# 5.B. AIR QUALITY

This section describes the following issues pertaining to the analysis of air quality:

1. The air quality environment in the Study Area,
2. The air quality standards set out in the various applicable environmental statutes and regulations,
3. The air quality analyses associated with those statutes and regulations, and
4. The Federal Aviation Administration's (FAA's) determination of which analyses are required for this Draft EIS.

An airport air quality assessment requires consideration under both the Clean Air Act including the 1990 Amendments (CAA) and the National Environmental Policy Act (NEPA). These two unique legislative acts require distinct analyses and may be separately applicable to an airport project. For either NEPA or CAA analysis, the emission sources that must be analyzed at airports are aircraft, ground support equipment (GSE), motorized stationary equipment, and motor vehicles. All of these cause emissions of pollutants that the U.S. Environmental Protection Agency (USEPA) has determined to be potentially harmful to human health.

This section evaluates air quality conditions caused by sources operating at the Fort Lauderdale-Hollywood International Airport (FLL) that contribute to the overall air quality conditions existing in Broward County in 2005 (2005 Existing Conditions). The air quality information provided in this section is supplemented by the technical report in Appendix G, *Air Quality*: Attachment G.1, *Technical Report: Air Quality Assessment Methodology and Procedure (Air Quality Technical Report)*. The *Air Quality Technical Report* documents the coordination with Federal, state, and local air quality agencies (Appendix G.1.A, *Agency Coordination,* and Appendix G.1.B, *Hazardous Air Pollutant (HAP) Evaluation*). Future air quality conditions are analyzed in Chapter Six, *Environmental Consequences*, Section 6.B, *Air Quality*.

The airport is entirely located within Broward County, in the Southeast Florida Airshed (Airshed). In February 2004, the USEPA determined that the counties within the Airshed met all the regulatory air quality standards, referred to as the National Ambient Air Quality Standards (NAAQS). However, emissions of nitrogen oxides ($NO_x$) and volatile organic compounds (VOC), which are precursors to ozone formation and are caused primarily by motor vehicle traffic and other mobile sources such as aircraft, are of continuing interest in Broward County.

The emissions of $NO_x$ and VOC are important to Broward County because the County is operating under a maintenance plan for ozone emissions, as based on USEPA monitoring data. Therefore, the implementation of a proposed Federal action in Broward County requires compliance with the provisions of the State Implementation Plan (SIP), which address the current ozone maintenance plan. This subject is discussed in Section 5.B.1.2, *State Implementation Plan*, and Section 5.B.1.3, *Broward County Air Quality Status*.

The evaluation of air quality impacts at FLL for the 2005 Existing Conditions was prepared pursuant to the FAA *Air Quality Procedures for Civilian Airports and Air Forces Bases (Air Quality Handbook*),[1] using the FAA Emissions and Dispersion Modeling System (EDMS).[2] The guidelines provided in the *Air Quality Handbook* are consistent with FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions;*[3] FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*;[4] and the State of Florida air pollution control provisions in its SIP.

## 5.B.1 REGULATORY OVERVIEW

The USEPA regulates and monitors the concentration of these pollutants: carbon monoxide (CO), nitrogen dioxide ($NO_2$), sulfur dioxide ($SO_2$), particulate matter[5] ($PM_{10}$ and $PM_{2.5}$), ozone, and lead in the ambient air.[6] These regulatory standards are referred to as the NAAQS.[7] The USEPA requires that states exceeding the NAAQS take action to reduce emissions and maintain the NAAQS standard. For this reason, Federal actions such as the improvements proposed for FLL are not permitted to interfere with Florida's plan for maintaining air quality, mandated by NEPA and the CAA.

Ultimately, any analyses conducted to satisfy requirements under either NEPA or the CAA must collectively demonstrate compliance with CAA Title 1, Section 176(c)(1) before the Federal action may be approved or funded.[8] Section 176(c)(1) refers to compliance with the NAAQS, which are the USEPA "criteria" as indicators of air quality for the six criteria pollutants identified in the previous paragraph.[9]

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1 FAA, *Air Quality Procedures for Civilian Airports and Air Forces Bases* (*Air Quality Handbook*), April 1997.

2 FAA Emissions and Dispersion Modeling System (EDMS), Version 4.5, 2006.

3 FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions*, April 28, 2006.

4 FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures* (including Change 1), March 20, 2006.

5 Particulate matter emissions are categorized by size. Coarse particles are defined as having a diameter of 10 micrometers or less and are referred to as $PM_{10}$; fine particles are defined as having a diameter of 2.5 micrometers or less and are referred to as $PM_{2.5}$.

6 Ambient air is defined as the freely moving air of the outdoor environment in areas where the general public has access.

7 Collectively, the pollutants CO, $NO_2$, $SO_2$, $PM_{10}$, $PM_{2.5}$, ozone, and lead are referred to as the "criteria" pollutants because the quality of the air, with regard to these pollutants, is regulated relative to numerical criteria, or standards.

8 Refer to Appendix G, *Air Quality*, Attachment G.1 *Technical Report: Air Quality Assessment Methodology and Procedure (Air Quality Technical Report)*, Section 2, *Regulatory Requirements*, Table 7, *CAA Title 1, Section 176(c)(1).*

9 Refer to Appendix G, *Air Quality*, Attachment G.1 *Technical Report: Air Quality Assessment Methodology and Procedure (Air Quality Technical Report)*, Section 2.1 *National Environmental Policy Act (NEPA)*, Table 5, *National Ambient Air Quality Standards (NAAQS).*

Under NEPA, a NAAQS comparison assessment evaluates the pollutant concentrations of $NO_x$,[10] sulfur oxides ($SO_x$), $PM_{10}$, $PM_{2.5}$, and CO for each project alternative being considered in an EIS. Particular attention would be given to the concentration of CO at selected roadway intersections in the vicinity of an airport, because the USEPA considers CO to be of particular importance at airports where the increase in the number of vehicles accessing the airport may cause or contribute to concentrations of CO that may exceed the NAAQS.

Under NEPA the FAA, as a Federal agency, is required to establish procedures to determine the potential for significant air quality impacts at airports. The FAA did this by requiring a comparison of project emissions to the NAAQS. The FAA then established screening criteria to limit the NAAQS comparison assessment to only those airports with the potential to exceed the NAAQS. (See the next section for a description of the criteria.)

Under the CAA, a General Conformity evaluation is required to consider the impact of the criteria pollutant or precursor pollutant for which the area is nonattainment or maintenance. For example, an area that is maintenance for ozone would be required to consider emissions of $NO_x$ and VOC and then, only for the FAA's Preferred Alternative. Therefore, the applicability of the conformity rules under the CAA depends primarily on the attainment status of the area where the Federal action is located. The following sections describe NEPA and General Conformity requirements in more detail.

### 5.B.1.1 National Environmental Policy Act (NEPA)

Under NEPA, the assessment of air quality for an airport project requires, at minimum, an inventory of the emissions attributable to airport operations under existing conditions. Further analysis depends on the size of the airport, for which the FAA has developed screening criteria. These operations and passenger screening criteria are applied to the operational and passenger characteristics of the particular airport. The airport has the potential to exceed the NAAQS when: (1) it accommodates or projects to accommodate more than 2.6 million passengers annually (or 1.3 million annual enplanements), or (2) when its current or projected combined general aviation and air taxi operations exceed 180,000 annually. In either case, a compliance assessment would be recommended.

An emission impact analysis for each alternative must be conducted regardless of the attainment status of the project area. A comparison of the "build" and "no build" inventories must be prepared for each alternative to determine the relative impacts. Normally, for projects where emissions do not exceed thresholds,[11] further analysis is not required unless the size of the airport exceeds the FAA screening criteria in the FAA *Air Quality Handbook,* as noted above.[12]

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[10] Concentrations of $NO_x$ as calculated using computer modeling, would not be sufficient to indicate conformity under the CAA.

[11] Refer to Appendix G, *Air Quality*, Attachment G.1 *Technical Report: Air Quality Assessment Methodology and Procedure (Air Quality Technical Report)*, Section 2.2.1 *General Conformity Rule Applicability.*

[12] FAA *Air Quality Procedures for Civilian Airports & Air Force Bases*, April 1997.

When a NAAQS comparison assessment is required, computer modeling must be conducted pursuant to Title 40 CFR Part 159,[13] and the results of the modeling must demonstrate compliance with CFR Title 40 Part 93.158(b)(1 and 2), as shown in **Table 5.B-1**.

**Table 5.B-1**
**CFR TITLE 40: PROTECTION OF ENVIRONMENT**
**PART 93.158(B)(1 AND 2)**
**CRITERIA FOR DETERMINING CONFORMITY OF GENERAL FEDERAL ACTIONS**

93.158(b) The areawide and/or local air quality modeling analyses must:
- (1) Meet the requirements in 40 CFR Part 93.159; and
- (2) Show that the action does not:
  - (i) cause or contribute to any new violation of any standard in any area; or
  - (ii) increase the frequency or severity of any existing violation of any standard in any area.

TITLE 40: Protection of Environment, PART 93—*Determining Conformity of Federal Actions to State or Federal Implementation Plans*, CHAPTER I--*Environmental Protection Agency*, SUBCHAPTER C--*Air Programs*, SUBPART B—*Determining Conformity of General Federal Actions to State or Federal Implementation Plans*, § 93.158 *Criteria for Determining Conformity of General Federal Actions.*

Source: Landrum & Brown, 2007

For FLL, the 2005 Existing Conditions analysis indicates that a NAAQS assessment is required. The total impacts attributed to each alternative[14] must then be compared to the NAAQS provided in **Table 5.B-2**. This comparison will show how each alterative meets or exceeds the required air quality standard (*see* Chapter Six, *Environmental Consequences*, Section 6.B, *Air Quality*). Table 5.B-2 contains the standards effective as of the Draft EIS issue date.

[13] In 40 CFR Part 93.159 (July 1, 2006), the USEPA outlines the procedures to be followed for the preparation of dispersion analyses, such as what planning assumptions the analyses should be based on, what version of motor vehicle emissions models to use, required compliance to the USEPA "Guideline on Air Quality Models", which is found in Appendix W of 40 CFR Part 51 (July 1, 2006), and the future years for which an analysis should be prepared.

[14] The "total impacts attributed to each alternative" would be the combination of the criteria pollutant concentration at any given location as estimated through computer modeling, combined with the associated ambient background concentration derived from the USEPA air quality monitoring network. The sum is referred to as the "design concentration." Refer to 40 CFR Part 51, Appendix W to Part 51, *Guideline on Air Quality Models*, Paragraph 7.2.1.1, March 1, 2007.

**Table 5.B-2**
**NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)**

| POLLUTANT | AVERAGING PERIOD | PRIMARY STANDARDS | SECONDARY STANDARDS |
|---|---|---|---|
| Sulfur Dioxide ($SO_2$) | Annual Arithmetic Mean | 0.03 PPM | None |
| | 24-Hour Average | 0.14 PPM | None |
| | 3-Hour Average | None | 0.50 PPM |
| Particulate Matter ($PM_{10}$) | 24-Hour Average | 150 $\mu g/m^3$ | 150 $\mu g/m^3$ |
| Particulate Matter ($PM_{2.5}$) | Annual Arithmetic Mean | 15 $\mu g/m^3$ | 15 $\mu g/m^3$ |
| | 24-Hour Average | 35$\mu g/m^3$ | 35 $\mu g/m^3$ |
| Carbon Monoxide (CO) | 8-Hour Average | 9 PPM | None |
| | 1-Hour Average | 35 PPM | None |
| Ozone ($O_3$) | 8-Hour Average | 0.08 PPM | 0.08 PPM |
| | 1-Hour Average | 0.12 PPM | 0.12 PPM |
| Nitrogen Dioxide ($NO_2$) | Annual Arithmetic Mean | 0.053 PPM | 0.053 PPM |
| Lead (Pb) [1] | 3-Month Arithmetic Mean | 1.5 $\mu g/m^3$ | 1.5 $\mu g/m^3$ |

Notes: PPM is parts per million.
$\mu g/m^3$ is micrograms per cubic meter.
The NAAQS were incorporated into the Florida SIP, by reference. Refer to *Florida Administrative Code (FAC)*, October 1, 2004, Chapter 62-204 *Air Pollution Control-General Provisions*, and Section 62-204.800 *Federal Regulations*.

[1] Airborne lead in urban areas is primarily emitted by vehicles using leaded fuels. The chief source of lead emissions at airports would be the combustion of leaded aviation gasoline in small piston-engine general aviation aircraft. However, the USEPA and FAA have determined that an exceedance of the lead standard would be unlikely at an airport because of the use of low-lead fuel for piston-engine aircraft. Therefore, emissions of lead were not considered in this analysis.

Sources: USEPA, *Code of Federal Regulations Title 40*, Part 50 *National Primary and Secondary Ambient Air Quality Standards*, Section 50.4 – Section 50.12.
FAA, *Air Quality Procedures for Civilian Airports & Air Force Bases*, April 1997.
DEP, *Florida Administrative Code (FAC)*, October 1, 2004, Chapter 62-204 *Air Pollution Control-General Provisions*, and Section 62-204.800 *Federal Regulations*.
71 FR 61144, 10/17/06, *National Ambient Air Quality Standards for Particulate Matter*, revisions to the standards for $PM_{10}$ and $PM_{2.5}$.
Landrum & Brown, 2007. (This table contains the standards in effect at the time of the Draft EIS issue date.)

### 5.B.1.2 State Implementation Plan (SIP)

According to the CAA, each state must provide the USEPA with a SIP. The SIP must include a strategy for air quality improvement in local areas for each criteria pollutant that exceeds the NAAQS. The SIP must also include a plan to maintain acceptable air quality in areas that do not exceed the NAAQS. For purposes of this Draft EIS, the relevant portion of the Florida SIP for Broward County contains the maintenance plan for one-hour ozone standard.[15]

[15] The Florida Administrative Code (FAC) Chapter 62, *Air Pollution Control*, contains the SIP and incorporates the NAAQS and the relevant provisions of the CAA by reference.

Historically, in 1979, the county was designated nonattainment for the one-hour ozone standard[16] based on results of ozone data provided through the USEPA air quality monitoring network. Subsequently, from 1990 to 1994, ambient air quality monitoring in the Airshed showed no violations of the one-hour ozone standard.[17] As a result, effective April 25, 1995, the USEPA approved the Florida Department of Environmental Protection's (DEP's) request for redesignation to attainment of the one-hour standard in the Airshed. The USEPA then approved the DEP's ten-year (1995 to 2005) maintenance plan for inclusion in the Florida SIP.

As the expiration of the first ten-year one-hour ozone maintenance plan approached, the DEP submitted the second ten-year update for the Southeast Florida area. DEP submitted this update on December 2002, based on the continued satisfactory ozone levels detected by the USEPA's monitoring network. The USEPA approved the *Southeast Florida Area Maintenance Plan Update* (Florida 2004 Plan Update) on February 13, 2004. The Florida 2004 Plan Update remains an enforceable element of the Florida SIP through 2015 or until the SIP is revised.

Subsequent to approval of the Florida 2004 Plan Update, the USEPA established the new eight-hour ozone standard and revoked the one-hour ozone standard when the agency published the *Final Phase 1 Rule to Implement the 8-Hour Ozone National Ambient Air Quality Standard* on April 30, 2004 (USEPA 2004 Rule).[18]

The USEPA 2004 Rule became effective on June 15, 2004. The rule appeared to effectively eliminate the applicability of the CAA General Conformity regulations to areas previously considered maintenance for the one-hour standard and subsequently designated attainment for the eight-hour standard.

However, in a court ruling dated December 22, 2006, the USEPA 2004 Rule was overturned. The USEPA was required to keep in place the measures intended to limit ozone formation, even though the measures were based on the now outdated one-hour standard. The opinion specifically required the evaluation of General Conformity in areas were the measures were already in place for the one-hour ozone standard.[19] As a result of the court's opinion, Broward County would continue to be included in an ozone maintenance area through 2015 or until the SIP is revised. The Florida DEP intends to submit a SIP revision in 2007.

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16 The moderate nonattainment designation was made pursuant to Section 107(d)(1)(C)(i) and Section 181(a)(1) of the CAA.

17 Florida Department of Environmental Protection (DEP), *Air Quality Maintenance Plan (2005-2015) Dade, Broward, and Palm Beach Counties*, December 2002.

18 USEPA, 69 FR 23,951, 4/30/2004, *Final Phase 1 Rule to Implement the 8-Hour Ozone National Ambient Air Quality Standard*.

19 U.S. Court of Appeals for the District of Columbia Circuit, Opinion No. 04-1200, *South Coast Air Quality Management District V. USEPA, et.al.*, decided December 22, 2006.

### 5.B.1.3 Broward County Air Quality Status

The Airshed includes Broward, Miami-Dade, and Palm Beach counties, which encompass a portion of the Southeast Florida Intrastate Air Quality Control Region.[20] The Airshed is in attainment for all the Federally-regulated standards as of the Draft EIS issue date. These would include the standards for emissions of CO, $SO_2$, $NO_2$, $PM_{10}$, $PM_{2.5}$, lead, and the eight-hour standard for ozone.

However, Broward County was designated an ozone maintenance area in 1995 and the Florida 2004 Plan Update remains effective through 2015, as required following a December 2006 court opinion.[21] Therefore, even though the Florida 2004 Plan Update was based on an outdated standard, the county would still be included in an ozone maintenance area.

### 5.B.1.4 Clean Air Act General Conformity Rule

The Clean Air Act (CAA) Amendments of 1990 included provisions to ensure emissions from Federal actions will comply with the goals of the SIP and will not interfere with the plans to improve air quality in a nonattainment or maintenance area. Compliance with the SIP requires the sponsoring Federal agency to prepare an analytical demonstration of the potential for significant air quality impacts from Federal actions located in nonattainment or maintenance areas. The analytical demonstration is prepared pursuant to the General Conformity Rule (the Rule), published at 40 CFR Part 93.[22] The rule applies only to Federal actions that are:

- Federally-funded or Federally-approved,
- Not a highway or transit project,
- Not identified as "exempt"[23] under the CAA and not identified on the approving Federal agency's "Presumed to Conform" list,[24]
- Located within a nonattainment or maintenance area, and
- Identified as the Federal agency's preferred alternative.

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20 USEPA, 40 CFR Part 81, Section 81.49, *Southeast Florida Intrastate Air Quality Control Region*, July 1, 2006.

21 Refer to Section 5.B.1.2, *State Implementation Plan*, for a complete explanation of the December 2006 court ruling.

22 40 CFR Part 93, Subpart B *Determining Conformity of General Federal Actions to State or Federal Implementation Plans*, July 1, 2006.

23 The FLL Proposed Action is not listed as an action exempt from a conformity determination pursuant to 40 CFR Part 93.153(c) (July 1, 2006). An exempt project is one that the USEPA has determined would clearly have no impact on air quality at the facility, and any net increase in emissions would be so small as to be considered negligible.

24 The provisions of the CAA allow a Federal agency to submit a list of actions demonstrated to have low emissions that would have no potential to cause an exceedance of the NAAQS and are presumed to conform to the CAA conformity regulations. This list would be referred to as the "Presumed to Conform" list. The FAA Presumed to Conform list was published in the Federal Register on February 12, 2007 (72 FR 6641-6656) airport projects that would not require evaluation under the General Conformity regulations.

The rule establishes minimum values, referred to as de minimis thresholds, for the criteria and precursor pollutants. If total project-related emissions equal or exceed the de minimis values, a General Conformity Determination must be prepared to demonstrate conformity to the SIP. The de minimis thresholds are provided in **Table 5.B-5**, ***Clean Air Act De Minimis Thresholds***.

## Table 5.B-5
## CLEAN AIR ACT DE MINIMIS THRESHOLDS

| POLLUTANT | NONATTAINMENT AREA THRESHOLD EMISSIONS (tons per year) | MAINTENANCE AREA THRESHOLD EMISSIONS (tons per year) |
|---|---|---|
| **Carbon Monoxide** (CO) | 100 | 100 |
| **Particulate Matter** ($PM_{10}$) | | 100 |
| Moderate Nonattainment Area | 100 | |
| Serious Nonattainment Area | 70 | |
| **Particulate Matter** ($PM_{2.5}$) | 100 | 100 |
| Precursor pollutants $SO_2$, $NO_x$, VOC, & $NH_4$[1] | 100 | 100 |
| **Sulfur Dioxide** ($SO_2$) | 100 | 100 |
| **Nitrogen Dioxide** ($NO_2$) | 100 | 100 |
| **Lead** (Pb) | 25 | 25 |
| **Ozone**[2] ($O_3$) | *VOC/NOx* | *VOC/$NO_x$* |
| Serious Nonattainment Area | 50/50 | |
| Severe Nonattainment Area | 25/25 | |
| Extreme Nonattainment Area | 10/10 | |
| Inside an ozone transport region[3]: | | 50/100 |
| Marginal Nonattainment Area | 50/100 | |
| Moderate Nonattainment Area | 50/100 | |
| Outside an ozone transport region[3]**:** | | 100/100 |
| Marginal Nonattainment Area | 100/100 | |
| Moderate Nonattainment Area | 100/100 | |

Note: The de minimis levels for all criteria and precursor pollutants provided in this table are effective as of the Draft EIS issue date.

The CAA General Conformity Rule, including the de minimis thresholds, were incorporated into the Florida SIP, by reference. Refer to *Florida Administrative Code (FAC)*, October 1, 2004, Chapter 62-204 *Air Pollution Control-General Provisions*, and Section 62-204.800 *Federal Regulations*.

[1] $NH_4$ is the chemical formula for ammonium (ammonia), a precursor to the development of $PM_{2.5}$. Net emissions of pollutants determined by USEPA as precursors or contributors to $PM_{2.5}$ emissions include $SO_2$, $NO_x$, VOC, and $NH_4$, and are each limited to net emissions of 100 tons per year in a $PM_{2.5}$ nonattainment or maintenance area.

[2] The rate of increase of ozone emissions is not usually evaluated in an environmental review because the formation of ozone occurs on a regional level and is the result of the photochemical reaction of $NO_x$ and VOC in the presence of abundant sunlight. Therefore, USEPA considers the rates of increase of $NO_x$ and VOC emissions to reflect the likelihood of ozone formation on a project level.

[3] An ozone transport region (OTR) is a single transport region for ozone, comprised of the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and the Consolidated Metropolitan Statistical Area that includes the District of Columbia.

Sources: 40 CFR 93.153(b)(1)&(2), July 1, 2006.
DEP, *Florida Administrative Code (FAC)*, October 1, 2004, Chapter 62-204 *Air Pollution Control-General Provisions*, and Section 62-204.800 *Federal Regulations*.

71 FR 17003, April 5, 2006, *$PM_{2.5}$ De Minimis Emission Levels for General Conformity Applicability*.

The evaluation of a Federal action under General Conformity need only consider those criteria or precursor pollutant thresholds for which the area is nonattainment or maintenance. Table 5.B-5, *Clean Air Act De Minimis Thresholds*, shows de minimis levels for all criteria and precursor pollutants effective as of the Draft EIS issue date.

Broward County is maintenance for ozone and is located outside an "ozone transport region."[25] As such, the de minimis thresholds applicable for the FAA Preferred Alternative at FLL would be 100 tons per year of either $NO_x$ or VOC emissions.

The level of ozone emissions is not specifically evaluated in an environmental imact review of a Federal action because ozone is not emitted by any single source. Rather, ozone is a regional phenomena resulting from the photochemical reaction $NO_x$ and VOC emissions in the presence of abundant sunlight and heat. The presence of ozone in any given area is the result of regional transport from sources well outside the perimeter of the study area and therefore would not be predictable. Consequently, USEPA considers the rates of increase of $NO_x$ and VOC emissions, referred to as the ozone precursor pollutants, to reflect the likelihood of ozone formation on a project level.

## 5.B.2 ASSESSMENT OF 2005 EXISTING CONDITIONS

An emission inventory for FLL was prepared for the 2005 Existing Conditions using the FAA EDMS Version 4.5. This inventory estimated the volume of criteria and precursor pollutant emissions, in tons per year. The sources of emissions evaluated for the emission inventory included aircraft; GSE; auxiliary power units (APUs); other mobile sources using airport roadways, access roadways, parking lots, and parking garages; and stationary sources such as fuel storage tanks and diesel-fueled generators.

To compare the concentration of airport emissions, identified in the inventory, to the NAAQS, FAA guidelines recommend dispersion modeling. The dispersion modeling for the 2005 Existing Conditions used the FAA EDMS Version 4.5, and CAL3QHC (the roadway emissions dispersion model that calculates the concentration of CO from vehicles at intersections). The dispersion analyses estimated the concentration of airport criteria emissions relative to time and space, in parts per million (PPM), for $NO_x$, CO, $PM_{10}$, $PM_{2.5}$, and $SO_x$. The sources of emissions evaluated for the NAAQS comparison would be the same as those evaluated for the emission inventory. A detailed description of the procedure and methodology to prepare the emission inventory and the dispersion analyses are provided in Appendix G, *Air Quality*.

[25] An ozone transport region (OTR) is a single transport region for ozone [within the meaning of Section 175B(a) of the Clean Air Act], comprised of the STATES of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and the Consolidated Metropolitan Statistical Area that includes the District of Columbia, as given at Section 184 of the Act.

There is no requirement under the CAA to prepare an analysis of existing conditions under the General Conformity Rule, which is concerned only with the potential impact from the Airport Sponsor's proposed project alternative. The evaluation of General Conformity is given in Chapter Six, *Environmental Consequences*, Section 6.B, *Air Quality*.

### 5.B.2.1 Criteria and Precursor Pollutant Emission Inventory

As noted earlier, the two pollutants of interest in Broward County are emissions of $NO_x$ and VOC. These two pollutants are ozone precursor pollutants because they contribute to the formation of ozone in the presence of abundant sunlight; and ozone emissions have been a concern of Broward County in the recent past.[26]

The results of the emission inventory are provided in **Table 5.B-6**, ***Criteria and Precursor Pollutant Emission Inventory - 2005 Existing Conditions***. The 9,100 annual tons of emissions are comprised primarily of CO and $NO_x$, and the majority of those emissions are caused by operation of GSE, APUs, and aircraft.

- Emissions of CO dominate the emission inventory, particularly from the use of GSE/APUs and motor vehicles. The majority of emissions of CO from aircraft come from piston aircraft that use AvGas and aircraft using JET-A fuel during idle.
- Emissions of $NO_x$ are mostly from aircraft that use JET-A fuel, particularly during takeoff.
- Emissions of VOC are produced equally by aircraft, GSE/APU, and on-road motor vehicles.
- Emissions of $SO_x$ and PM are produced primarily by aircraft engines.

When compared to the projected Florida 2004 Plan Update SIP budget for 2005 VOC emissions,[27] the airport was estimated to contribute 0.5 percent of total projected VOC emissions. When compared to the projected SIP budget for 2005 $NO_x$ emissions, the airport was estimated to contribute 2.1 percent of total projected $NO_x$ emissions. Aircraft and GSE/APUs combined were estimated to account for 7.4 percent of the total off-road mobile $NO_x$ emissions projected in the county for 2005. Aircraft and GSE/APUs combined were estimated to account for 3.1 percent of the total off-road mobile VOC emissions projected in the county for 2005.

### 5.B.2.2 Dispersion Analysis

Dispersion analysis computes pollutant concentrations with respect to space and time. For this analysis, it is important to incorporate aircraft location in each mode

[26] Refer to Appendix G, *Air Quality*, Attachment G.1 *Technical Report: Air Quality Assessment Methodology and Procedure (Air Quality Technical Report)*, Section 3.2 *Criteria and Precursor Pollutant Emission Inventory*.

[27] Refer to Appendix G, *Air Quality*, Attachment G.1 *Technical Report: Air Quality Assessment Methodology and Procedure (Air Quality Technical Report)*, Section 1.2, *State Implementation Plans*.

of the Landing and Takeoff Cycle (LTO).[28] Ambient background concentrations must be added to dispersion results to determine the design concentrations.[29] The total concentrations are then compared to the NAAQS. The applicable ambient background concentrations used for the dispersion analysis of criteria pollutants at FLL under the 2005 Existing Conditions are provided in Appendix G*, Air Quality*.[30]

Two dispersion analyses were conducted for comparison to the NAAQS: (1) the criteria pollutant dispersion analysis based on the EDMS emission inventory,[31] and (2) the CAL3QHC roadway intersection "hot spot" CO dispersion analysis based on the results of the roadway volume analysis for four area roadway intersections. The results of each analysis were added to the average ambient background concentrations to determine the design concentration for comparison to the NAAQS.

[28] Refer to Appendix G, *Air Quality*, Attachment G.1 *Technical Report: Air Quality Assessment Methodology and Procedure (Air Quality Technical Report)*, Section 3.4, *Dispersion Analysis*.

[29] Design concentration refers to the total concentration of criteria pollutants that would be compared to the NAAQS to determine compliance to the SIP. The estimated pollutant concentration derived from computer modeling would be added to the actual monitored ambient background concentration to provide the most accurate representation of the entire contribution of pollutants to a specific location. Refer to 40 CFR Part 51, Appendix W, Section 7.2.1.1 *Design Concentrations for* $SO_2$, $PM_{10}$, *CO, Pb, and* $NO_2$, and Section 7.2.1.2, *Design Concentrations for* $O_3$ *and* $PM_{2.5}$, *March 1, 2007.*

[30] Refer to Appendix G, *Air Quality*, Attachment G.1 *Technical Report: Air Quality Assessment Methodology and Procedure (Air Quality Technical Report)*, Section 3.4.4, *Air Quality Monitoring and Background Concentrations*, Table 15, *Background Concentrations.*

[31] The dispersion analysis was based on the EDMS criteria pollutant inventory using only the emissions data estimated using the EDMS database and did not include the additional particulate matter emissions calculated and added to the inventory using the USEPA AP-42 emission factors.

**Table 5.B-6**
**CRITERIA AND PRECURSOR POLLUTANT EMISSION INVENTORY**
**2005 EXISTING CONDITIONS**
**Fort Lauderdale-Hollywood International Airport**

| EMISSION SOURCES | ANNUAL EMISSIONS (tons per year) | | | | | | |
|---|---|---|---|---|---|---|---|
| | CO | VOC | $NO_X$ | $SO_X$ | $PM_{10}$[1] | $PM_{2.5}$[1] | TOTAL |
| Aircraft | 1,231.4 | 154.6 | 1,070.0 | 77.9 | 74.7 | 74.7 | **2,683.3** |
| GSE/APUs | 3,486.0 | 137.3 | 263.1 | 27.1 | 8.7 | 8.4 | **3,930.6** |
| Roadways | 1,520.8 | 154.3 | 144.6 | 2.2 | 4.0 | 2.8 | **1,828.7** |
| Parking Facilities | 508.4 | 91.1 | 38.6 | 0.4 | 0.8 | 0.6 | **639.9** |
| Stationary Sources | 1.6 | 15.6 | 7.1 | 0.5 | 0.5 | 0.5 | **25.8** |
| **TOTAL** | **6,748.2** | **552.9** | **1,523.4** | **108.1** | **88.7** | **87.0** | **9,108.3** |

Note: GSE is ground support equipment and APUs are the auxiliary power units.

[1] Particulate matter emissions estimated in EDMS were supplemented by adding emissions calculated using the $PM_{10}$ emission factors from the USEPA AP-42 for aircraft not having PM emission factors available in the EDMS database. All emissions of $PM_{10}$ calculated using data from the AP-42 database were assumed to be equal to emissions of $PM_{2.5}$ for the same aircraft.

Sources: FAA, Emissions and Dispersion Modeling System (EDMS) Version 4.5, 2006.
USEPA, *Compilation of Air Pollutant Emission Factors (AP-42) Volume II: Mobile Sources, 4th ed.*, Section II-1, *Aircraft*.

### 5.B.2.2.1 CRITERIA POLLUTANT DISPERSION ANALYSIS

Four receptor locations were used in the dispersion analysis (161 receptor locations were narrowed down by sensitivity dispersion analysis to the four with the highest results):

- Receptor 188 - Melaluca Gardens, a residential area south of Runway 9R/27L
- Receptor T13 - Terminal 3 curbfront
- Receptor 57 - North side of the airport, beyond Interstate-595, east of Snyder Park
- Receptor 45 - Off-airport parking lot, east of Interstate-95

The results of the dispersion analysis of the criteria pollutants for the 2005 Existing Conditions inventory are provided in **Table 5.B-7** ***Criteria Pollutant Design Concentrations 2005 Existing Conditions***. None of the design concentrations at any of the four receptor locations equal or exceed the NAAQS.

- The concentrations identified in Table 5.B-7, compared to the national standards, are not significant. These concentrations were identified in the terminal area where airport emissions of CO and $NO_x$ from mobile sources (vehicles and GSE) produced design concentrations of 78 to nearly 99 percent of the national standard.

## Table 5.B-7
## CRITERIA POLLUTANT DESIGN CONCENTRATIONS
## 2005 EXISTING CONDITIONS
## Fort Lauderdale-Hollywood International Airport

| RECEPTORS | POLLUTANT CONCENTRATIONS ($\mu g/m^3$) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | CO | | $NO_x$ | $SO_x$ | | $PM_{10}$ | | $PM_{2.5}$ | |
| | 1-HR | 8-HR | ANNUAL | 24-HR | ANNUAL | 24-HR | ANNUAL | 24-HR | ANNUAL |
| **USEPA STANDARDS** | **40,000** | **10,000** | **100** | **365** | **80** | **150** | **50** | **65** | **15** |
| Receptor G10 | 14,599.2 | 5,777.9 | 58.2 | 1.9 | 1.5 | 3.8 | 1.2 | 6.0 | 1.0 |
| Background | 5,733.1 | 3,436.4 | 20.7 | 23.6 | 5.2 | 43.8 | 19.6 | 35.0 | 8.4 |
| **TOTAL** | **20,332.3** | **9,214.3** | **78.9** | **25.5** | **6.7** | **47.6** | **20.8** | **41.0** | **9.4** |
| Receptor R2 | 17,926.2 | 5,523.2 | 58.3 | 3.7 | 2.2 | 5.7 | 1.8 | 7.2 | 1.4 |
| Background | 5,733.1 | 3,436.4 | 20.7 | 23.6 | 5.2 | 43.8 | 19.6 | 35.0 | 8.4 |
| **TOTAL** | **23,659.3** | **8,959.6** | **79.0** | **27.3** | **7.4** | **49.5** | **21.4** | **42.2** | **9.8** |
| Receptor T4 | 15,015.2 | 6,151.6 | 70.6 | 11.0 | 3.1 | 5.6 | 2.2 | 6.7 | 1.7 |
| Background | 5,733.1 | 3,436.4 | 20.7 | 23.6 | 5.2 | 43.8 | 19.6 | 35.0 | 8.4 |
| **TOTAL** | **20,748.3** | **9,588.0** | **91.3** | **34.6** | **8.3** | **49.4** | **21.8** | **41.7** | **10.1** |
| Receptor T9 | 15,520.9 | 5,392.3 | 72.9 | 5.5 | 2.6 | 5.7 | 2.2 | 6.7 | 1.7 |
| Background | 5,733.1 | 3,436.4 | 20.7 | 23.6 | 5.2 | 43.8 | 19.6 | 35.0 | 8.4 |
| **TOTAL** | **21,254.0** | **8,828.7** | **93.6** | **29.1** | **7.8** | **49.5** | **21.8** | **41.7** | **10.1** |
| Receptor T13 | 18,897.5 | 4,522.5 | 78.1 | 10.3 | 3.7 | 5.3 | 2.3 | 6.8 | 1.9 |
| Background | 5,733.1 | 3,436.4 | 20.7 | 23.6 | 5.2 | 43.8 | 19.6 | 35.0 | 8.4 |
| **TOTAL** | **24,630.6** | **7,958.9** | **98.8** | **33.9** | **8.9** | **49.1** | **21.9** | **41.8** | **10.3** |
| Receptor T14 | 17,821.0 | 4,344.9 | 64.6 | 12.0 | 4.1 | 5.4 | 2.0 | 6.8 | 1.7 |
| Background | 5,733.1 | 3,436.4 | 20.7 | 23.6 | 5.2 | 43.8 | 19.6 | 35.0 | 8.4 |
| **TOTAL** | **23,554.1** | **7,781.3** | **85.3** | **35.6** | **9.3** | **49.2** | **21.6** | **41.8** | **10.1** |
| Receptor 45 | 4,463.5 | 426.0 | 12.2 | 3.1 | 0.9 | 2.1 | 0.5 | 3.8 | 0.6 |
| Background | 5,733.1 | 3,436.4 | 20.7 | 23.6 | 5.2 | 43.8 | 19.6 | 35.0 | 8.4 |
| **TOTAL** | **10,196.6** | **3,862.4** | **32.9** | **26.7** | **6.1** | **45.9** | **20.1** | **38.8** | **9.0** |
| Receptor 57 | 6,638.3 | 1,409.2 | 7.0 | 0.3 | 0.6 | 2.0 | 0.2 | 2.3 | 0.2 |
| Background | 5,733.1 | 3,436.4 | 20.7 | 23.6 | 5.2 | 43.8 | 19.6 | 35.0 | 8.4 |
| **TOTAL** | **12,371.4** | **4,845.6** | **27.7** | **23.9** | **5.8** | **45.8** | **19.8** | **37.3** | **8.6** |
| Receptor 117 | 11,407.3 | 1,837.3 | 5.8 | 6.1 | 0.4 | 1.5 | 0.2 | 3.1 | 0.2 |
| Background | 5,733.1 | 3,436.4 | 20.7 | 23.6 | 5.2 | 43.8 | 19.6 | 35.0 | 8.4 |
| **TOTAL** | **17,140.4** | **5,273.7** | **26.5** | **29.7** | **5.6** | **45.3** | **19.8** | **38.1** | **8.6** |
| Receptor 118 | 11,983.4 | 1,753.1 | 5.5 | 5.8 | 0.5 | 1.6 | 0.2 | 3.3 | 0.2 |
| Background | 5,733.1 | 3,436.4 | 20.7 | 23.6 | 5.2 | 43.8 | 19.6 | 35.0 | 8.4 |
| **TOTAL** | **17,716.5** | **5,189.5** | **26.2** | **29.4** | **5.7** | **45.4** | **19.8** | **38.3** | **8.6** |

Notes: $\mu g/m^3$ is micrograms per cubic meter.
"Background" refers to regional background pollutant concentrations.
Does not include the additional PM emissions estimated using USEPA AP-42 data, as was given for the emission inventory in Table 5.B-6.
Source: FAA, Emissions and Dispersion Modeling System (EDMS) Version 4.5, 2006.

The greatest concentrations occur at Receptor T13 adjacent to Terminal 3, where the annual $NO_x$ concentration caused by motor vehicles is 98.8 percent of the $NO_x$ NAAQS.

#### 5.B.2.2.2 ROADWAY INTERSECTION CARBON MONOXIDE (CO) DISPERSION ANALYSIS

A "hot spot" dispersion analysis is indicated for airport-related traffic expected to cause CO emissions that may exceed the NAAQS. Four intersections were chosen for this "hot spot" analysis. While each of the four intersections is controlled by a traffic light, other characteristics unique to each of the four were required for modeling, such as the number of turning lanes, volume of vehicles on each turning movement, and signal timing. The four intersections are:

- Griffin and U.S. Highway 1
- Southeast 30th Street and U.S. Highway 1
- Griffin and the Interstate-95 Ramps

Ravenswood and SW 42nd Street

An aerial photograph of the modeled intersections is shown in Appendix G, *Air Quality*.[32] The results of the CAL3QHC "hot spot" CO dispersion analysis are provided in **Table 5.B-8**, ***Roadway Intersection Carbon Monoxide Design Concentrations - 2005 Existing Conditions***. The design concentration includes the same CO background information used for the criteria pollutant dispersion analysis. The design concentration for each intersection receptor is the greatest estimated concentration of CO, considering all receptors included in the analysis for each intersection. None of the design concentrations projected for the intersection analysis were estimated to equal or exceed the CO NAAQS at any of the intersection receptor locations.

The maximum concentration of CO at the intersection of Griffin and U.S. Highway 1 occurs at the southeast corner of the intersection, outside the northbound approach lanes of U.S. Highway 1. This intersection experiences the highest volume of vehicles and the longest queuing, which results in the highest CO concentrations compared to the other three intersections.

At the intersection of 30th Street and U.S. Highway 1, the maximum concentration of CO is along the west side of the U.S. Highway 1 southbound approach lanes, caused by the high number of vehicles approaching the intersection and queuing for right and left turns.

The maximum concentration of CO at the intersection of Griffin and the Interstate-95 ramps occurs at the northwest corner of the intersection, outside the Interstate-95 southbound exit ramp onto the eastbound departure lanes on Griffin Road.

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[32] Refer to Appendix G, *Air Quality*, Attachment G.1 *Technical Report: Air Quality Assessment Methodology and Procedure (Air Quality Technical Report)*, Section 3.4, *Roadway Intersection CO Dispersion Analysis*.

The maximum concentration of CO at the intersection of Ravenswood and 42nd Street is caused by the queue of vehicles making a left turn onto eastbound 42nd Street. This intersection experiences the lowest CO concentrations, compared to the other three intersections.

## 5.B.3 CONCLUSION

Broward County is designated as attainment for all the NAAQS as of the Draft EIS issue date. However, as discussed in earlier sections, an evaluation of General Conformity is still required because the SIP currently in effect designates Broward County as a maintenance area. (*See* 5.B.1.3, *Broward County Air Quality Status*.)

**Table 5.B-8**
**ROADWAY INTERSECTION CARBON MONOXIDE DESIGN CONCENTRATIONS**
**2005 EXISTING CONDITIONS**
**Fort Lauderdale-Hollywood International Airport**

| INTERSECTIONS | CARBON MONOXIDE DESIGN CONCENTRATIONS ($\mu g/m^3$) | |
|---|---|---|
| | USEPA STANDARDS | |
| | 1-HOUR | 8-HOUR |
| | 40,000 | 10,000 |
| Griffin and U.S. Highway 1 | 7,590 | 4,554 |
| Background | 5,733 | 3,436 |
| **TOTAL** | **13,323** | **7,990** |
| Southeast 30th Street and U.S Highway 1 | 7,245 | 4,347 |
| Background | 5,733 | 3,436 |
| **TOTAL** | **12,978** | **7,783** |
| Griffin and Interstate-95 Ramps | 4,370 | 2,622 |
| Background | 5,733 | 3,436 |
| **TOTAL** | **10,103** | **6,058** |
| Ravenswood and SW 42nd Street | 1,725 | 1,035 |
| Background | 5,733 | 3,436 |
| **TOTAL** | **7,458** | **4,471** |

Note: $\mu g/m^3$ is micrograms per cubic meter.
"Background" refers to regional background pollutant concentrations.

Sources: USEPA, CAL3QHC.
The Corradino Group analysis, 2006.
Landrum & Brown analysis, 2006.

The emission inventory for the 2005 Existing Conditions show the airport is a relatively small contributor to total emissions projected in the SIP regional budget for 2005. The estimated total airport emissions of VOCs account for 0.5 percent of

the total projected regional budget for VOCs in Broward County, whereas total airport emissions of $NO_x$ were estimated to account for 2.1 percent of the projected regional budget for $NO_x$ emissions in Broward County.

The relatively high level of aircraft operations and passengers served at the airport requires a comparative assessment of airport emissions to the NAAQS, pursuant to NEPA and FAA guidelines. As such, a dispersion analysis was conducted, based on the emission inventory to determine the contribution of emissions due to the operation of the airport. The analyses showed that emissions under the 2005 Existing Conditions were estimated to be less than the NAAQS at all of the airport receptor locations included in the analysis and at all of the receptors evaluated for the four roadway intersections.