

APPENDIX C

AIR QUALITY

This appendix presents an assessment of the potential impacts to air quality from the Proposed Action and the No-Build/No-Action. The following subsections discuss the relevant Federal and state air quality review requirements. The results of the air quality analysis for the Existing Conditions (2012) and conditions for year 2015 are presented under both the No-Build/No-Action and the Proposed Action.

Burke Lakefront Airport (BKL) is located in the Greater Metropolitan Cleveland Intrastate Air Quality Control Region (Cleveland AQCR).¹ The Cleveland AQCR does not meet the Federal standard for fine particulate matter (PM_{2.5}).² In the past, Cuyahoga County was designated as nonattainment for ozone, carbon monoxide (CO), Sulfur Dioxide (SO₂), and Coarse Particulate Matter (PM₁₀); however the U.S. Environmental Protection Agency (USEPA) determined the Cleveland AQCR had attained the standard for these pollutants and the region was re-designated to attainment. The area now operates under a maintenance plan for ozone, CO, SO₂, and PM₁₀.³

C.1 REGULATORY BACKGROUND

This section evaluates the conformity of the Proposed Action with the Ohio State Implementation Plan (SIP) by assessing the potential impact of the Proposed Action on state efforts to achieve and maintain compliance with the National Ambient Air Quality Standards (NAAQS) established under Title I of the Clean Air Act (CAA). In addition to these CAA requirements, there are state regulations that may apply to airport projects, including an Indirect Source Review (ISR). These Federal and state air quality requirements are discussed in the following sections.

C.1.1 NATIONAL AMBIENT AIR QUALITY STANDARDS

The CAA, including the 1990 Amendments, provides for the establishment of standards and programs to evaluate, achieve, and maintain acceptable air quality in the U.S. Under the CAA, the USEPA established a set of standards, or criteria, for six pollutants determined to be potentially harmful to human health and welfare.⁴

¹ U.S. Environmental Protection Agency (USEPA), 40 CFR Part 81, Section 81.22, *Greater Metropolitan Cleveland Intrastate Air Quality Control Region* (e-CFR data current as of May 30, 2012).

² A portion of Cuyahoga County, the area that is bounded on the west by Washington Park Blvd./Crete Ave./East 49th St., on the east by East 71st St., on the north by Fleet Ave., and on the south by Grant Avenue is designated nonattainment for the lead standard. However Burke Lakefront Airport is not within that portion of Cuyahoga County.

³ The 8-hour concentration of ozone was redesignated to moderate maintenance September 15, 2009. CO was redesignated to moderate maintenance March 7, 1994. SO₂ was redesignated to maintenance February 28, 2005. PM₁₀ was redesignated to moderate maintenance January 10, 2001.

⁴ USEPA, Code of Federal Regulations, Title 40, Part 50 (40 CFR Part 50) *National Primary and Secondary Ambient Air Quality Standards* (NAAQS), July 2011.

The USEPA considers the presence of the following six criteria pollutants to be indicators of air quality:

- Ozone (O₃);
- Carbon monoxide (CO);
- Nitrogen dioxide (NO₂);
- Particulate matter (PM₁₀ and PM_{2.5});⁵
- Sulfur dioxide (SO₂); and,
- Lead (Pb).

The standards for the criteria pollutants, known as the NAAQS, are summarized in **Table C-1**. For each of the criteria pollutants, the USEPA established primary standards intended to protect public health, and secondary standards for the protection of other aspects of public welfare, such as preventing materials damage, preventing crop and vegetation damage, and assuring good visibility. Areas of the country where air pollution levels consistently exceed these standards may be designated nonattainment by the USEPA.

A nonattainment area is a homogeneous geographical area⁶ (usually referred to as an air quality control region) that is in violation of one or more NAAQS and has been designated as nonattainment by the USEPA as provided for under the CAA. Some regulatory provisions, for instance the CAA conformity regulations, apply only to areas designated as nonattainment or maintenance.

A maintenance area describes the air quality designation of an area previously designated nonattainment by the USEPA and subsequently redesignated attainment after emissions are reduced. Such an area remains designated as maintenance for a period up to 20 years at which time the state can apply for redesignation to attainment, provided that the NAAQS were sufficiently maintained throughout the maintenance period.

⁵ PM₁₀ and PM_{2.5} are airborne inhalable particles that are less than ten micrometers (coarse particles) and less than 2.5 micrometers (fine particles) in diameter, respectively.

⁶ A homogeneous geographical area, with regard to air quality, is an area, not necessarily bounded by state lines, where the air quality characteristics have been shown to be similar over the whole area. This may include several counties, encompassing more than one state, or may be a very small area within a single county.

**Table C-1
NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)
Burke Lakefront Airport**

NAAQS FOR CRITERIA POLLUTANTS			
POLLUTANT	AVERAGING PERIOD	PRIMARY STANDARDS	SECONDARY STANDARDS
a) Sulfur Dioxide (SO ₂)	1-Hour Average 3-Hour Average	0.075 PPM None	None 0.50 PPM
b) Particulate Matter (PM ₁₀)	24-Hour Average	150 µg/m ³	Same as Primary
b) Particulate Matter (PM _{2.5})	Annual Arithmetic Mean (1997 Std) 24-Hour Average (2006 Std)	15 µg/m ³ 35µg/m ³	Same as Primary
c) Carbon Monoxide (CO)	8-Hour Average 1-Hour Average	9 PPM 35 PPM	None
d) Ozone (O ₃)	8-Hour Average (2008 Std)	0.075 PPM	Same as Primary
e) Nitrogen Dioxide (NO ₂)	1-Hour Daily Maximum Annual Arithmetic Mean	0.100 PPM 0.053 PPM	Same as Primary
f) Lead (Pb)	Rolling 3-Month Average 3-Month Arithmetic Mean	0.15 µg/m ³ 1.5 µg/m ³	Same as Primary

- a) 75 Federal Register 35520, June 22, 2010. Final rule signed June 2, 2010. The 1971 annual and 24-hour SO₂ standards (38 FR 25678 September 14, 1973) were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.
- b) 71 Federal Register 61144, October 2006.
- c) 76 Federal Register 54294, August 31, 2011.
- d) 73 Federal Register 16436, March 27, 2008. Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard.
- e) 75 Federal Register 6474, February 9, 2010. 61 Federal Register 52852, October 8, 1996.
- f) 73 Federal Register 66964, November 12, 2008. Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m³ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

Notes: PPM is parts per million; Std is Standard.

µg/m³ is micrograms per cubic meter.

Sources: USEPA, 40 CFR Part 50.4 through Part 50.13, *National Primary and Secondary Ambient Air Quality Standards*.

According to Federal Aviation Administration (FAA) guidelines⁷ that establish procedures to meet National Environmental Policy Act (NEPA) requirements, an air quality assessment prepared pursuant to NEPA regulations should include an analysis and conclusions of a Federal action's impacts on air quality, as quoted in **Table C-2**.

**Table C-2
NEPA COMPLIANCE FOR AIRPORT FEDERAL ACTIONS
Burke Lakefront Airport**

FAA GUIDELINES FOR AIRPORT NEPA COMPLIANCE
<i>Environmental Impacts: Policies and Procedures FAA Order 1050.1E Change 1, Section 2, Air Quality</i>
Paragraph 2.1(c), Requirements:
When a NEPA analysis is needed, the proposed action's impact on air quality is assessed by evaluating the impact of the proposed action on the NAAQS. The proposed action's "build" and "no-build" emissions are inventoried for each reasonable alternative. Normally, further analysis would not be required for pollutants where emissions do not exceed General Conformity [<i>de minimis</i>] thresholds.

Source: FAA Order 1050.1E Change 1, *Environmental Impacts: Policies and Procedures*, Appendix A, Section 2, *Air Quality*, March 20, 2006.

At a minimum, an inventory would be prepared reflecting emissions under the baseline (No Action) conditions, and a separate inventory would be prepared describing emissions due to the Proposed Action. The net emissions derived from the comparison of the two inventories indicate the relative impact to air quality. Generally, when a Federal action will not result in net emissions that equal or exceed the requirements under the CAA General Conformity regulations, a comparative evaluation of the Federal action to the NAAQS, which requires dispersion analysis, is not necessary, and the Federal action is assumed to comply with the NAAQS.

C.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 did not meet the NAAQS in the recent past.

C.1.3 CLEAN AIR ACT CONFORMITY REGULATIONS

The 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 to the SIP requires the sponsoring Federal agency to prepare an analytical demonstration of

⁷ FAA Order 1050.1E Change 1, *Environmental Impacts: Policies and Procedures*, Appendix A, Section 2 *Air Quality*, March 20, 2006.

the potential for significant air quality impacts from Federal actions unless the action is exempt under the CAA regulations, or is a project included in the sponsoring agency's Presumed to Conform List.⁸

The USEPA promulgated the conformity regulations on November 24, 1993⁹ to assist Federal agencies in complying with the SIP by specifying rules for two categories of Federal actions: transportation actions and general actions. The two rules have separate and distinct applicability and evaluation requirements. Transportation conformity applies to highway and transit projects, and general conformity regulations apply to all other Federal actions that are not transportation projects, such as airport improvement projects.

C.1.4 GENERAL CONFORMITY RULE APPLICABILITY

The General Conformity Rule under the CAA establishes minimum values, referred to as the *de minimis* thresholds, for the criteria and precursor pollutants¹⁰ for the purpose of:

- Identifying Federal actions with project-related emissions that are clearly negligible (*de minimis*);
- Avoiding unreasonable administrative burdens on the sponsoring agency, and;
- Focusing efforts on key actions that would have potential for significant air quality impacts.

The *de minimis* rates vary depending on the severity of the nonattainment area and further depend on whether the general Federal action is located inside an ozone transport region.¹¹ An evaluation relative to the General Conformity Rule (the Rule), published under 40 CFR Part 93,¹² is required only for general Federal actions that would cause emissions of the criteria or precursor pollutants, and are:

- Federally-funded or Federally-approved;
- Not a highway or transit project¹³;

⁸ The Final Notice for the FAA Presumed to Conform list was published in the Federal Register on July 30, 2007 (72 FR 41565) and includes airport projects that would not require evaluation under the General Conformity regulations. RSA improvements are presumed to conform unless a new road or the relocation of a road is required. Therefore, the Proposed Action at BKL is not exempt under General Conformity.

⁹ 58 FR 62188, dated November 24, 1993.

¹⁰ Precursor pollutants are pollutants that are involved in the chemical reactions that form the resultant pollutant. Ozone precursor pollutants are NO_x and VOC, whereas PM_{2.5} precursor pollutants include NO_x, VOC, SO_x, and ammonia (NH₃).

¹¹ The ozone transport region is a single transport region for ozone (within the meaning of Section 176A(a) of the CAA), 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 CAA.

¹² USEPA, 40 CFR Part 93, Subpart B, *Determining Conformity of General Federal Actions to State or Federal Implementation Plans*, July 1, 2006.

¹³ Highway and transit projects are defined under Title 23 U.S. Code and the Federal Transit Act.

- Not identified as an exempt project¹⁴ under the CAA;
- Not a project identified on the approving Federal agency's Presumed to Conform list;¹⁵ and,
- Located within a nonattainment or maintenance area.

The Proposed Action at BKL is included in a nonattainment area for PM_{2.5} and maintenance area for ozone, CO, SO₂, and PM₁₀. Further, the Proposed Action meets the remaining criteria for requiring an evaluation under the General Conformity Rule. When the action requires evaluation under the General Conformity regulations, the net total direct and indirect emissions due to the Federal action may not equal or exceed the relevant *de minimis* thresholds unless:

- An analytical demonstration is provided that shows the emissions would not exceed the NAAQS; or
- Net emissions are accounted for in the SIP planning emissions budget; or
- Net emissions are otherwise accounted for by applying a solution prescribed under 40 CFR Part 93.158.

The Federal *de minimis* thresholds established under the CAA are given in **Table C-3**. The Proposed Action would occur in Cuyahoga County, which is designated nonattainment for PM_{2.5} and a maintenance area for ozone, CO, SO₂, and PM₁₀. Conformity to the *de minimis* thresholds is relevant only with regard to those pollutants and the precursor pollutants for which the area is nonattainment or maintenance. Notably, there are no *de minimis* thresholds to which a Federal agency would compare ozone emissions. This is because ozone is not directly emitted from a source. Rather, ozone is formed through photochemical reactions involving emissions of the precursor pollutants NO_x and volatile organic compounds (VOC) in the presence of abundant sunlight, and heat. Therefore, emissions of ozone on a project level are evaluated based on the rate of emissions of the ozone precursor pollutants, NO_x and VOC.

¹⁴ The BKL Proposed Action is not listed as an action exempt from a conformity determination pursuant to 40 CFR Part 93.153(c). 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.

¹⁵ 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 exceedence 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) and includes airport projects that would not require evaluation under the General Conformity regulations. The final rule on the list has not been published.

**Table C-3
DE MINIMIS THRESHOLDS
Burke Lakefront Airport**

CRITERIA AND PRECURSOR POLLUTANTS	TYPE AND SEVERITY OF NONATTAINMENT AREA	TONS PER YEAR THRESHOLD
Ozone (VOC or NO _x) ¹	Serious nonattainment	50
	Severe nonattainment	25
	Extreme nonattainment	10
	Other areas outside an ozone transport region	100
Ozone (NO _x) ¹	Marginal and moderate nonattainment inside an ozone transport regions ²	100
	Maintenance	100
Ozone (VOC) ¹	Marginal and moderate nonattainment inside an ozone transport region ²	50
	Maintenance within an ozone transport region ²	50
	Maintenance outside an ozone transport region ²	100
Carbon monoxide (CO)	All nonattainment & maintenance	100
Sulfur dioxide (SO ₂)	All nonattainment & maintenance	100
Nitrogen dioxide (NO ₂)	All nonattainment & maintenance	100
Coarse particulate matter (PM ₁₀)	Serious nonattainment	70
	Moderate nonattainment and maintenance	100
Fine particulate matter (PM _{2.5}) (VOC, NO _x , NH ₃ , and SO _x) ³	All nonattainment and maintenance	100
Lead (Pb)	All nonattainment and maintenance	25

Notes: Federal thresholds that are shaded are applicable to this project.
Code of Federal Regulations (CFR), Title 40, *Protection of the Environment*.
USEPA defines *de minimis* as emissions that are so low as to be considered insignificant and negligible. Volatile organic compounds (VOC); Nitrogen oxides (NO_x); Ammonia (NH₃); Sulfur oxides (SO_x).

¹ The rate of increase of ozone emissions is not evaluated for a project-level 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 and heat. Therefore, USEPA considers the increasing rates of NO_x and VOC emissions to reflect the likelihood of ozone formation on a project level.

² An 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.

³ For the purposes of General Conformity applicability, VOC's and NH₃ emissions are only considered PM_{2.5} precursors in nonattainment areas where either a State or USEPA has made a finding that the pollutants significantly contribute to the PM_{2.5} problem in the area. In addition, NO_x emissions are always considered a PM_{2.5} precursor unless the State and USEPA make a finding that NO_x emissions from sources in the State do not significantly contribute to PM_{2.5} in the area. Refer to 74 FR 17003, April 5, 2006.

Sources: USEPA, 40 CFR Part 93.153(b)(1) & (2), March 25, 2008. USEPA, 40 CFR Part 51.853, March 25, 2008.

Although PM_{2.5} is sometimes emitted directly, fine particle emissions can form resulting from chemical reactions involving emissions of the PM_{2.5} precursor pollutants NO_x, VOC, SO_x, and ammonia (NH₃).¹⁶ Similar to ozone, the net emissions of PM_{2.5} and the precursor pollutants SO_x, NO_x, and VOC would be evaluated with regard to General Conformity. As such, the pollutants of concern for the project proposed at BKL are CO, NO_x, VOC, PM_{2.5}, PM₁₀, and SO_x. The relevant *de minimis* thresholds are 100 tons per year for all of these pollutants.

If the General Conformity evaluation of the Proposed Action at BKL were to show that any of these thresholds could potentially be equaled or exceeded on an annual basis, additional, more detailed analysis to demonstrate conformity would be required, which is referred to as a General Conformity Determination.¹⁷ Conversely, if the General Conformity evaluation were to show that none of the relevant thresholds were equaled or exceeded, the Proposed Action at BKL would be presumed to conform under the CAA, NEPA, and the SIP and no further analysis would be required under the CAA.

C.1.5 TRANSPORTATION CONFORMITY RULE APPLICABILITY

Although airport improvement projects are usually considered under the General Conformity regulations, there can be elements of a Federal action or its alternatives that may require an analysis to demonstrate Transportation Conformity, such as actions relating to transportation plans, programs, projects developed, funded, or approved under Title 23 United States Code (U.S.C.) or the Federal Transit Act (FTA),¹⁸ or involve Federal highways. In such cases, the sponsoring Federal agency would be required to coordinate with the Federal Highway Administration (FHWA), the state Department of Transportation (DOT), and the local metropolitan planning organization (MPO) to assist in completing a Transportation Conformity evaluation.

As with General Conformity, Transportation Conformity regulations apply only to Federal actions located within a nonattainment or maintenance area. The Proposed Action under consideration at BKL would not be developed, funded, or approved by the FHWA or FTA, and does not have a significant adverse effect on regional transportation plans or programs. Therefore, the Transportation Conformity regulations would not apply.

C.1.6 INDIRECT SOURCE REVIEW

Some states require an air quality review when a Federal action has the potential to cause an increase in net emissions from indirect sources. Indirect sources cause emissions that occur later in time or are farther removed from the Federal action. Depending on the state, indirect sources may be identified as motor vehicles on highways, parking at sports and entertainment facilities, or an increase in aircraft operations. The state requirement is referred to as the ISR and each state requiring an ISR sets thresholds for increased operation of the indirect sources.

¹⁶ Emissions of NH₃ are generally associated with commercial animal agriculture, including feeding operations. Therefore, emissions of NH₃ were not included in this analysis.

¹⁷ 40 CFR Part 93.153.

¹⁸ USEPA, 40 CFR Part 93.153, *Applicability*, July 1, 2006.

When a Federal action has the potential to exceed these thresholds, an air quality review is required to assess the character and impact of the additional emissions, which is separate from the analyses required under NEPA or the CAA. According to FAA, *Air Quality Procedures for Airports and Air Force Bases*,¹⁹ Ohio does not require an ISR.

C.2 MODELING APPROACH

In order to properly determine the potential for impact to air quality the following analyses were conducted for this assessment:

- Criteria and precursor pollutant emission inventory; and a,
- Construction equipment emissions inventory.

C.2.1 METEOROLOGY

In order to properly estimate the emissions inventories, information regarding the weather must be obtained, particularly the mixing height, temperature, barometric pressure, wind direction, ceiling height and visibility.

The calculation of emissions assumes that aircraft operate only within the mixing layer, below the mixing height, where the emissions may influence ground-based pollutant concentrations. The mixing height, combined with the angle of approach (usually 3 degrees above the horizon) and the departure angle, determines the total time an aircraft operates during approach and climbout.

The emissions inventories were prepared using the FAA-required and USEPA-approved Emissions and Dispersion Modeling System (EDMS) version 5.1.3 computer program released in November 2010. EDMS is an emissions inventory and air dispersion model designed specifically to estimate emissions and calculate pollutant concentrations from airport specific sources. EDMS requires the declaration of a mixing height when the computer study is created. The EDMS default mixing height of 3,000 feet was used in this analysis. In addition, the EDMS default value of 49 degrees Fahrenheit for temperature was used for the analysis.

C.2.2 AIRCRAFT, AUXILIARY POWER UNITS, AND GROUND SUPPORT EQUIPMENT AIRCRAFT

At all airports the number of aircraft operations directly affects emissions relative to the use of aircraft engines in arrival and departure operations, the use of aircraft engines during taxi time, and through departure queue delay time. The Proposed Action would not increase the actual number of aircraft or change the existing or projected fleet mix. Therefore, the Proposed Action would not increase the total number of aircraft operations as compared to the 2015 No-Build/No-Action. **Table C-4** shows the annual operations by aircraft category for the existing conditions and for the 2015 Proposed Action and No Action alternative.

¹⁹ FAA, *Air Quality Procedures for Civilian Airports & Air Force Bases*, Appendix J, April 1997 and Addendum September 2004.

**Table C-4
ANNUAL OPERATIONS BY AIRCRAFT CATEGORY
Burke Lakefront Airport**

Aircraft Category	ANNUAL OPERATIONS	
	2012	2015
Jet	14,104	15,513
Turboprop	20,440	19,345
Multi Engine Piston	5,475	4,745
Single Engine Piston	1,511	1,059
Helicopters	14,272	13,271
TOTAL	55,801	53,932

Totals may not sum exactly due to rounding.

Source: L&B Analysis, 2012.

For the existing baseline (2012) there were a total of 55,805²⁰ annual operations. In 2015, the FAA's Terminal Area Forecast estimates there would be 53,880 annual operations.

In order to properly estimate emissions, the landing take-off cycles (LTOs) of each particular aircraft is needed. An LTO consists of the approach, landing roll, taxi to and from the gate/terminal/or parking area, idle time, takeoff, and climbout. An LTO is defined as one arrival operation and one departure operation. Therefore 55,805 annual operations in 2012 would equal 27,903 LTO's.

From the aircraft category a representative aircraft that operated at BKL was selected and then entered into EDMS with the corresponding LTOs. **Table C-5** shows the Annual LTOs per aircraft for each year in the study.

²⁰ Federal Aviation Administration's (FAA's) Air Traffic Activity System (ATADS) for the period from March 2011 through February 2012.

**Table C-5
LTOs BY AIRCRAFT
Burke Lakefront Airport**

AIRCRAFT CATEGORY	REPRESENTATIVE AIRCRAFT	ANNUAL LANDING TAKE OFF CYCLES	
		2012	2015
Jet	Bombardier Challenger 600	1,281	1,409
	Bombardier Learjet 35	2,759	3,037
	Cessna 560 Citation Excel	2,310	2,540
	Mitsubishi MU-300 Diamond	701	770
Turboprop	Cessna 208 Caravan	4,563	4,380
	Cessna 441 Conquest II	5,658	5,293
Multi Engine Piston	Raytheon Beech Baron 58	2,738	2,373
Single Engine Piston	Cessna 172	208	179
	Piper PA-28 Cherokee	548	350
Helicopter	Sikorsky S-76 Spirit	7,136	6,636
TOTAL		27,901	26,966

Totals may not sum exactly due to rounding.
Source: L&B Analysis, 2012.

Taxi Times

Taxi distances for BKL were developed for aircraft traveling to each runway end. A central aircraft parking area adjacent to the terminal was established and runway use percentages were used in the calculation of taxi times. The existing distance from the central aircraft parking area to Runway End 6L was determined to be approximately 2,020 feet and the distance from the central aircraft parking area to Runway End 24R was determined to be 6,485 feet. For a taxi speed of ten miles per hour, an average taxi in and taxi out time of six minutes and 35 seconds was calculated for the 2012 Existing condition and the 2015 future No Action Alternative. The total average taxi in and taxi out time for the Airport was applied to each aircraft in the fleet list for the calculation of the emissions inventory.

The proposed 600 foot shift and extension of Runway End 24R would have the potential to change average taxi time of aircraft at the Airport. The Proposed Action would increase total taxi distance and taxi time and therefore total emissions from aircraft operations. The proposed distance from the central aircraft parking area to new Runway End 6L was determined to be approximately 1,831 feet and the distance from the central aircraft parking area to new Runway End 24R was determined to be 7,092 feet. For the Proposed Action, an average taxi in and taxi out time of six minutes and 86 seconds was calculated. The total average taxi in and taxi out time was applied to each aircraft in the future fleet list for the calculation of the emissions inventory.

Particulate Matter Emissions Factors for Aircraft

EDMS does not contain particulate matter emissions factors for all aircraft. Therefore, emissions factors from the USEPA's AP42 Table II-1-9 were used in the calculations of PM₁₀ and PM_{2.5} emissions when none existed in EDMS.²¹

Auxiliary Power Unit (APU)

The larger jet aircraft use an auxiliary power unit (APU) to operate heat, air conditioning, and electric for the aircraft. The APU is also used to restart the engines before departing from the terminal/gate area. The assignments of APUs were made using the EDMS default assignments. It is assumed there would be no change in operating time of APU use from the 2015 No-Build/No-Action to the 2015 Proposed Action.

Ground Support Equipment (GSE)

The EDMS default assignments for the type and operating time of ground support equipment (GSE) for each aircraft type was used for the analysis. It is assumed there would be no change in operating time of GSE use from the 2015 No-Build/No-Action to the 2015 Proposed Action.

C.2.3 GROUND ACCESS VEHICLES (GAV)

The Proposed Action would not increase the number of ground access vehicles (GAV) on or near Airport roadways. Therefore for this analysis it is assumed there would be no change in ground access vehicle use from 2015 No-Build/No-Action to the 2015 Proposed Action

C.2.4 STATIONARY SOURCES

The Proposed Action does not involve any changes to existing stationary sources at the Airport. Therefore it is assumed there would be no change in stationary source use from 2015 No-Build/No-Action to the 2015 Proposed Action.

²¹ USEPA. *AP 42 Supplement A to Compilation of Air Pollutant Emission Factors Volume II: Mobile Sources*. Table II-1-9 Emission factors per aircraft per landing/takeoff cycle-civil aircraft. January 1991.

C.3 EXISTING CONDITIONS

The results of the emission inventory for the 2012 Existing Conditions are provided in **Table C-6**.

**Table C-6
2012 EXISTING CONDITIONS EMISSIONS INVENTORY
Burke Lakefront Airport**

EMISSION SOURCES	ANNUAL EMISSIONS					
	(tons per year)					
	CO	VOC	NO _x	SO _x	PM ₁₀	PM _{2.5}
Aircraft	154.53	53.90	9.86	2.40	6.93	6.93
GSE	28.06	1.08	4.31	0.08	0.17	0.16
APUs	1.26	0.03	0.22	0.04	0.04	0.04
Total	183.85	55.00	14.38	2.51	7.14	7.14

Total emissions may not sum exactly due to rounding.
Source: L&B Analysis, 2012.

C.4 CONSTRUCTION

Short-term temporary air quality impacts would be caused by construction of the Proposed Action. In accordance with FAA Order 1050.1E Change 1, *Environmental Impacts: Policies and Procedures*, the impacts to the environment due to construction activities must be assessed. Final engineering for the Proposed Action is not complete. Therefore, the analysis of construction emissions was based on estimates of the type and quantity of construction activities likely to be used for the project. The use of equipment anticipated to be necessary for the construction of the Proposed Action were based on airport construction projects of similar size and scope that were successfully reviewed in previous recent airport environmental documents. Construction of the Proposed Action is planned to occur between May 2013 and November 2014.

The construction emissions inventory was calculated using the National Mobile Inventory Model (NMIM)²² for diesel-powered nonroad equipment, such as excavators and backhoes, and diesel-powered onroad vehicles typically used for construction, such as dump trucks and cement trucks.

The following procedures were used to project the emissions caused by equipment and vehicles during construction of the Proposed Action:

- Develop the list of construction equipment and materials necessary for each construction task;

²² USEPA, *NMIM*; computer modeling system for USEPA NONROAD and MOBILE 6.02 computer programs. USEPA extended the grace period until after March 2, 2013 before the Motor Vehicle Simulator model (MOVES) is required for regional emissions analyses for transportation conformity determinations.

- Calculate total operating hours for each piece of equipment required for each construction task using a Microsoft® EXCEL 2010 spreadsheet;
- Enter construction equipment information into the NMIM, which incorporates data from the USEPA NONROAD and MOBILE programs, to calculate construction emissions.

The emissions for all the individual construction tasks were added together to determine the total construction emissions for each year of construction attributable to the Proposed Action as provided in **Table C-7**.

**Table C-7
PROPOSED ACTION CONSTRUCTION EMISSIONS INVENTORY
Burke Lakefront Airport**

Construction Year	ANNUAL EMISSIONS					
	(tons per year)					
	CO	VOC	NO _x	SO _x	PM ₁₀	PM _{2.5}
2013	0.16	0.00	0.28	0.00	0.03	0.03
2014	0.05	0.00	0.09	0.00	0.01	0.01
de minimis THRESHOLD	100	100	100	100	100	100

Total emissions may not sum exactly due to rounding.

Source: L&B Analysis, 2012.

Construction of the Proposed Action would result in short term air quality impacts from exhaust emissions from construction equipment and from fugitive dust emissions from vehicle movement and soil excavation. Fugitive dust emissions consist mostly of soil. As provided in **Table C-9**, emissions due to construction equipment would not exceed applicable thresholds.

While the construction of the Proposed Action would be expected to contribute to fugitive dust in and around the construction site, the City of Cleveland Department of Port Control (DPC) would ensure that all possible measures would be taken to reduce fugitive dust emissions during construction by requiring the construction contractor to submit a proposed method of erosion and dust control, and disposal of waste materials pursuant to guidelines included in FAA, *Standards for Specifying Construction of Airports*.²³ While the estimated annual occurrence of temporary fugitive dust emissions during construction is highly variable on a daily basis, the implementation of the measures by the DPC would result in fugitive dust emissions from construction activity being essentially nil. Methods of controlling dust and other airborne particles will be implemented to the maximum possible extent and may include, but not limited to, the following:

- Minimizing the exposed area of erodible earth;

²³ FAA, *Standards for Specifying Construction of Airports*, Item P-156, *Temporary Air and Water Pollution, Soil Erosion, and Siltation Control*, AC 150/5370-10F (September 30, 2011).

- Use of water sprinkler trucks for material piles and unpaved areas;
- Use of particle-trap exhaust filters;
- Reduction of idling of diesel engines;
- Use of covered haul trucks to move construction material;
- Use of dust palliatives or penetration asphalt on haul roads; and
- Use of plastic sheet coverings for material piles.

C.5 EMISSIONS INVENTORY

The results of the emission inventory for the 2015 No-Build/No-Action Conditions are provided in **Table C-8**.

**Table C-8
2015 NO-BUILD/NO-ACTION EMISSIONS INVENTORY
Burke Lakefront Airport**

EMISSION SOURCES	ANNUAL EMISSIONS					
	(tons per year)					
	CO	VOC	NO _x	SO _x	PM ₁₀	PM _{2.5}
Aircraft	144.69	55.21	10.08	2.43	7.05	7.05
GSE	21.92	0.82	2.92	0.07	0.13	0.12
APUs	1.39	0.03	0.24	0.04	0.04	0.04
Total	167.99	56.05	13.24	2.55	7.22	7.21

Total emissions may not sum exactly due to rounding.
Source: L&B Analysis, 2012.

The results of the emission inventory for the 2015 Proposed Action Conditions are provided in **Table C-9**.

**Table C-9
2015 PROPOSED ACTION EMISSIONS INVENTORY
Burke Lakefront Airport**

EMISSION SOURCES	ANNUAL EMISSIONS					
	(tons per year)					
	CO	VOC	NO _x	SO _x	PM ₁₀	PM _{2.5}
Aircraft	150.29	58.43	10.31	2.52	7.08	7.08
GSE	21.92	0.82	2.92	0.07	0.13	0.12
APUs	1.39	0.03	0.24	0.04	0.04	0.04
Total	173.60	59.28	13.46	2.64	7.25	7.25

Total emissions may not sum exactly due to rounding.
Source: L&B Analysis, 2012.

C.5.1 GENERAL CONFORMITY EVALUATION

The purpose of a general conformity evaluation is to examine the results of the emissions inventories and to determine the applicability of the General Conformity Rule to the Proposed Action. A General Conformity Determination is required if the net increase in emissions resulting from the Proposed Action exceed the applicable *de minimis* thresholds. **Table C-10** shows that the estimated net emissions from construction and implementation of the Proposed Action would be less than the applicable *de minimis* thresholds. Because construction and implementation of the Proposed Action would not result in increased emissions above the applicable *de minimis* thresholds, no further analysis is required under the General Conformity (Rule 40 CFR Part 93, §93.153) and the Proposed Action is presumed to conform.

**Table C-10
GENERAL CONFORMITY EVALUATION
Burke Lakefront Airport**

ALTERNATIVES	ANNUAL EMISSIONS (tons per year)					
	CO	VOC	NO _x	SO _x	PM ₁₀	PM _{2.5}
2013* Proposed Action	0.16	0.00	0.28	0.00	0.03	0.03
NET EMISSIONS	0.16	0.00	0.28	0.00	0.03	0.03
2014* Proposed Action	0.05	0.00	0.09	0.00	0.01	0.01
NET EMISSIONS	0.05	0.00	0.09	0.00	0.01	0.01
2015 No-Build/No-Action	167.99	56.05	13.24	2.55	7.22	7.21
2015 Proposed Action	173.60	59.28	13.46	2.64	7.25	7.25
NET EMISSIONS	5.60	3.22	0.23	0.09	0.04	0.04
<i>de minimis</i> THRESHOLD	100	100	100	100	100	100

* 2013 and 2014 represent construction years.
Total emissions may not sum exactly due to rounding.
Source: EDMS version 5.1.3, L&B Analysis, 2012.

C.6 CLIMATE AND GREENHOUSE GAS EMISSIONS

Greenhouse gases (GHG) are gases that trap heat in the earth's atmosphere. Both naturally occurring and man-made GHGs primarily include water vapor (H₂O), carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆). Sources that require fuel or power at an airport are the primary sources that would generate GHGs. Aircraft are probably the most often cited air pollutant source, but they produce the same types of emissions as GAV.

Research has shown there is a direct correlation between fuel combustion and GHG emissions. In terms of U.S. contributions, the General Accounting Office (GAO) reports that "domestic aviation contributes about three percent of total carbon dioxide emissions, according to EPA data," compared with other industrial sources including the remainder of the transportation sector (20 percent) and power

generation (41 percent).²⁴ The International Civil Aviation Organization (ICAO) estimates that GHG emissions from aircraft account for roughly three percent of all anthropogenic GHG emissions globally.²⁵ Climate change due to GHG emissions is a global phenomenon, so the affected environment is the global climate.²⁶

The scientific community is continuing efforts to better understand the impact of aviation emissions on the global atmosphere. The FAA is leading and participating in a number of initiatives intended to clarify the role that commercial aviation plays in GHG emissions and climate. The FAA, with support from the U.S. Global Change Research Program and its participating federal agencies (e.g., National Aeronautics and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA), Environmental Protection Agency (EPA), and Department Of Energy (DOE)), has developed the Aviation Climate Change Research Initiative (ACCRI) in an effort to advance scientific understanding of regional and global climate impacts of aircraft emissions. FAA also funds the Partnership for Air Transportation Noise & Emissions Reduction (PARTNER) Center of Excellence research initiative to quantify the effects of aircraft exhaust and contrails on global and U.S. climate and atmospheric composition. Similar research topics are being examined at the international level by the International Civil Aviation Organization.²⁷

A GHG emissions inventory was prepared using the EDMS version 5.1.3 computer program. Carbon dioxide from aircraft was calculated and then totals were converted from short to metric tons (1 short ton = 0.907184 metric tons). The results are provided in **Table C-11**.

²⁴ *Aviation and Climate Change*. GAO Report to Congressional Committees, (2009).

²⁵ Alan Melrose, "European ATM and Climate Adaptation: A Scoping Study," in *ICAO Environmental Report*. (2010).

²⁶ As explained by the U.S. Environmental Protection Agency, "greenhouse gases, once emitted, become well mixed in the atmosphere, meaning U.S. emissions can affect not only the U.S. population and environment but other regions of the world as well; likewise, emissions in other countries can affect the United States." Climate Change Division, Office of Atmospheric Programs, U.S. Environmental Protection Agency, *Technical Support Document for Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act 2-3* (2009).

²⁷ Lourdes Q. Maurice and David S. Lee. *Chapter 5: Aviation Impacts on Climate*. Final Report of the International Civil Aviation Organization (ICAO) Committee on Aviation and Environmental Protection (CAEP) Workshop. October 29th November 2nd 2007, Montreal.

**Table C-11
GREENHOUSE GAS EMISSIONS
Burke Lakefront Airport**

Annual Metric Tons of CO ₂	
Existing Conditions	5,311.48
2015 No-Build/No-Action	5,377.72
2015 Proposed Action	5,586.00
NET EMISSIONS	208.27

CO₂: Carbon Dioxide

Total emissions may not sum exactly due to rounding.

Source: EDMS version 5.1.3, L&B Analysis, 2012.

Currently, there are no Federal standards for reporting GHG emissions from aviation sources, as well as no significance thresholds. The Proposed Action would increase GHG emissions by 208.27 metric tons over the No Action alternative, an increase of 3.9 percent. This increase would comprise less than 3.05×10^{-8} percent of U.S. based GHG emissions and less than 4.25×10^{-9} percent of global GHG emissions.²⁸ Therefore, it is not expected that the emissions of GHGs from this project be significant. No further consideration of GHGs is necessary.²⁹

C.8 RESULTS

The air quality assessment demonstrates that construction and implementation of the Proposed Action would not cause an increase in air emissions above the applicable *de minimis* thresholds. Therefore, the Proposed Action conforms to the SIP and the CAA and would not create any new violation of the NAAQS, delay the attainment of any NAAQS, nor increase the frequency or severity of any existing violations of the NAAQS. As a result, no adverse impact on local or regional air quality is expected by construction or implementation of the Proposed Action. No further analysis or reporting is required under the CAA or NEPA.

²⁸ U.S. based GHG emission estimated at 6,821.8 million metric tons CO₂ equivalent in Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2010, (April 2012) .

²⁹ FAA Order 1050.1E, Change 1, Guidance Memo#3. To: FAA Lines of Business and Managers with NEPA Responsibilities. From: Julie Marks, FAA AEE-400, Prepared by Thomas Cuddy, FAA AEE-400. Subject: Considering Greenhouse Gases and Climate Under the National Environmental Policy Act (NEPA): Interim Guidance. January 12, 2012.

ATTACHMENT 1 GLOSSARY

The Environmental Assessment (EA) process requires the use of many technical terms. Some of the most important terms are defined in this section. Terms in *italics* are defined separately in this glossary.

Air Quality Control Region (AQCR) An EPA designated interstate or intrastate geographic region that has significant air pollution or the potential for significant air pollution and, due to topography, meteorology, etc., needs a common air quality control strategy. The region includes all the counties that are affected by or have sources that contribute directly to the air quality of that region.

Attainment Area – Any area that meets the national primary or secondary ambient air quality standard for a particular criteria pollutant.

Carbon Monoxide (CO) - A *criteria pollutant* that is colorless, odorless gas produced through the incomplete combustion of fossil fuels.

CFRs – Code of Federal Regulations

Clean Air Act (CAA) – The Federal law regulating air quality. The first Clean Air Act (CAA) passed in 1967, required that air quality criteria necessary to protect the public health and welfare be developed. Since 1967, there have been several revisions to the CAA. The Clean Air Act Amendments of 1990 represent the fifth major effort to address clean air legislation.

Conformity – The act of meeting Section 176(c)(1) of the CAAA that requires Federal actions to conform to the SIP for air quality. The action may not increase the severity of an existing violation nor can it delay attainment of an standards.

Criteria Pollutants – The six air pollutants listed in the CAA for which the USEPA has established health-based limits. The six criteria pollutants are *carbon monoxide, nitrogen dioxide, lead, sulfur dioxide, particulate matter, and ozone.*

***de minimis* Thresholds** – The *de minimis* thresholds are considered the thresholds of significance relative to compliance of net emissions under Federal and state air quality regulations, and in determining the potential for significant air quality impacts caused by a Federal action. They are the minimum rates (tons per year) for the Proposed Action above which a General Conformity Determination would be required. *De minimis* is defined by the *USEPA* as emissions that are insignificant and negligible, with no potential to cause significant adverse air quality impacts. The applicable rates depend on the severity of the nonattainment designation and whether the project is located within the ozone transport region. Also applicable are rates for precursor pollutants, which are NO_x and VOC for ozone, and SO_x for emissions of PM_{2.5}.

Dispersion – The process by which atmospheric pollutants disseminate due to wind and vertical stability.

Emission Factor – The rate at which pollutants are emitted into the atmosphere by one source or a combination of sources.

Federal Aviation Administration (FAA) - The Federal agency responsible for insuring the safe and efficient use of the nation's airspace, for fostering civil aeronautics and air commerce, and for supporting the requirements of national defense.

Fugitive Dust – Dust discharged to the atmosphere in an unconfined flow stream such as that from an unpaved road, storage piles, and heavy construction operations.

Hydrocarbons (HC) – Gases that represent unburned and wasted fuel. They come from incomplete combustion of gasoline and from evaporation of petroleum fuels.

Inversion – A thermal gradient created by warm air situated above cooler air. An inversion suppresses turbulent mixing and thus limits the upward dispersion of polluted air.

Landing and Takeoff Cycle (LTO) – One aircraft LTO is equivalent to two aircraft operations (one landing and one takeoff). The standard LTO cycle begins when the aircraft crosses into the mixing zone as it approaches the airport on its descent from cruising altitude, lands and taxis to the gate. The cycle continues as the aircraft taxis back out to the runway for takeoff and climbout as its heads out of the mixing zone and back up to cruising altitude. The five specific operating modes in a standard LTO are: approach, taxi/idle-in, taxi/idle-out, takeoff, and climbout. Most aircraft go through this sequence during a complete standard operating cycle.

Maintenance Area (MA) - Any geographic area of the United States previously designated nonattainment pursuant the CAA Amendments of 1990 and subsequently redesignated to attainment.

Mixing Height - The height of the completely mixed portion of atmosphere that begins at the earth's surface and extends to a few thousand feet overhead where the atmosphere becomes fairly stable.

Mobile Source - A moving vehicle that emits pollutants. Such sources include airplanes, automobiles, trucks and ground support equipment.

National Environmental Policy Act of 1969 (NEPA) - The original legislation establishing the environmental review process for proposed Federal actions.

Nitrogen Dioxide (NO₂) – A *criteria pollutant* gas that absorbs sunlight and gives air a reddish-brown color. NO₂ is a subset of the larger set of nitrogen oxides (NO_x). The gas is reactive and forms when fuel is burned at high temperatures and high pressure.

Nitrogen Oxides (NO_x) – See NO₂.

National Ambient Air Quality Standard (NAAQS) - Air Quality standards established by the EPA to protect human health (primary standards) and to protect property and aesthetics (secondary standards).

Nonattainment Area– Any geographical area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for any particular *criteria pollutant*.

Ozone (O₃) – A *criteria pollutant* which is not directly emitted, rather, ozone is formed in the atmosphere through photochemical reaction with *nitrogen oxides (NO_x)*, *volatile organic compounds (VOC)*, sunlight, and heat. It is the primary constituent of smog and problems occur many miles away from the pollutant sources. Due to the fact that ozone is not directly emitted and is a regional phenomenon, emissions of NO_x and VOC are evaluated to indicate the likely formation of ozone. Ozone is not evaluated for a project-level emission inventory.

Particulate Matter (PM₁₀ & PM_{2.5}) – There are two sizes of particulate matter that account for one of the six criteria pollutants. PM₁₀, coarse particles with a diameter of 10 micrometers or less, and PM_{2.5}, fine particles with a diameter of 2.5 micrometers or less. Emissions of PM_{2.5} is a subset of emissions of PM₁₀. Particulate matter can be any particle of these sizes, including dust, dirt, and soot. Particulate matter is directly emitted by engine combustion. PM_{2.5} reacts with precursor pollutants VOC, NO_x, and SO_x gases to form secondary particles.

PPM - Parts per million.

Precursor Pollutant – Pollutant which aid in the formation of *criteria pollutants*. NO_x and VOC are precursor pollutants to *ozone* development; SO_x, NO_x, and VOC are precursors to development of PM_{2.5}.

State Implementation Plan (SIP) – A plan stating the strategy the state will use to meet and maintain the Federal air quality standards as required under the Clean Air Act (CAA, including the 1990 Amendments). A SIP includes the projected emission budgets and controls for industrial, area, and mobile sources of pollution.

Sulfur Dioxide (SO₂) – A *criteria pollutant* formed when fuel containing sulfur, like coal, oil and jet fuel, is burned and is commonly expressed as SO_x since it is a large subset of sulfur dioxides (SO₂). SO₂ is a colorless gas that is typically identified as having a strong odor. SO_x is a *precursor pollutant* to the formation of PM_{2.5} emissions.

Sulfur Oxides (SO_x) – See SO₂.

Volatile Organic Compound (VOC) – Gases that are emitted from solids or liquids, such as fuel storage, paint, and cleaning fluids. VOC include a variety of chemicals, some which can have short and long-term adverse health effects. VOCs are *precursor pollutants* that react with heat, sunlight and *nitrogen oxides (NO_x)* to form *ozone (O₃)*. VOC also mix with other gases to form PM_{2.5}. VOCs are a subset of TOGs.