Hartsfield-Jackson Atlanta International Airport

Documentation for the CY 2011 Criteria Air Pollutant Emission Inventory

Prepared for:
City of Atlanta/Department of Aviation
P.O. Box 20509
Atlanta, Georgia 30320

Prepared by:
KB Environmental Sciences, Inc.

August 2014

Contents

1. Introduction 1
2. Emissions Inventory Results 1
3. Emissions Inventory Methodology 2
3.1. Aircraft 2
3.2. Auxiliary Power Units 7
3.3. Ground Service Equipment 7

List of Tables

Table 1 – CY 2011 Emissions Inventory 2
Table 2 –Aircraft Fleet Mix and Operations 4
Table 3 – Take-off Weight By Trip Length 5
Table 4 – Operational Profiles 6
Table 5 – APU Operating Times (minutes) 7
Table 6 – GSE Operating Times per LTO 9
Table 7 – Additional Baggage Tractor Operating Time 9

1. Introduction

Presented herein is an emissions inventory of calendar year (CY) 2011 air emissions from major sources operating at Hartsfield-Jackson Atlanta International Airport (H-JAIA) for inclusion in an emissions inventory State Implementation Plan (SIP) currently in development by the Georgia Department of Natural Resources Environmental Protection Division (Georgia EPD) for the *Atlanta, GA* marginal nonattainment area under the 2008 8-Hour Ozone (O_3) National Ambient Air Quality Standard (NAAQS). Accordingly, emissions of nitrogen oxides (NO_x) and volatile organic compounds (VOC), each of which are considered precursors to O_3 formation, are presented.

Additionally, although this emissions inventory SIP is being prepared for the purposes of O_3 compliance, the provided inventory also includes an estimate of the U.S. Environmental Protection Agency's (US EPA) other criteria pollutants carbon monoxide (CO), particulate matter measuring ten micrometers or less in diameter (PM_{10}), particulate matter measuring 2.5 micrometers or less in diameter ($PM_{2.5}$), and sulfur dioxide (SO_2).[1]

H-JAIA emissions sources included in this report comprise aircraft; auxiliary power units (APU); and ground service equipment (GSE). Detailed methodologies, input data and assumptions used to develop the CY 2011 air emissions inventory are also provided.

2. Emissions Inventory Results

CY 2011 emissions from aircraft, APU and GSE are summarized on **Table 1**. Shown, based on CY 2011 operations at H-JAIA these sources are estimated to emit 9,782 tons of CO, 4,293 tons of NO_x, 96 tons of PM_{10} and $PM_{2.5}$, 548 tons of SO_2 and 782 tons of VOC.

[1] Of note, emissions of lead (Pb) are discounted from this inventory because there is only a nominal amount of activity at H-JAIA that is performed by piston engine powered aircraft fueled by leaded aviation gasoline.

TABLE 1 – CY 2011 EMISSIONS INVENTORY

Source	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Aircraft	**5,875.61**	**3,736.01**	**49.94**	**49.94**	**505.57**	**643.26**
Startup	--	--	--	--	--	154.08
Taxi-Out	3,519.16	602.97	15.18	15.18	196.9	294.4
Takeoff	34.28	1,585.58	13.76	13.76	87.21	5.3
Climb Out	24.25	913.24	8.01	8.01	57.29	2.7
Approach	412.06	247.22	4.33	4.33	51.59	29.38
Taxi-in	1,885.86	387	8.66	8.66	112.58	157.4
APU	**392.01**	**243.81**	**37.46**	**37.46**	**34.48**	**25.33**
GSE	**3,515.09**	**283.11**	**8.79**	**8.35**	**8.14**	**113.8**
Total	**9,782.71**	**4,262.93**	**96.19**	**95.75**	**548.19**	**782.39**

Values may reflect rounding.
Source: Emissions and Dispersion Modeling System (EDMS) version 5.1.3. Prepared by KB Environmental Sciences, Inc., 2012.

3. Emissions Inventory Methodology

Emissions calculation methodology, input data and assumptions used to develop the CY 2011 emissions estimate on **Table 1** are individually described below for aircraft, GSE and APU, respectively.

3.1. Aircraft

The number of aircraft operations and the type of aircraft that operate at an airport (the aircraft fleet mix) are important factors in estimating the level of air pollutant/precursor emissions. In the year 2011, there were 933,670 annual operations (2,558 average daily operations). The Federal Aviation Administration's (FAA's) Emissions and Dispersion Modeling System EDMS v.5.1.3 was used to estimate emissions from aircraft operating within the Landing/Take-Off cycle (LTO). One LTO is equivalent to one aircraft arrival and one departure operation, and includes the startup, taxi-out, take-off, climb-out, approach, and taxi-in operational modes, defined as follows:

- "Startup" begins with fuel flowing into an aircraft engine's annular combustor. At this point, any emissions are unburned, raw fuel vapor (i.e., VOC).[2]
- "Taxi/idle" includes the time an aircraft taxis between the runway and a terminal and all ground-based delay incurred through the aircraft route.

[2] *Engine Startup Emissions*, International Civil Aviation Organization (ICAO)/Committee on Aviation Environmental Protection (CAEP) Working Group 3, May 2006.

- "Approach" begins when an aircraft descends below the atmospheric mixing height and ends when an aircraft touches down on a runway.
- "Takeoff" begins when full power is applied to an aircraft and ends when an aircraft reaches approximately 500 to 1,000 feet. At this altitude, pilots typically power back for a gradual ascent.
- "Climb Out" begins when an aircraft powers back from the takeoff mode and ascends above the atmospheric mixing zone height.

EDMS uses area-specific atmospheric mixing height data to approximate the level in the atmosphere where aircraft emissions would have no discernable impact on ground level emissions. Notably, the mixing height affects only the time in, and the emissions from, the aircraft operational modes of climb out and approach. For the purpose of preparing the year 2011 emissions inventory, the EDMS default mixing height of 3,000 feet was assumed.

The EDMS aircraft fleet mix, describing the level of LTO's performed by each aircraft type operating at H-JAIA in 2011, was developed based on data extracted from the City of Atlanta Department of Aviation's (DOA) Noise and Operations Monitoring System (NOMS). Trip (stage) length data was obtained from a proprietary flight tracker (FlightAware). According to this data, a total of 933,670 operations (466,835 LTOs) were performed by aircraft operating at H-JAIA in 2011. These LTO's were allocated to specific airframes and engines, aircraft trip lengths, and take-off weights in a manner consistent with an aircraft noise analysis conducted using the FAA's Integrated Noise Model (INM v.7.0c) for the same calendar year.

Table 2 describes the EDMS aircraft fleet mix and level of operations, by trip length. **Table 3** repeats this information to indicate take-off weights applied in the analysis. To estimate taxi emissions, average airport-wide taxi times based on data published within the FAA's Aviation Performance System Metrics (ASPM) database for that calendar year were input into EDMS, corresponding to 21.7 minutes on departure and 11.5 minutes on arrival.

Table 2 – Aircraft Fleet Mix and Operations

Category	EDMS ID		LTO's by Trip Length									
	Airframe	Engine	1	2	3	4	5	6	7	8	9	Total
Cargo - Air Carrier	Airbus A300B4-600 Series	PW4158 Reduced smoke	686	44	-	-	-	-	-	-	-	730
	Boeing 727-200 Series	JT8D-15 Reduced emissions	562	168	-	-	-	-	-	-	-	730
	Boeing 747-200 Series	JT9D-7Q	29	168	29	-	55	84	-	-	-	365
	Boeing 747-400 Series	PW4056	-	321	-	241	102	66	-	-	-	730
	Boeing 757-200 Series	RB211-535E4	106	259	-	-	-	-	-	-	-	365
	Boeing DC-10-10 Series	CF6-6D	865	230	-	-	-	-	-	-	-	1,095
	Boeing DC-10-30 Series	CF6-50C2 Low emissions fuel nozzle	270	95	-	-	-	-	-	-	-	365
	Boeing DC-8 Series 70	CFM56-2-C5	365	-	-	-	-	-	-	-	-	365
	Boeing MD-11	PW4460 Reduced smoke	263	73	-	-	197	-	197	-	-	730
	Boeing MD-11	CF6-80C2D1F 1862M39	132	37	-	-	99		99	-	-	367
Cargo - General Aviation	Cessna 208 Caravan	PT6A-114	2,190	-	-	-	-	-	-	-	-	2,190
	DeHavilland DHC-6-300 Twin Otter	PT6A-27	365	-	-	-	-	-	-	-	-	365
	Dornier 328-100 Series	PW119C	365	-	-	-	-	-	-	-	-	365
	Mitsubishi MU-300 Diamond	JT15D-5, -5A, -5B	365	-	-	-	-	-	-	-	-	365
General Aviation	Bombardier Challenger 600	ALF 502L-2	365	-	-	-	-	-	-	-	-	365
	Bombardier Learjet 35	TFE731-2-2B	365	-	-	-	-	-	-	-	-	365
	Cessna 172 Skyhawk	IO-360-B	365	-	-	-	-	-	-	-	-	365
	DeHavilland DHC-6-300 Twin Otter	PT6A-27	365	-	-	-	-	-	-	-	-	365
	Mitsubishi MU-300 Diamond	JT15D-5, -5A, -5B	365	-	-	-	-	-	-	-	-	365
	Raytheon Beech Baron 58	TIO-540-J2B2	365	-	-	-	-	-	-	-	-	365
Passenger - Air Carrier	Airbus A319-100 Series	V2522-A5	4,650	3,511	1,329	-	-	-	-	-	-	9,490
	Airbus A320-200 Series	CFM56-5-A1	4,672	3,738	3,037	234	-	-	-	-	-	11,681
	Airbus A320-200 Series	V2527-A5	292	234	190	15	-	-	-	-	-	731
	Airbus A330-300 Series	CF6-80E1A2	-	22	-	110	-	1,511	548	-	-	2,191
	Airbus A340-200 Series	CFM56-5C2	-	-	-	-	-	-	365	-	-	365
	Boeing 717-200 Series	BR700-715A1-30 Improved fuel injector	25,184	24,680	504	-	-	-	-	-	-	50,368
	Boeing 737-500 Series	CFM56-3C-1	-	1,095	-	-	-	-	-	-	-	1,095
	Boeing 737-700 Series	CFM56-7B24	8,256	9,964	3,132	6,833	285	-	-	-	-	28,470
	Boeing 737-800 Series	CFM56-7B26	6,033	7,906	4,577	2,289	-	-	-	-	-	20,805
	Boeing 747-200 Series	JT9D-7Q	-	-	-	-	-	365	-	-	-	365
	Boeing 747-400 Series	PW4056	-	-	-	-	-	219	-	-	511	730
	Boeing 757-200 Series	PW2037	17,848	20,823	8,924	11,899	-	-	-	-	-	59,494
	Boeing 757-300 Series	RB211-535E4B	467	1,168	-	1,285	-	-	-	-	-	2,920
	Boeing 767-300 Series	PW4060 Reduced emissions	340	679	1,019	4,752	679	2,037	1,811	-	-	11,317
	Boeing 767-400 ER	CF6-80C2B8F 1862M39	-	22	22	154	285	723	986	-	-	2,192
	Boeing 777-200-ER	GE90-90B DAC I	-	307	-	154	-	394	132	438	767	2,192
	Boeing 777-300 Series	Trent 892	-	-	-	-	-	22	1,073	-	-	1,095
	Boeing DC-9-50 Series	JT8D-17 Reduced emissions	7,752	5,387	-	-	-	-	-	-	-	13,139
	Boeing MD-82	JT8D-217A Environmental Kit (E_Kit)	1,205	920	66	-	-	-	-	-	-	2,191
	Boeing MD-83	JT8D-219 Environmental Kit (E_Kit)	43,963	33,571	2,398	-	-	-	-	-	-	79,932
	Boeing MD-90	V2525-D5	599	803	59	-	-	-	-	-	-	1,461
Passenger - Commuter	Bombardier Challenger 601	CF34-3A LEC II	90,151	-	-	-	-	-	-	-	-	90,151
	Bombardier CRJ-900-ER	CF34-8C5 LEC	22,994	26,571	1,533	-	-	-	-	-	-	51,098
	Embraer ERJ145-ER	AE3007A	887	2,398	-	-	-	-	-	-	-	3,285
	Embraer ERJ145-LR	AE3007A1 Type 3 (reduced emissions)	1,095	-	-	-	-	-	-	-	-	1,095
	Gulfstream V-SP	BR700-710A1-10	6,205	-	-	-	-	-	-	-	-	6,205
	Saab 340-A	CT7-9B	1,460	-	-	-	-	-	-	-	-	1,460
		Total	**252,806**	**145,194**	**26,819**	**27,966**	**1,702**	**5,421**	**5,211**	**438**	**1,278**	**466,835**

Source: City of Atlanta Department of Aviation, 2012; KB Environmental Sciences, 2012.

Table 3 – Take-off Weight By Trip Length

Category	EDMS ID		Take-off Weight (lbs.) by Trip Length								
	Airframe	Engine	1	2	3	4	5	6	7	8	9
Cargo - Air Carrier	Airbus A300B4-600 Series	PW4158 Reduced smoke	278,700	290,300	-	-	-	-	-	-	-
	Boeing 727-200 Series	JT8D-15 Reduced emissions	156,000	164,000	-	-	-	-	-	-	-
	Boeing 747-200 Series	JT9D-7Q	525,000	545,000	565,000	-	665,000	725,000	-	-	-
	Boeing 747-400 Series	PW4056	-	563,800	-	621,500	669,500	720,900	-	-	-
	Boeing 757-200 Series	RB211-535E4	183,000	191,200	-	-	-	-	-	-	-
	Boeing DC-10-10 Series	CF6-6D	325,000	340,000	-	-	-	-	-	-	-
	Boeing DC-10-30 Series	CF6-50C2 Low emissions fuel nozzle	375,000	390,000	-	-	-	-	-	-	-
	Boeing DC-8 Series 70	CFM56-2-C5	220,000	-	-	-	-	-	-	-	-
	Boeing MD-11	PW4460 Reduced smoke	359,000	410,000	-	-	495,000	-	580,000	-	-
	Boeing MD-11	CF6-80C2D1F 1862M39	395,000	441,000	-	-	495,000	-	580,000	-	-
Cargo - General Aviation	Cessna 208 Caravan	PT6A-114	10,080	-	-	-	-	-	-	-	-
	DeHavilland DHC-6-300 Twin Otter	PT6A-27	12,500	-	-	-	-	-	-	-	-
	Dornier 328-100 Series	PW119C	30,843	-	-	-	-	-	-	-	-
	Mitsubishi MU-300 Diamond	JT15D-5, -5A, -5B	14,100	-	-	-	-	-	-	-	-
General Aviation	Bombardier Challenger 600	ALF 502L-2	36,000	-	-	-	-	-	-	-	-
	Bombardier Learjet 35	TFE731-2-2B	18,300	-	-	-	-	-	-	-	-
	Cessna 172 Skyhawk	IO-360-B	2,450	-	-	-	-	-	-	-	-
	DeHavilland DHC-6-300 Twin Otter	PT6A-27	12,500	-	-	-	-	-	-	-	-
	Mitsubishi MU-300 Diamond	JT15D-5, -5A, -5B	14,100	-	-	-	-	-	-	-	-
	Raytheon Beech Baron 58	TIO-540-J2B2	5,500	-	-	-	-	-	-	-	-
Passenger - Air Carrier	Airbus A319-100 Series	V2522-A5	125,900	131,000	136,500	-	-	-	-	-	-
	Airbus A320-200 Series	CFM56-5-A1	133,400	139,200	145,200	155,900	-	-	-	-	-
	Airbus A320-200 Series	V2527-A5	132,900	138,500	144,200	154.300	-	-	-	-	-
	Airbus A330-300 Series	CF6-80E1A2	-	378,500	-	411,700	-	469,100	478,400	-	-
	Airbus A340-200 Series	CFM56-5C2	-	-	-	-	-	-	573,2000	-	-
	Boeing 717-200 Series	BR700-715A1-30 Improved fuel injector	94,900	99,700	104,900	-	-	-	-	-	-
	Boeing 737-500 Series	CFM56-3C-1	-	108,500	-	-	-	-	-	-	-
	Boeing 737-700 Series	CFM56-7B24	120,000	125,000	130,300	141,100	141,100	-	-	-	-
	Boeing 737-800 Series	CFM56-7B26	133,300	139,200	145,500	156,700	-	-	-	-	-
	Boeing 747-200 Series	JT9D-7Q	-	-	-	-	-	725,000	-	-	-
	Boeing 747-400 Series	PW4056	-	-	-	-	-	720,900	-	-	875,000
	Boeing 757-200 Series	PW2037	183,200	190,000	197,500	212,600	-	-	-	-	-
	Boeing 757-300 Series	RB211-535E4B	203,900	212,700	-	239,100	-	-	-	-	-
	Boeing 767-300 Series	PW4060 Reduced emissions	265,000	275,500	286,400	305,700	330,000	355,900	367,700	-	-
	Boeing 767-400 ER	CF6-80C2B8F 1862M39	-	299,037	310,125	329,861	354,427	380,906	422,420	-	-
	Boeing 777-200-ER	GE90-90B DAC I	-	442,400	-	483,100	-	551,700	589,400	629,500	656,000
	Boeing 777-300 Series	Trent 892	-	-	-	-	-	564,500	636,100	-	-
	Boeing DC-9-50 Series	JT8D-17 Reduced emissions	100,000	107,000	-	-	-	-	-	-	-
	Boeing MD-82	JT8D-217A Environmental Kit (E_Kit)	-	127,379	134,584	-	-	-	-	-	-
	Boeing MD-83	JT8D-219 Environmental Kit (E_Kit)	121,555	128,361	135,456	-	-	-	-	-	-
	Boeing MD-90	V2525-D5	131,021	137,490	144,181	-	-	-	-	-	-
Passenger - Commuter	Bombardier Challenger 601	CF34-3A LEC II	43,100	-	-	-	-	-	-	-	-
	Bombardier CRJ-900-ER	CF34-8C5 LEC	67,500	71,000	75,000	-	-	-	-	-	-
	Embraer ERJ145-ER	AE3007A	35,500	39,500	-	-	-	-	-	-	-
	Embraer ERJ145-LR	AE3007A1 Type 3 (reduced emissions)	35,275	-	-	-	-	-	-	-	-
	Gulfstream V-SP	BR700-710A1-10	76,925	-	-	-	-	-	-	-	-
	Saab 340-A	CT7-9B	24,548	-	-	-	-	-	-	-	-

Source: City of Atlanta Department of Aviation, 2012; FlightAware, 2012; KB Environmental Sciences, 2012.

For the purpose of estimating emissions using the EDMS, operational, or temporal profiles that describe the level of activity at the airport can be used and are useful for the purposes of applying an emissions inventory to an atmospheric dispersion model. These profiles describe airport activity on a month, daily, and quarterly-hourly basis as a fraction of peak period activity. For the year 2011 emissions inventory, the airport's operational profiles were derived from data extracted from the airport's NOMS and are summarized on **Table 4**. Of note, it was assumed that quarter-hourly activity does not vary within a given hour, therefore, the hourly profile is provided on Table 4 as a proxy to the quarter-hourly profile.

TABLE 4 – OPERATIONAL PROFILES

Monthly Profile		Daily Profile		Hourly Profile	
January	0.873	Monday	0.976	0	0.082
February	0.832	Tuesday	0.973	1	0.030
March	0.968	Wednesday	0.969	2	0.016
April	0.923	Thursday	1.000	3	0.013
May	0.945	Friday	0.986	4	0.026
June	0.970	Saturday	0.846	5	0.099
July	1.000	Sunday	0.934	6	0.189
August	0.990			7	0.610
September	0.921			8	0.867
October	0.957			9	0.984
November	0.908			10	0.921
December	0.904			11	0.847
				12	0.863
				13	0.821
				14	0.870
				15	1.000
				16	0.921
				17	0.864
				18	0.887
				19	0.908
				20	0.856
				21	0.779
				22	0.633
				23	0.278

Profiles depict the fraction of activity within a given period relative to the peak period activity.
Source: City of Atlanta Department of Aviation, 2012; KB Environmental Sciences, 2012.

3.2. Auxiliary Power Units

An APU is a small turbine engine that is used on some aircraft to generate electricity and compressed air, which operate the aircraft's instruments, lights, ventilation and other equipment when the aircraft's main engines are shut down. An APU also provides power to restart the aircraft's main engines after shutdown. APU's may be activated when an aircraft is on approach and may be used during taxiing. Pilots may also use an APU shortly before departing a gate and when performing pre-flight instrument checks. Notably, some types of aircraft, such as general aviation aircraft, are not equipped with APUs.

For aircraft in the EDMS fleet that are equipped with APU, usage times were based upon a survey conducted in 2008. Specific APU equipment models were based upon EDMS default information. For the 2011 condition, it was assumed that the total APU running time per LTO occurs while an aircraft is taxiing to the gate on arrival, plus the observed running time while the aircraft is gated at the terminal. **Table 5** presents the calendar year 2011 APU running times per aircraft size and trip purpose (i.e., domestic versus international) input into EDMS. For some general aviation aircraft in the fleet with an APU equipment assignment per EDMS, the default operating time of 13 minutes on arrival was retained.

TABLE 5 – APU OPERATING TIMES (MINUTES)

Aircraft Size	Taxi-in Time	Observed APU Time per LTO		Total APU Time per LTO	
		Domestic	Int'l	Domestic	Int'l
Wide-Body	11.27	16.43	186.13	27.70	197.40
Narrow-Body (Non-commuter)	11.27	20.03	--	31.30	--
Narrow-Body (Commuter)	11.27	14.83	--	26.10	--

Source: KB Environmental Sciences, 2012.

3.3. Ground Service Equipment

EDMS calculates emissions from GSE as a function of the fuel type, operating hours per LTO, and the estimated horsepower of the equipment. As with APU, the GSE fleet and operating times utilized in the 2011 emissions inventory were based on an airfield survey conducted in 2008. This survey recorded, per aircraft size and trip purpose (i.e., domestic versus international), the duration of time each type of GSE serviced an aircraft during the observation period.

For the H-JAIA analysis, the assignment of GSE was based on individual aircraft type (e.g., Boeing 737) and aircraft category (e.g., Passenger Air Carrier). Additionally, pre-conditioned air (PCA) and gate power units are available at the commercial gates at H-JAIA. As such, portable air conditioners and air (engine) start units were not assigned to passenger air carrier aircraft. Similarly, hydrant fuel systems are also available at the airport's commercial gates. As such, fuel trucks were not assigned to many of the passenger air carrier aircraft. The EDMS default information for all other parameters (i.e., fuel type and horsepower) was retained for this analysis.

The GSE operating times per LTO, equipment and aircraft type that were derived from the survey are summarized on **Table 6**. However, because the airfield survey did not account for the additional engine run time for baggage tractors operating to and from the ends of each of the airport's concourses as well as to and from the airport's terminal baggage handling area, the data was augmented to include assumed additional operating times for this activity. For this purpose, it was assumed that 33 percent of the passengers in the year 2011 were originating passengers (i.e., local passengers arriving and departing from H-JAIA) and 66 percent were passengers arriving from and going to other airports (i.e., connecting passengers).

To process the baggage for originating passengers, it was assumed that baggage tractors would travel from the airport's concourses to the baggage handling area under the airport's terminal. To process the baggage for connecting passengers, it was assumed that baggage tractors would only travel to the end of the concourse (to an area where bags are transferred to/from baggage tractors for each flight). The assumed additional distance and time for baggage tractors associated with connecting passengers was 0.2 miles and 1.6 minutes, respectively (at an assumed travel speed of 15 miles-per-hour). To derive an average for the additional engine run times of baggage tractors for originating passengers (for input in to the EDMS), a weighted average run time was calculated based on the percentage of originating and connecting passengers, the number of gates at each concourse, and the time to travel to/from the baggage handling area. Additionally, two minutes of idle time were assumed per trip. The number of gates, and the miles/additional operating times for originating passengers are presented on **Table 7**.

TABLE 6 – GSE OPERATING TIMES PER LTO

Equipment	Domestic			International
	Wide-Body	Narrow-Body	Commuter	Wide-Body
Air Start	--	--	0.5	--
Aircraft Tractor	10.0	6.4	6.8	15.8
Baggage Tractor	60.1	61.3	28.8	118.9
Belt Loader	71.5	68.3	57.9	32.8
Cabin Service Truck	39.7	22.3	13.8	11.3
Cargo Loader	82.0	--	--	73.0
Cart	--	--	1.4	2.8
Catering Truck	27.3	27.8	--	79.6
Fork Lift	1.7	--	--	--
Fuel Truck	--	0.7	8.2	--
Hydrant Cart	25.0	15.8	2.1	143.3
Lavatory Truck	8.5	7.4	3.2	48.0
Service Truck	--	1.2	--	25.5

Source: KB Environmental Sciences, 2012.

TABLE 7 – ADDITIONAL BAGGAGE TRACTOR OPERATING TIME

Concourse	Number of Gates	Miles To Terminal Baggage Handling Area	Additional Baggage Tractor Run Time (minutes)[1]
T	14	<0.01	<0.01
A	30	0.18	1.44
B	35	0.37	2.96
C	44	0.55	4.40
D	44	0.74	5.92
E	28	0.91	7.28

[1] Does not account for 2 minutes of idling time assumed per trip.
Source: KB Environmental Sciences, 2012.