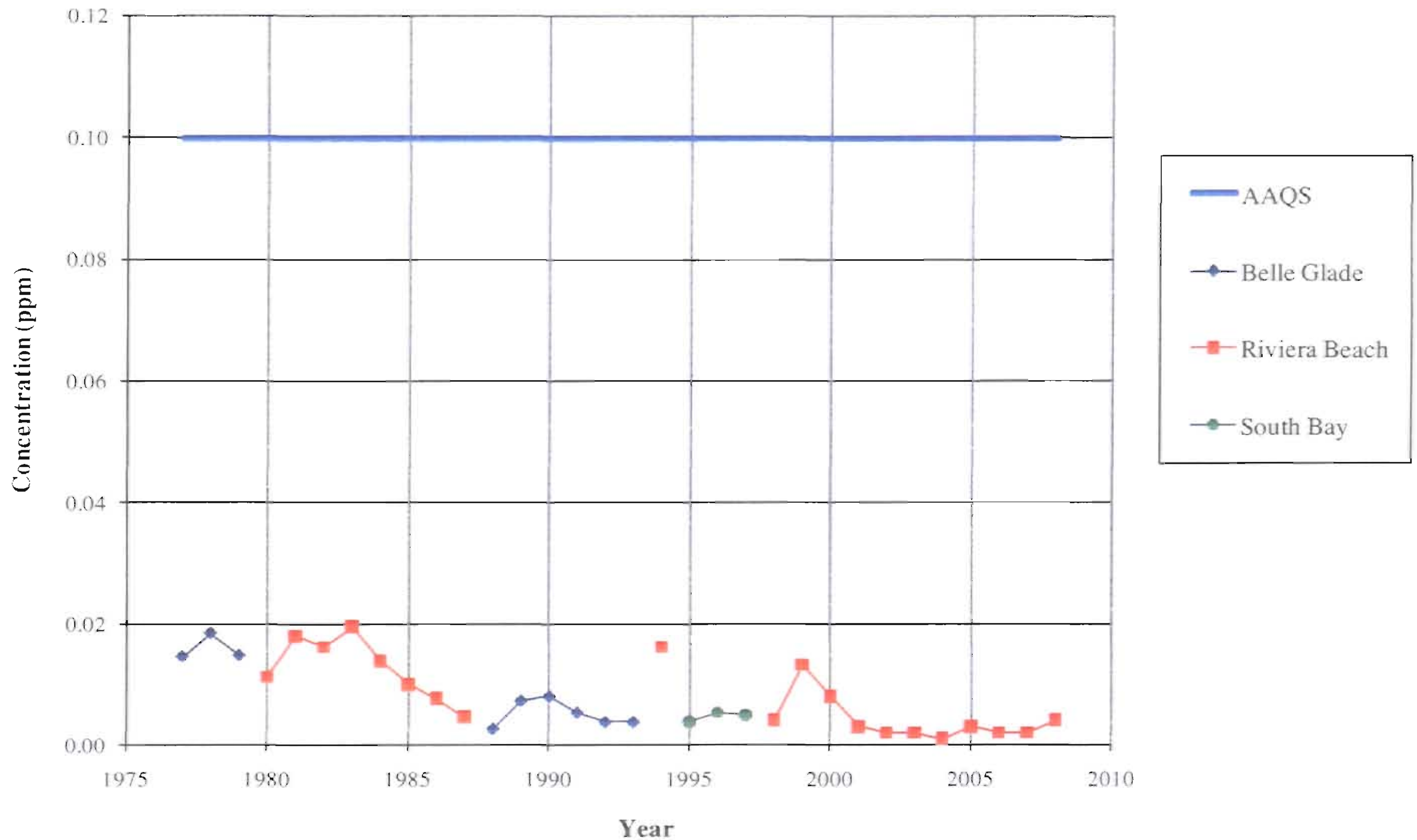


Figure 7-7
24-Hour Average Sulfur Dioxide Concentrations (2nd Highest Values) Measured from 1977 to 2007 – Palm Beach County

Source: Golder, 2009.

Golder Associates

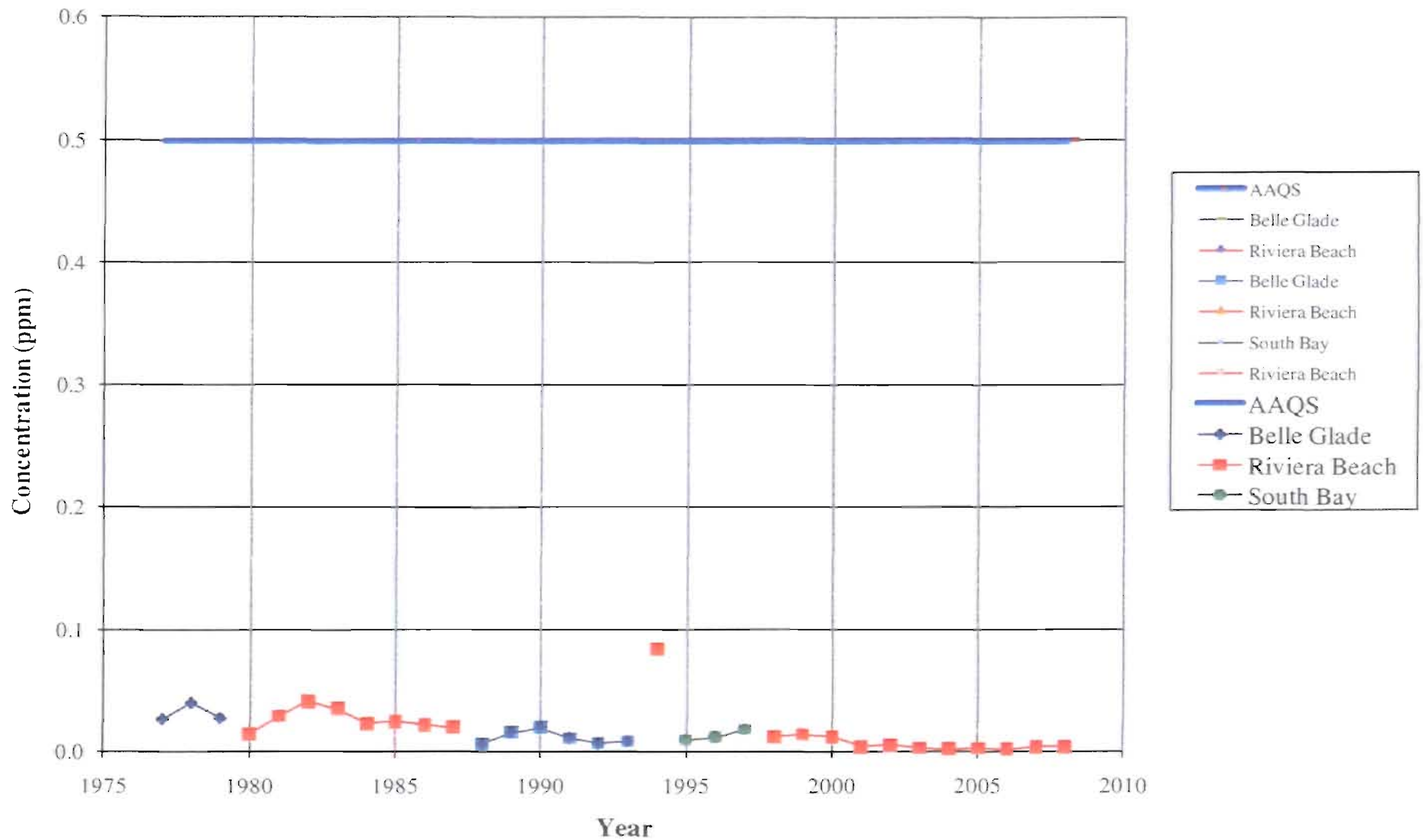


Figure 7-8
3-Hour Average Sulfur Dioxide Concentrations (2nd Highest Values) Measured from 1977 to 2007 – Palm Beach County

Source: Golder, 2009.

Golder Associates

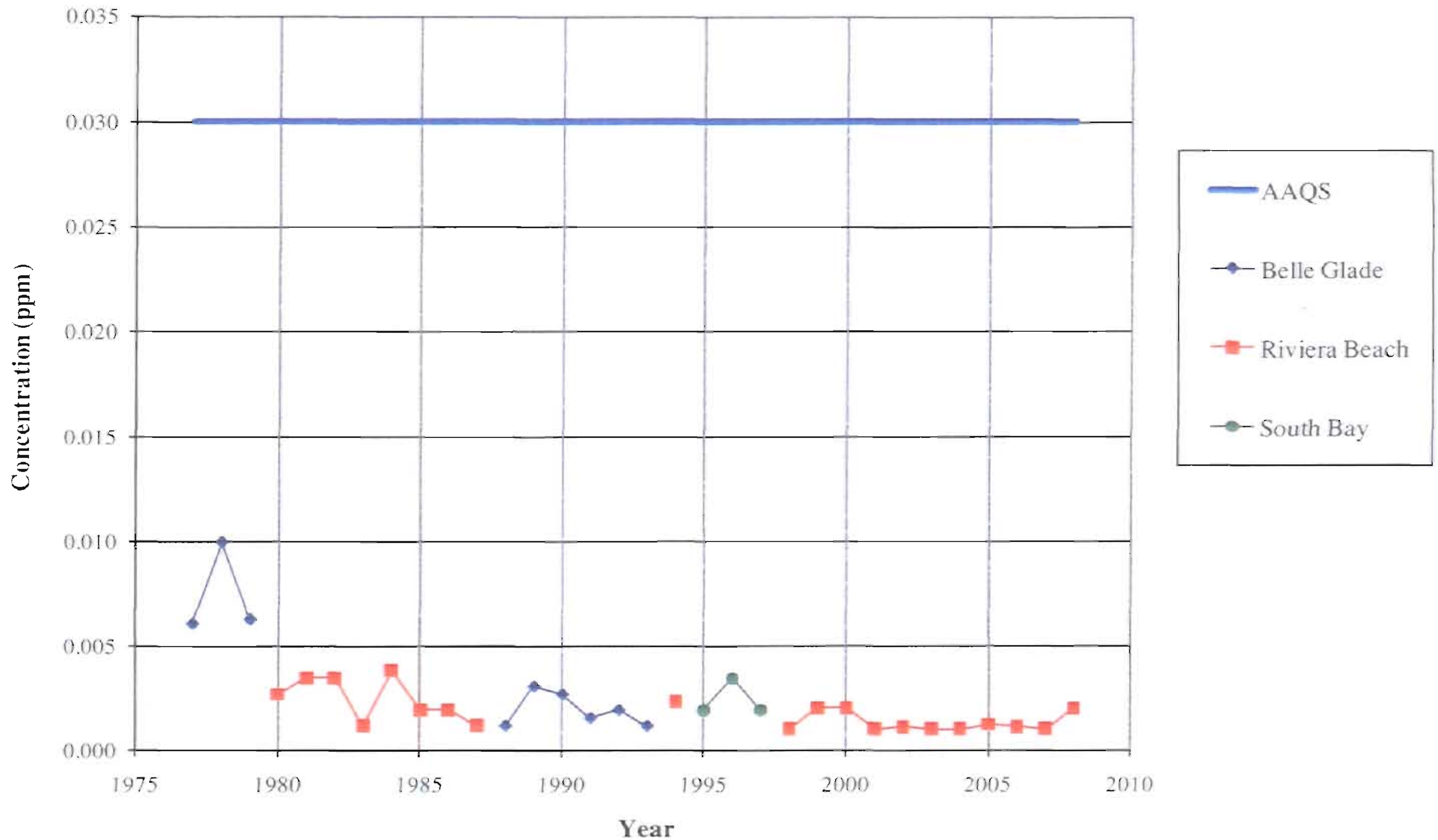


Figure 7-9
Annual Average Sulfur Dioxide Concentrations Measured from 1977 to 2007 – Palm Beach County

Source: Golder, 2009.

Golder Associates

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APPENDIX A

APPLICATION FOR AIR PERMIT

Department of Environmental Protection

Division of Air Resource Management

APPLICATION FOR AIR PERMIT - LONG FORM

I. APPLICATION INFORMATION

Air Construction Permit – Use this form to apply for an air construction permit:

- For any required purpose at a facility operating under a federally enforceable state air operation permit (FESOP) or Title V air operation permit;
- For a proposed project subject to prevention of significant deterioration (PSD) review, nonattainment new source review, or maximum achievable control technology (MACT);
- To assume a restriction on the potential emissions of one or more pollutants to escape a requirement such as PSD review, nonattainment new source review, MACT, or Title V; or
- To establish, revise, or renew a plantwide applicability limit (PAL).

Air Operation Permit – Use this form to apply for:

- An initial federally enforceable state air operation permit (FESOP); or
- An initial, revised, or renewal Title V air operation permit.

To ensure accuracy, please see form instructions.

Identification of Facility

1. Facility Owner/Company Name: **United Technologies Corp/Pratt & Whitney**	
2. Site Name: **Pratt & Whitney**	
3. Facility Identification Number: **0990021**	
4. Facility Location... Street Address or Other Locator: **17900 Beeline Highway (SR-710)** City: **Jupiter** County: **Palm Beach** Zip Code: **33478**	
5. Relocatable Facility? ☐ Yes ☒ No	6. Existing Title V Permitted Facility? ☒ Yes ☐ No

Application Contact

1. Application Contact Name: **Mr. Dean Gee**
2. Application Contact Mailing Address... Organization/Firm: **Pratt & Whitney** Street Address: **P.O. Box 109600, MS 717-03** City: **West Palm Beach** State: **Florida** Zip Code: **33410-9600**
3. Application Contact Telephone Numbers... Telephone: **(561) 796-2108** ext. Fax: **(561) 796-2787**
4. Application Contact Email Address: **dean.gee@pw.utc.com**

Application Processing Information (DEP Use)

1. Date of Receipt of Application:	3. PSD Number (if applicable):
2. Project Number(s):	4. Siting Number (if applicable):

APPLICATION INFORMATION

Purpose of Application

This application for air permit is being submitted to obtain: (Check one)

Air Construction Permit

☒ Air construction permit.

☐ Air construction permit to establish, revise, or renew a plantwide applicability limit (PAL).

☐ Air construction permit to establish, revise, or renew a plantwide applicability limit (PAL), and separate air construction permit to authorize construction or modification of one or more emissions units covered by the PAL.

Air Operation Permit

☐ Initial Title V air operation permit.

☐ Title V air operation permit revision.

☐ Title V air operation permit renewal.

☐ Initial federally enforceable state air operation permit (FESOP) where professional engineer (PE) certification is required.

☐ Initial federally enforceable state air operation permit (FESOP) where professional engineer (PE) certification is not required.

Air Construction Permit and Revised/Renewal Title V Air Operation Permit (Concurrent Processing)

☐ Air construction permit and Title V permit revision, incorporating the proposed project.

☐ Air construction permit and Title V permit renewal, incorporating the proposed project.

Note: By checking one of the above two boxes, you, the applicant, are requesting concurrent processing pursuant to Rule 62-213.405, F.A.C. In such case, you must also check the following box:

☐ I hereby request that the department waive the processing time requirements of the air construction permit to accommodate the processing time frames of the Title V air operation permit.

Application Comment

The purpose of this application is to request the issuance of an air construction permit to include an increase in the operating hours of the two GG4-9 turbine engines utilized at the RAM Test Facility to 3,000 hours.

A PSD Analysis report is included in this application submittal.

APPLICATION INFORMATION

Scope of Application

Emissions Unit ID Number	Description of Emissions Unit	Air Permit Type	Air Permit Processing Fee
079	Two JP-8 fired industrial turbine engines	AC1A	$7,500

Application Processing Fee

Check one: ☒ Attached - Amount: $ 7,500 ☐ Not Applicable

APPLICATION INFORMATION

Owner/Authorized Representative Statement

Complete if applying for an air construction permit or an initial FESOP.

1.	Owner/Authorized Representative Name : **Mr. Steve Bouley, Vice President**
2.	Owner/Authorized Representative Mailing Address... Organization/Firm: **Pratt & Whitney** Street Address: **P.O. Box 109600, MS 717-03** City: **West Palm Beach** State: **Florida** Zip Code: **33410-9600**
3.	Owner/Authorized Representative Telephone Numbers... Telephone: **(561) 796-2327** ext. Fax: **(561) 796-9221**
4.	Owner/Authorized Representative E-mail Address: **Steven.Bouley@pwr.utc.com**
5.	Owner/Authorized Representative Statement: *I, the undersigned, am the owner or authorized representative of the corporation, partnership, or other legal entity submitting this air permit application. To the best of my knowledge, the statements made in this application are true, accurate and complete, and any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. I understand that a permit, if granted by the department, cannot be transferred without authorization from the department.* [signature] Signature 08-27-09 Date

APPLICATION INFORMATION

Application Responsible Official Certification

Complete if applying for an initial, revised, or renewal Title V air operation permit or concurrent processing of an air construction permit and revised or renewal Title V air operation permit. If there are multiple responsible officials, the "application responsible official" need not be the "primary responsible official."

1. Application Responsible Official Name:

2. Application Responsible Official Qualification (Check one or more of the following options, as applicable):
   - ☐ For a corporation, the president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or a duly authorized representative of such person if the representative is responsible for the overall operation of one or more manufacturing, production, or operating facilities applying for or subject to a permit under Chapter 62-213, F.A.C.
   - ☐ For a partnership or sole proprietorship, a general partner or the proprietor, respectively.
   - ☐ For a municipality, county, state, federal, or other public agency, either a principal executive officer or ranking elected official.
   - ☐ The designated representative at an Acid Rain source, CAIR source, or Hg Budget source.

3. Application Responsible Official Mailing Address...
   Organization/Firm:
   Street Address:
   City: State: Zip Code:

4. Application Responsible Official Telephone Numbers...
   Telephone: ( ) ext. Fax:

5. Application Responsible Official E-mail Address:

6. Application Responsible Official Certification:

I, the undersigned, am a responsible official of the Title V source addressed in this air permit application. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this application are true, accurate and complete and that, to the best of my knowledge, any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. The air pollutant emissions units and air pollution control equipment described in this application will be operated and maintained so as to comply with all applicable standards for control of air pollutant emissions found in the statutes of the State of Florida and rules of the Department of Environmental Protection and revisions thereof and all other applicable requirements identified in this application to which the Title V source is subject. I understand that a permit, if granted by the department, cannot be transferred without authorization from the department, and I will promptly notify the department upon sale or legal transfer of the facility or any permitted emissions unit. Finally, I certify that the facility and each emissions unit are in compliance with all applicable requirements to which they are subject, except as identified in compliance plan(s) submitted with this application.

____________________ Signature

____________________ Date

APPLICATION INFORMATION

Professional Engineer Certification

1. Professional Engineer Name: **Brian A. Storey** Registration Number: **66766**	
2. Professional Engineer Mailing Address... Organization/Firm: **Golder Associates Inc.**** Street Address: **6026 NW 1st Place** City: **Gainesville** State: **FL** Zip Code: **32607**	
3. Professional Engineer Telephone Numbers... Telephone: **(352) 336-5600** ext. **21127** Fax: **(352) 336-6603**	
4. Professional Engineer E-mail Address: **bstorey@golder.com**	

5. Professional Engineer Statement:

I, the undersigned, hereby certify, except as particularly noted herein, that:*

(1) To the best of my knowledge, there is reasonable assurance that the air pollutant emissions unit(s) and the air pollution control equipment described in this application for air permit, when properly operated and maintained, will comply with all applicable standards for control of air pollutant emissions found in the Florida Statutes and rules of the Department of Environmental Protection; and

(2) To the best of my knowledge, any emission estimates reported or relied on in this application are true, accurate, and complete and are either based upon reasonable techniques available for calculating emissions or, for emission estimates of hazardous air pollutants not regulated for an emissions unit addressed in this application, based solely upon the materials, information and calculations submitted with this application.

(3) If the purpose of this application is to obtain a Title V air operation permit (check here ☐, if so), I further certify that each emissions unit described in this application for air permit, when properly operated and maintained, will comply with the applicable requirements identified in this application to which the unit is subject, except those emissions units for which a compliance plan and schedule is submitted with this application.

(4) If the purpose of this application is to obtain an air construction permit (check here ☒, if so) or concurrently process and obtain an air construction permit and a Title V air operation permit revision or renewal for one or more proposed new or modified emissions units (check here ☐, if so), I further certify that the engineering features of each such emissions unit described in this application have been designed or examined by me or individuals under my direct supervision and found to be in conformity with sound engineering principles applicable to the control of emissions of the air pollutants characterized in this application.

(5) If the purpose of this application is to obtain an initial air operation permit or operation permit revision or renewal for one or more newly constructed or modified emissions units (check here ☐, if so), I further certify that, with the exception of any changes detailed as part of this application, each such emissions unit has been constructed or modified in substantial accordance with the information given in the corresponding application for air construction permit and with all provisions contained in such permit.

Brian A Storey #66766 — 08/24/09

Signature — Date

(seal) STATE OF FLORIDA

* Attach any exception to certification statement.

**Board of Professional Engineers Certificate of Authorization #00001670.

II. FACILITY INFORMATION

A. GENERAL FACILITY INFORMATION

Facility Location and Type

1. Facility UTM Coordinates... Zone **17** East (km) **567.3** North (km) **2974.4**		2. Facility Latitude/Longitude... Latitude (DD/MM/SS) **26/53/28** Longitude (DD/MM/SS) **80/19/20**	
3. Governmental Facility Code: **0**	4. Facility Status Code: **A**	3. Governmental Facility Code: **0**	4. Facility Status Code: **A**
7. Facility Comment :			

Facility Contact

1. Facility Contact Name: **Mr. Dean Gee**
2. Facility Contact Mailing Address... Organization/Firm: **Pratt & Whitney** Street Address: **P.O. Box 109600, MS 717-03** City: **West Palm Beach** State: **Florida** Zip Code: **33410-9600**
3. Facility Contact Telephone Numbers: Telephone: **(561) 796-2108** ext. Fax: **(561) 796-2787**
4. Facility Contact Email Address: **dean.gee@pw.utc.com**

Facility Primary Responsible Official

Complete if an "application responsible official" is identified in Section I that is not the facility "primary responsible official."

1. Facility Primary Responsible Official Name:
2. Facility Primary Responsible Official Mailing Address... Organization/Firm: Street Address: City: State: Zip Code:
3. Facility Primary Responsible Official Telephone Numbers... Telephone: ( ) ext. Fax: ( )
4. Facility Primary Responsible Official E-mail Address:

Facility Regulatory Classifications

Check all that would apply *following* completion of all projects and implementation of all other changes proposed in this application for air permit. Refer to instructions to distinguish between a "major source" and a "synthetic minor source."

1. ☐ Small Business Stationary Source	☐ Unknown
2. ☐ Synthetic Non-Title V Source	
3. ☒ Title V Source	
4. ☒ Major Source of Air Pollutants, Other than Hazardous Air Pollutants (HAPs)	
5. ☐ Synthetic Minor Source of Air Pollutants, Other than HAPs	
6. ☒ Major Source of Hazardous Air Pollutants (HAPs)	
7. ☐ Synthetic Minor Source of HAPs	
8. ☒ One or More Emissions Units Subject to NSPS (40 CFR Part 60)	
9. ☐ One or More Emissions Units Subject to Emission Guidelines (40 CFR Part 60)	
10. ☒ One or More Emissions Units Subject to NESHAP (40 CFR Part 61 or Part 63)	
11. ☐ Title V Source Solely by EPA Designation (40 CFR 70.3(a)(5))	
12. Facility Regulatory Classifications Comment:	

List of Pollutants Emitted by Facility

1. Pollutant Emitted	2. Pollutant Classification	3. Emissions Cap [Y or N]?
Nitrogen Oxides - NOx	**A**	**N**
Carbon Monoxide - CO	**A**	**N**
Total Hazardous Air Pollutants - Total HAPS	**A**	**N**
Volatile Organic Compounds - VOC	**B**	**N**
Sulfur Dioxide - SO2	**B**	**N**
Particulate Matter - PM	**B**	**N**
Particulate Matter < 10 microns - PM10	**B**	**N**
Fluorides - FL	**B**	**N**
Individual Hazardous Air Pollutants - HAP	**A**	**N**

B. EMISSIONS CAPS

Facility-Wide or Multi-Unit Emissions Caps

1. Pollutant Subject to Emissions Cap	2. Facility-Wide Cap [Y or N]? (all units)	3. Emissions Unit ID's Under Cap (if not all units)	4. Hourly Cap (lb/hr)	5. Annual Cap (ton/yr)	6. Basis for Emissions Cap

7. Facility-Wide or Multi-Unit Emissions Cap Comment:

C. FACILITY ADDITIONAL INFORMATION

Additional Requirements for All Applications, Except as Otherwise Stated

1.	Facility Plot Plan: (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought) ☒ Attached, Document ID: **PSD Report** ☐ Previously Submitted, Date:_____
2.	Process Flow Diagram(s): (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought) ☒ Attached, Document ID: **PSD Report** ☐ Previously Submitted, Date:_____
3.	Precautions to Prevent Emissions of Unconfined Particulate Matter: (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought) ☐ Attached, Document ID:__________ ☒ Previously Submitted, Date: **December 2008**

Additional Requirements for Air Construction Permit Applications

1.	Area Map Showing Facility Location: ☐ Attached, Document ID:__________ ☒ Not Applicable (existing permitted facility)
2.	Description of Proposed Construction, Modification, or Plantwide Applicability Limit (PAL): ☐ Attached, Document ID:__________
3.	Rule Applicability Analysis: ☐ Attached, Document ID:__________
4.	List of Exempt Emissions Units: ☐ Attached, Document ID:__________ ☒ Not Applicable (no exempt units at facility)
5.	Fugitive Emissions Identification: ☐ Attached, Document ID:__________ ☒ Not Applicable
6.	Air Quality Analysis (Rule 62-212.400(7), F.A.C.): ☒ Attached, Document ID: **PSD Report** ☐ Not Applicable
7.	Source Impact Analysis (Rule 62-212.400(5), F.A.C.): ☒ Attached, Document ID: **PSD Report** ☐ Not Applicable
8.	Air Quality Impact since 1977 (Rule 62-212.400(4)(e), F.A.C.): ☒ Attached, Document ID: **PSD Report** ☐ Not Applicable
9.	Additional Impact Analyses (Rules 62-212.400(8) and 62-212.500(4)(e), F.A.C.): ☒ Attached, Document ID: **PSD Report** ☐ Not Applicable
10.	Alternative Analysis Requirement (Rule 62-212.500(4)(g), F.A.C.): ☒ Attached, Document ID: **PSD Report** ☐ Not Applicable

C. FACILITY ADDITIONAL INFORMATION (CONTINUED)

Additional Requirements for FESOP Applications

1. List of Exempt Emissions Units: ☐ Attached, Document ID:__________ ☐ Not Applicable (no exempt units at facility)	

Additional Requirements for Title V Air Operation Permit Applications

1. List of Insignificant Activities: (Required for initial/renewal applications only) ☐ Attached, Document ID:__________ ☐ Not Applicable (revision application)	
2. Identification of Applicable Requirements: (Required for initial/renewal applications, and for revision applications if this information would be changed as a result of the revision being sought) ☐ Attached, Document ID:__________ ☐ Not Applicable (revision application with no change in applicable requirements)	
3. Compliance Report and Plan: (Required for all initial/revision/renewal applications) ☐ Attached, Document ID:__________ Note: A compliance plan must be submitted for each emissions unit that is not in compliance with all applicable requirements at the time of application and/or at any time during application processing. The department must be notified of any changes in compliance status during application processing.	
4. List of Equipment/Activities Regulated under Title VI: (If applicable, required for initial/renewal applications only) ☐ Attached, Document ID:__________ ☐ Equipment/Activities Onsite but Not Required to be Individually Listed ☐ Not Applicable	
5. Verification of Risk Management Plan Submission to EPA: (If applicable, required for initial/renewal applications only) ☐ Attached, Document ID:__________ ☐ Not Applicable	
6. Requested Changes to Current Title V Air Operation Permit: ☐ Attached, Document ID:__________ ☐ Not Applicable	

C. FACILITY ADDITIONAL INFORMATION (CONTINUED)

Additional Requirements for Facilities Subject to Acid Rain, CAIR, or Hg Budget Program

1. Acid Rain Program Forms:

   Acid Rain Part Application (DEP Form No. 62-210.900(1)(a)):

   ☐ Attached, Document ID:__________ ☐ Previously Submitted, Date:__________

   ☒ Not Applicable (not an Acid Rain source)

   Phase II NO_X Averaging Plan (DEP Form No. 62-210.900(1)(a)1.):

   ☐ Attached, Document ID:__________ ☐ Previously Submitted, Date:__________

   ☒ Not Applicable

   New Unit Exemption (DEP Form No. 62-210.900(1)(a)2.):

   ☐ Attached, Document ID:__________ ☐ Previously Submitted, Date:__________

   ☒ Not Applicable

2. CAIR Part (DEP Form No. 62-210.900(1)(b)):

   ☐ Attached, Document ID:__________ ☐ Previously Submitted, Date:__________

   ☒ Not Applicable (not a CAIR source)

3. Hg Budget Part (DEP Form No. 62-210.900(1)(c)):

   ☐ Attached, Document ID:__________ ☐ Previously Submitted, Date:__________

   ☒ Not Applicable (not a Hg Budget unit)

Additional Requirements Comment

III. EMISSIONS UNIT INFORMATION

Title V Air Operation Permit Application - For Title V air operation permitting only, emissions units are classified as regulated, unregulated, or insignificant. If this is an application for an initial, revised or renewal Title V air operation permit, a separate Emissions Unit Information Section (including subsections A through I as required) must be completed for each regulated and unregulated emissions unit addressed in this application. Some of the subsections comprising the Emissions Unit Information Section of the form are optional for unregulated emissions units. Each such subsection is appropriately marked. Insignificant emissions units are required to be listed at Section II, Subsection C.

Air Construction Permit or FESOP Application - For air construction permitting or federally enforceable state air operation permitting, emissions units are classified as either subject to air permitting or exempt from air permitting. The concept of an "unregulated emissions unit" does not apply. If this is an application for an air construction permit or FESOP, a separate Emissions Unit Information Section (including subsections A through I as required) must be completed for each emissions unit subject to air permitting addressed in this application for air permit. Emissions units exempt from air permitting are required to be listed at Section II, Subsection C.

Air Construction Permit and Revised/Renewal Title V Air Operation Permit Application – Where this application is used to apply for both an air construction permit and a revised or renewal Title V air operation permit, each emissions unit is classified as either subject to air permitting or exempt from air permitting for air construction permitting purposes, and as regulated, unregulated, or insignificant for Title V air operation permitting purposes. A separate Emissions Unit Information Section (including subsections A through I as required) must be completed for each emissions unit addressed in this application that is subject to air construction permitting and for each such emissions unit that is a regulated or unregulated unit for purposes of Title V permitting. (An emissions unit may be exempt from air construction permitting but still be classified as an unregulated unit for Title V purposes.) Emissions units classified as insignificant for Title V purposes are required to be listed at Section II, Subsection C.

If submitting the application form in hard copy, the number of this Emissions Unit Information Section and the total number of Emissions Unit Information Sections submitted as part of this application must be indicated in the space provided at the top of each page.

A. GENERAL EMISSIONS UNIT INFORMATION

Title V Air Operation Permit Emissions Unit Classification

1. Regulated or Unregulated Emissions Unit? (Check one, if applying for an initial, revised or renewal Title V air operation permit. Skip this item if applying for an air construction permit or FESOP only.)

   ☐ The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit.

   ☐ The emissions unit addressed in this Emissions Unit Information Section is an unregulated emissions unit.

Emissions Unit Description and Status

1. Type of Emissions Unit Addressed in this Section: (Check one)

   ☒ This Emissions Unit Information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).

   ☐ This Emissions Unit Information Section addresses, as a single emissions unit, a group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions.

   ☐ This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.

2. Description of Emissions Unit Addressed in this Section:
   Two GG4-9A, JP8-fired turbine engines

3. Emissions Unit Identification Number: **079**

4. Emissions Unit Status Code:	5. Commence Construction Date:	6. Initial Startup Date:	7. Emissions Unit Major Group SIC Code:
A			**37**

8. Federal Program Applicability: (Check all that apply)

   ☐ Acid Rain Unit

   ☐ CAIR Unit

   ☐ Hg Budget Unit

9. Package Unit:
   Manufacturer: **Pratt & Whitney** Model Number: **GG4-9A**

10. Generator Nameplate Rating: **19.5** MW

11. Emissions Unit Comment:

EMISSIONS UNIT INFORMATION
Section [1]
Two GG4-9A Turbine Engines

Emissions Unit Control Equipment/Method: Control _____ of _____

1. Control Equipment/Method Description:
2. Control Device or Method Code:

Emissions Unit Control Equipment/Method: Control _____ of _____

1. Control Equipment/Method Description:
2. Control Device or Method Code:

Emissions Unit Control Equipment/Method: Control _____ of _____

1. Control Equipment/Method Description:
2. Control Device or Method Code:

Emissions Unit Control Equipment/Method: Control _____ of _____

1. Control Equipment/Method Description:
2. Control Device or Method Code:

B. EMISSIONS UNIT CAPACITY INFORMATION
(Optional for unregulated emissions units.)

Emissions Unit Operating Capacity and Schedule

1.	Maximum Process or Throughput Rate:
2.	Maximum Production Rate:
3.	Maximum Heat Input Rate: 272.1 million Btu/hr
4.	Maximum Incineration Rate: pounds/hr tons/day
5.	Requested Maximum Operating Schedule: hours/day days/week weeks/year 3,000 hours/year
6.	Operating Capacity/Schedule Comment: **Operating hours are limited to 3,000 hours per year. Refer to PSD Report for maximum heat input rate calculations.**

C. EMISSION POINT (STACK/VENT) INFORMATION
(Optional for unregulated emissions units.)

Emission Point Description and Type

1. Identification of Point on Plot Plan or Flow Diagram: **Stack**		2. Emission Point Type Code: **1**
3. Descriptions of Emission Points Comprising this Emissions Unit for VE Tracking:		
4. ID Numbers or Descriptions of Emission Units with this Emission Point in Common:		
5. Discharge Type Code: **V**	6. Stack Height: **26** feet	7. Exit Diameter: **5.9** feet
8. Exit Temperature: **750**°F	9. Actual Volumetric Flow Rate: **328,000** acfm	10. Water Vapor: %
11. Maximum Dry Standard Flow Rate: dscfm		12. Nonstack Emission Point Height: feet
13. Emission Point UTM Coordinates... Zone: East (km): North (km):		14. Emission Point Latitude/Longitude... Latitude (DD/MM/SS) Longitude (DD/MM/SS)
15. Emission Point Comment:		

D. SEGMENT (PROCESS/FUEL) INFORMATION

Segment Description and Rate: Segment 1 of 1

1. Segment Description (Process/Fuel Type): **Internal combustion engines: Industrial: Kerosene/Naphtha (jet fuel)**		
2. Source Classification Code (SCC): **2-02-009-01**	3. SCC Units: **1,000 gallons burned**	
4. Maximum Hourly Rate: **2.04**	5. Maximum Annual Rate: **6,120**	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit:
10. Segment Comment: **Maximum annual rate based on operating 3,000 hours per year. HHV of JP-8 fuel = 19,910 Btu/lb, and the density is 6.70 lb/gal.**		

Segment Description and Rate: Segment _____ of _____

1. Segment Description (Process/Fuel Type):		
2. Source Classification Code (SCC):	3. SCC Units:	
4. Maximum Hourly Rate:	5. Maximum Annual Rate:	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit:
10. Segment Comment:		

E. EMISSIONS UNIT POLLUTANTS

List of Pollutants Emitted by Emissions Unit

1. Pollutant Emitted	2. Primary Control Device Code	3. Secondary Control Device Code	4. Pollutant Regulatory Code
Carbon Monoxide - CO			NS
Nitrogen Oxides - NOx			NS
Particulate Matter - PM			NS
Particulate Matter <10 microns - PM10			NS
Sulfur Dioxide - SO2			NS
Total Hazardous Air Pollutants - HAPS			NS
Volatile Organic Compounds - VOC			NS

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL, FUGITIVE, AND ACTUAL EMISSIONS

(Optional for unregulated emissions units.)

Complete a Subsection F1 for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V operation permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

Potential, Estimated Fugitive, and Baseline & Projected Actual Emissions

1. Pollutant Emitted: **CO**	2. Total Percent Efficiency of Control:
3. Potential Emissions: **597.3** lb/hour **388.1** tons/year	4. Synthetically Limited? ☐ Yes ☒ No
5. Range of Estimated Fugitive Emissions (as applicable): to tons/year	
6. Emission Factor: **Refer to PSD Report.** Reference:	7. Emissions Method Code: **1**
8.a. Baseline Actual Emissions (if required): tons/year	8.b. Baseline 24-month Period: From: To:
9.a. Projected Actual Emissions (if required): tons/year	9.b. Projected Monitoring Period: ☐ 5 years ☐ 10 years
10. Calculation of Emissions: **Emission factors based on July 31, 2008 stack testing results. Refer to PSD Report.**	
11. Potential, Fugitive, and Actual Emissions Comment:	

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete Subsection F2 if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL, FUGITIVE, AND ACTUAL EMISSIONS

(Optional for unregulated emissions units.)

Complete a Subsection F1 for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V operation permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

Potential, Estimated Fugitive, and Baseline & Projected Actual Emissions

1. Pollutant Emitted: **NOx**	2. Total Percent Efficiency of Control:
3. Potential Emissions: **299.9** lb/hour **343.7** tons/year	4. Synthetically Limited? ☐ Yes ☒ No
5. Range of Estimated Fugitive Emissions (as applicable): to tons/year	
6. Emission Factor: **Refer to PSD Report.** Reference:	7. Emissions Method Code: **1**
8.a. Baseline Actual Emissions (if required): tons/year	8.b. Baseline 24-month Period: From: To:
9.a. Projected Actual Emissions (if required): tons/year	9.b. Projected Monitoring Period: ☐ 5 years ☐ 10 years
10. Calculation of Emissions: **Emission factors based on July 31, 2008 stack testing results. Refer to PSD Report.**	
11. Potential, Fugitive, and Actual Emissions Comment:	

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete Subsection F2 if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL, FUGITIVE, AND ACTUAL EMISSIONS

(Optional for unregulated emissions units.)

Complete a Subsection F1 for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V operation permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

Potential, Estimated Fugitive, and Baseline & Projected Actual Emissions

1. Pollutant Emitted: **PM**	2. Total Percent Efficiency of Control:
3. Potential Emissions: **3.34** lb/hour **4.02** tons/year	4. Synthetically Limited? ☐ Yes ☒ No
5. Range of Estimated Fugitive Emissions (as applicable): to tons/year	
6. Emission Factor: **7.2 x 10^{-3} lb/MMBtu** Reference: **AP-42, Chapter 3.1, Table 3.1-2a**	7. Emissions Method Code: **3**
8.a. Baseline Actual Emissions (if required): tons/year	8.b. Baseline 24-month Period: From: To:
9.a. Projected Actual Emissions (if required): tons/year	9.b. Projected Monitoring Period: ☐ 5 years ☐ 10 years
10. Calculation of Emissions: **Refer to PSD Report.**	
11. Potential, Fugitive, and Actual Emissions Comment:	

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete Subsection F2 if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL, FUGITIVE, AND ACTUAL EMISSIONS

(Optional for unregulated emissions units.)

Complete a Subsection F1 for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V operation permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

Potential, Estimated Fugitive, and Baseline & Projected Actual Emissions

1. Pollutant Emitted: **PM10**	2. Total Percent Efficiency of Control:
3. Potential Emissions: **2.00** lb/hour **2.40** tons/year	4. Synthetically Limited? ☐ Yes ☒ No
5. Range of Estimated Fugitive Emissions (as applicable): to tons/year	
6. Emission Factor: **4.3 x 10^{-3} lb/MMBtu** Reference: **AP-42, Chapter 3.1, Table 3.1-2a**	7. Emissions Method Code: **3**
8.a. Baseline Actual Emissions (if required): tons/year	8.b. Baseline 24-month Period: From: To:
9.a. Projected Actual Emissions (if required): tons/year	9.b. Projected Monitoring Period: ☐ 5 years ☐ 10 years
10. Calculation of Emissions: **Refer to PSD Report.**	
11. Potential, Fugitive, and Actual Emissions Comment:	

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete Subsection F2 if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL, FUGITIVE, AND ACTUAL EMISSIONS

(Optional for unregulated emissions units.)

Complete a Subsection F1 for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V operation permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

Potential, Estimated Fugitive, and Baseline & Projected Actual Emissions

1. Pollutant Emitted: **SO2**	2. Total Percent Efficiency of Control:
3. Potential Emissions: **53.0** lb/hour **63.7** tons/year	4. Synthetically Limited? ☐ Yes ☒ No
5. Range of Estimated Fugitive Emissions (as applicable): to tons/year	
6. Emission Factor: **0.114 lb/MMBtu** Reference: **AP-42, Chapter 3.1, Table 3.1-2a**	7. Emissions Method Code: **3**
8.a. Baseline Actual Emissions (if required): tons/year	8.b. Baseline 24-month Period: From: To:
9.a. Projected Actual Emissions (if required): tons/year	9.b. Projected Monitoring Period: ☐ 5 years ☐ 10 years

10. Calculation of Emissions:
Emission factor based on a sulfur content of 0.113 percent for JP-8 fuel. Refer to PSD Report.

SO_2 (lb/MMBtu) = 1.01 x (0.113) = 0.114 lb/MMBtu

11. Potential, Fugitive, and Actual Emissions Comment:

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete Subsection F2 if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL, FUGITIVE, AND ACTUAL EMISSIONS

(Optional for unregulated emissions units.)

Complete a Subsection F1 for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V operation permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

Potential, Estimated Fugitive, and Baseline & Projected Actual Emissions

1. Pollutant Emitted: **HAPS**	2. Total Percent Efficiency of Control:
3. Potential Emissions: **0.598** lb/hour **0.719** tons/year	4. Synthetically Limited? ☐ Yes ☒ No
5. Range of Estimated Fugitive Emissions (as applicable): to tons/year	
6. Emission Factor: Reference: **Refer to PSD Report.**	7. Emissions Method Code: **3**
8.a. Baseline Actual Emissions (if required): tons/year	8.b. Baseline 24-month Period: From: To:
9.a. Projected Actual Emissions (if required): tons/year	9.b. Projected Monitoring Period: ☐ 5 years ☐ 10 years
10. Calculation of Emissions: **Refer to PSD Report.**	
11. Potential, Fugitive, and Actual Emissions Comment:	

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete Subsection F2 if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

F1. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION – POTENTIAL, FUGITIVE, AND ACTUAL EMISSIONS

(Optional for unregulated emissions units.)

Complete a Subsection F1 for each pollutant identified in Subsection E if applying for an air construction permit or concurrent processing of an air construction permit and a revised or renewal Title V operation permit. Complete for each emissions-limited pollutant identified in Subsection E if applying for an air operation permit.

<u>Potential, Estimated Fugitive, and Baseline & Projected Actual Emissions</u>

1. Pollutant Emitted: **VOC**	2. Total Percent Efficiency of Control:
3. Potential Emissions: **0.190** lb/hour **0.229** tons/year	4. Synthetically Limited? ☐ Yes ☒ No
5. Range of Estimated Fugitive Emissions (as applicable): to tons/year	
6. Emission Factor: **4.1 x 10^{-4} lb/MMBtu** Reference: **AP-42, Chapter 3.1, Table 3.1-2a**	7. Emissions Method Code: **3**
8.a. Baseline Actual Emissions (if required): tons/year	8.b. Baseline 24-month Period: From: To:
9.a. Projected Actual Emissions (if required): tons/year	9.b. Projected Monitoring Period: ☐ 5 years ☐ 10 years
10. Calculation of Emissions: **Refer to PSD Report.**	
11. Potential, Fugitive, and Actual Emissions Comment:	

F2. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION - ALLOWABLE EMISSIONS

Complete Subsection F2 if the pollutant identified in Subsection F1 is or would be subject to a numerical emissions limitation.

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

Allowable Emissions Allowable Emissions _____ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance:	
6. Allowable Emissions Comment (Description of Operating Method):	

G. VISIBLE EMISSIONS INFORMATION

Complete Subsection G if this emissions unit is or would be subject to a unit-specific visible emissions limitation.

Visible Emissions Limitation: Visible Emissions Limitation 1 of 1

1. Visible Emissions Subtype: **VE20**	2. Basis for Allowable Opacity: ☒ Rule ☐ Other
3. Allowable Opacity: Normal Conditions: **20** % Exceptional Conditions: % Maximum Period of Excess Opacity Allowed: min/hour	
4. Method of Compliance: **EPA Method 9**	
5. Visible Emissions Comment: **The maximum period of excess opacity allowed is 2 hours in a 24-hour period as stated in Rule 62-296.320(4)(b), F.A.C.**	

Visible Emissions Limitation: Visible Emissions Limitation _____ of _____

1. Visible Emissions Subtype:	2. Basis for Allowable Opacity: ☐ Rule ☐ Other
3. Allowable Opacity: Normal Conditions: % Exceptional Conditions: % Maximum Period of Excess Opacity Allowed: min/hour	
4. Method of Compliance:	
5. Visible Emissions Comment:	

H. CONTINUOUS MONITOR INFORMATION

Complete Subsection H if this emissions unit is or would be subject to continuous monitoring.

Continuous Monitoring System: Continuous Monitor ____ of ____

1. Parameter Code:	2. Pollutant(s):
3. CMS Requirement:	☐ Rule ☐ Other
4. Monitor Information... Manufacturer: Model Number:	Serial Number:
5. Installation Date:	6. Performance Specification Test Date:
7. Continuous Monitor Comment:	

Continuous Monitoring System: Continuous Monitor ____ of ____

1. Parameter Code:	2. Pollutant(s):
3. CMS Requirement:	☐ Rule ☐ Other
4. Monitor Information... Manufacturer: Model Number:	Serial Number:
5. Installation Date:	6. Performance Specification Test Date:
7. Continuous Monitor Comment:	

I. EMISSIONS UNIT ADDITIONAL INFORMATION

Additional Requirements for All Applications, Except as Otherwise Stated

1. Process Flow Diagram: (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)
   ☒ Attached, Document ID: **PSD Report** ☐ Previously Submitted, Date ______

2. Fuel Analysis or Specification: (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)
   ☒ Attached, Document ID: **PSD Report** ☐ Previously Submitted, Date ______

3. Detailed Description of Control Equipment: (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)
   ☒ Attached, Document ID: **PSD Report** ☐ Previously Submitted, Date ______

4. Procedures for Startup and Shutdown: (Required for all operation permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)
   ☐ Attached, Document ID: ______ ☐ Previously Submitted, Date ______
   ☒ Not Applicable (construction application)

5. Operation and Maintenance Plan: (Required for all permit applications, except Title V air operation permit revision applications if this information was submitted to the department within the previous five years and would not be altered as a result of the revision being sought)
   ☐ Attached, Document ID: ______ ☐ Previously Submitted, Date ______
   ☒ Not Applicable

6. Compliance Demonstration Reports/Records:
   ☐ Attached, Document ID: ______
   Test Date(s)/Pollutant(s) Tested: ______

   ☒ Previously Submitted, Date: **September 11, 2008**
   Test Date(s)/Pollutant(s) Tested: **July 31, 2008/NO_X and CO**

   ☐ To be Submitted, Date (if known): ______
   Test Date(s)/Pollutant(s) Tested: ______

   ☐ Not Applicable

   Note: For FESOP applications, all required compliance demonstration records/reports must be submitted at the time of application. For Title V air operation permit applications, all required compliance demonstration reports/records must be submitted at the time of application, or a compliance plan must be submitted at the time of application.

7. Other Information Required by Rule or Statute:
   ☐ Attached, Document ID: ______ ☒ Not Applicable

I. EMISSIONS UNIT ADDITIONAL INFORMATION (CONTINUED)

Additional Requirements for Air Construction Permit Applications

1. Control Technology Review and Analysis (Rules 62-212.400(10) and 62-212.500(7), F.A.C.; 40 CFR 63.43(d) and (e)): ☒ Attached, Document ID: PSD Report ☐ Not Applicable	
2. Good Engineering Practice Stack Height Analysis (Rules 62-212.400(4)(d) and 62-212.500(4)(f), F.A.C.): ☒ Attached, Document ID: PSD Report ☐ Not Applicable	
3. Description of Stack Sampling Facilities: (Required for proposed new stack sampling facilities only) ☐ Attached, Document ID: ________ ☒ Not Applicable	

Additional Requirements for Title V Air Operation Permit Applications

1. Identification of Applicable Requirements: ☐ Attached, Document ID: ________	
2. Compliance Assurance Monitoring: ☐ Attached, Document ID: ________ ☐ Not Applicable	
3. Alternative Methods of Operation: ☐ Attached, Document ID: ________ ☐ Not Applicable	
4. Alternative Modes of Operation (Emissions Trading): ☐ Attached, Document ID: ________ ☐ Not Applicable	

Additional Requirements Comment