Boston Logan International Airport
Environmental Data Report — 2012 Update

Massport prepares an annual comprehensive environmental report, either in the form of an Environmental Data Report (EDR) or the more complex Environmental Status and Planning Report (ESPR), which is completed approximately every five years. For 2012 and 2013, however, Massport is combining the EDRs for those reporting years. As with previous ESPRs, the level of effort involved in preparing last year's *2011 ESPR* analyses (including new forecast and planning studies) was considerably greater than that of an annual EDR. Rather than providing a *2012 EDR* in the fall of 2013, Massport will report on 2012 and 2013 conditions in a combined *2012/2013 Logan Airport EDR*. For more detailed information, please see the *2011 ESPR.* Combining the 2012 and 2013 reports will allow Massport to analyze trends as the economy continues to rebound from the 2008/2009 Economic Recession.

The purpose of this update is to provide an interim status report for 2012 on environmental conditions at Logan Airport with a complete *2012/2013 EDR* to be filed in the Fall of 2014. Logan Airport activities and environmental conditions reported include activity levels, regional transportation, ground access, air quality, and noise. Where available, 1990, 2000, and 2005 data are provided for comparison purposes.

Activity Levels

Key Findings

- Annual aircraft operations decreased from 368,987 in 2011 to 354,869 in 2012 (3.8 percent decrease) with commercial operations decreasing by 4.1 percent and general aviation (GA) operations remaining at a similar level compared to 2011 (see Table 1). GA operations remained consistent compared to 2011 decreasing 0.4 percent from 28,230 operations in 2011 to 28,114 operations in 2012. GA operations still represent only a small percentage (7.9 percent) of total operations at Logan Airport.

- Daily operations in 2012 (366 days) averaged approximately 969 operations per day compared to approximately 1,011 operations per day in 2011. Since 2000, the number of daily aircraft operations has declined by almost 30 percent (from 1,355 operations per day in 2000 to 969 operations per day in 2012). This trend reflects reductions in the use of small aircraft since 2000 and tighter capacity control and increased efficiencies on the part of airlines.

Table 1: Logan Airport Aircraft Operations, 2000, 2005, and 2010-2012

Category	2000	2005	2010	2011	2012	Percent Change (2011-2012)
Total Aircraft Operations	487,996	409,067	352,643	368,987	354,869	(3.83%)
Operations by Type and Aircraft Class						
Passenger Jet	254,968	201,502	214,307	223,083	225,166	0.9%
Passenger Regional Jet	37,600	113,886	66,498	61,704	46,753	(24.2%)
Passenger Non-Jet	147,913	52,114	50,882	49,700	49,599	(0.2%)
Total Passenger Operations	440,481	367,502	331,687	334,487	321,518	(3.9%)
GA Jet Operations	20,595	25,806	11,430	21,129	21,042	(0.4%)
GA Non-Jet Operations	14,638	6,846	3,252	7,101	7,072	(0.4%)
Total GA Operations	35,233	32,652	14,682	28,230	28,114	(0.4%)
Cargo Jet	11,788	8,913	5,332	5,053	4,220	(16.5%)
Cargo Non-Jet	494	0	942	1,217	1,017	(16.5%)
Total Cargo Operations	12,282	8,913	6,274	6,270	5,237	(16.5%)

Source: Massport
Notes: Jet includes the Embraer E-190, which is a regional jet configured with 88-100 seats, but is similar in size to some traditional narrow-body jets.
Numbers in parenthesis () indicate negative number.

Key Findings

Logan Airport and Regional Airports

- In 2012, Logan's passenger traffic reached a new peak of 29.3 million, which represents 66 percent of the region's commercial air passengers (see Table 2). JetBlue and the entry of other low-cost carriers (LCCs) have been the primary drivers of passenger growth at Logan Airport.

- Passenger levels at the regional airports have declined steeply in recent years, similar to trends at other small regional airports across the nation. From 2005 to 2012, the combined passenger traffic at the regional commercial airports in New England dropped by 29 percent, or 4.7 percent per year. The passenger declines are a result of reduced airline capacity at the smaller regional airports as airlines cut services on thinner, less profitable routes to deal with high fuel costs and weak passenger demand resulting from the 2008/2009 Economic Recession and subsequent sluggish economic growth. Reliever and commercial airports accommodating GA activity in the Greater Boston area are presented in Figure 1.

Table 2: Passenger Activity at Logan Airport, Hanscom Field, and Other New England Commercial Service Airports, 2005 and 2012

Airport	Passengers (millions)		Average Annual Growth	2012 Passenger Share
	2005	2012	2005 - 2012	
Logan Airport	27.09	29.33	1.1%	66.3%
Regional Airports				
Bradley International, CT	7.38	5.38	(4.4%)	12.2%
T.F. Green, RI	5.73	3.65	(6.2%)	8.2%
Manchester-Boston, NH	4.33	2.45	(7.8%)	5.5%
Portland International Jetport, ME	1.46	1.62	1.5%	3.7%
Burlington International, VT	1.38	1.23	(1.6%)	2.8%
Bangor International, ME	0.48	0.46	(0.6%)	1.0%
Tweed New Haven, CT	0.13	0.08	(7.4%)	0.2%
Worcester Regional, MA	-	0.03	-	0.1%
Portsmouth International, NH	0.01	0.03	12.1%	0.1%
Hanscom Field, MA	0.02	0.01	(9.6%)	0.0%
Subtotal Regional Airports	20.92	14.93	(4.7%)	33.7%
Total New England Airports	48.01	44.26	(1.2%)	100.0%

Source: Massport and individual airport data

Since 2005, commercial operations at Logan Airport and the regional airports have declined by 2.0 percent per year and 6.2 percent per year, respectively. The downward trend in commercial aircraft operations reflects airline reductions in scheduled services, especially at the smaller airports, as well as an industry-wide shift away from small aircraft and tighter capacity control on the part of airlines. Airlines have retired large numbers of the small regional jets (RJs) with 30 to 50 seats, which have proven to be cost-ineffective in the current high fuel price environment, while increasing the use of large RJs or turboprops with 60 to 90 seats. Commercial operations at Hanscom Field have historically represented less than 1.0 percent of the region's total commercial operations.

Figure 1: General Aviation Reliever and Commercial Airports Accommodating General Aviation Activity in Greater Boston

Massport, in conjunction with the City of Worcester, has been active in promoting the reintroduction of scheduled airline service at Worcester Regional Airport. JetBlue commenced new services from Worcester to Orlando International and Fort Lauderdale-Hollywood Airports on November 7, 2013.

Table 3: General Aviation Operations at General Aviation Reliever and Commercial Service Airports in Greater Boston

Airport	Primary Aviation Service	General Aviation Operations		Average Annual Growth	Percent Local (2012)	Based Aircraft (2012)
		2005	2012			
Hanscom Field	General Aviation	165,424	164,835	(0.1%)	42.3%	340
Norwood Municipal	General Aviation	70,496	68,405	(0.4%)	51.9%	160
Beverly Municipal	General Aviation	64,110	58,203	(1.4%)	54.9%	98
Nashua/Boire Field	General Aviation	127,573	55,620	(11.2%)	53.2%	324
Lawrence Municipal	General Aviation	70,828	52,157	(4.3%)	45.8%	212
Worcester Regional	General Aviation	65,938	44,070	(5.6%)	39.8%	63
Portsmouth International	General Aviation	32,586	38,132	2.3%	67.7%	117
Logan International	Commercial Service	32,652	28,144	(2.1%)	0.0%	-
Manchester-Boston	Commercial Service	27,538	12,504	(10.7%)	21.8%	60
Total		657,145	522,070	(3.2%)	39.8%	1,322

Source: Massport; FAA; and ATADS, Terminal Area Forecast, December 2012.
Notes:
1 Includes air taxi operations except for Manchester-Boston Airport, where air taxi operations are comingled with regional commuter airlines operations
2 Hanscom Field based aircraft are from Massport records. All other based aircraft from FAA, Terminal Area Forecast.

GA operations in the greater Boston area fell by 3.2 percent per year between 2005 and 2012 as a result of high fuel prices, a weak economy, and declining number of student pilots, consistent with the national trend (see Table 3).

Key Findings

On-Airport Transportation and Activity

- As shown in Table 4, the total number of annual air passengers at Logan Airport increased 1.1 percent to 29.2 million in 2012, compared to 28.9 million in 2011. During the same period, average daily traffic on Airport roadways decreased 0.2 percent from 99,449 vehicles per day in 2011 to 99,281 vehicles per day in 2012.
- There was a small decrease in VMT (0.05 percent) from 2011 to 2012 (see Table 5).

Table 4: Logan Airport Gateways: Annual Average Daily Traffic, 2000, 2005 and 2010- 2012

	AADT		AWDT		AWEDT		Annual Air Passengers	
Year	Volume	Percent Change	Volume	Percent Change	Volume	Percent Change	Level of Activity	Percent Change from Prior Year
2000	95,058	3.8%	101,446	3.9%	78,358	2.1%	27,412,926	1.3%
2005	106,000	5.8%	112,600	6.0%	89,400	5.2%	27,087,905	3.6%
2010	94,179	5.1%	98,968	5.7%	82,595	4.7%	27,428,962	7.5%
2011	99,449	5.6%	104,863	6.0%	85,879	4.0%	28,907,938	5.4%
2012	99,281	(0.2%)	104, 439	(0.4%)	86,494	0.7%	29,235,643	1.1%

Source: Massport
Notes: Numbers in parentheses () represent negative numbers.
1 For years between 1999 and 2003, total gateway volumes are adjusted to eliminate TWT- Route 1A through traffic not destined to or from Logan Airport.
2 Based on a ratio of AADT/AWDT from previous years and based on a ratio of AWEDT/AWDT from previous years.
3 Gateway traffic volumes were not collected in 2006 due to the temporary closure of the TWT.
AADT Annual average daily traffic.
AWDT Annual average weekday daily traffic.
AWEDT Annual average weekend daily traffic.

Table 5: Airport Study Area Vehicle Miles Traveled (VMT) for Airport-Related Traffic, 2000, 2005, and 2010 - 2012

Analysis Year	AM Peak Hour	PM Peak Hour	High 8-Hour	Average Weekday	Average Weekday Percent Change from Prior Year
2000 (VMT model)	11,213	13,252	85,823	178,798	3.0%
2005 (VMT model)	8,477	10,998	80,240	167,166	4.2%
2010 (VMT model)	8,451	10,887	78,185	162,885	4.8%
2011 (VMT model)	8,898	11,495	82,665	172,218	5.7%
2011 (VISSIM model)	8,391	10,978	76,920	167,647	2.9%
2012 (VISSIM model)	8,387	10,974	76,883	167,564	(0.05%)

Source: VHB and Massport

Ground Access Activity

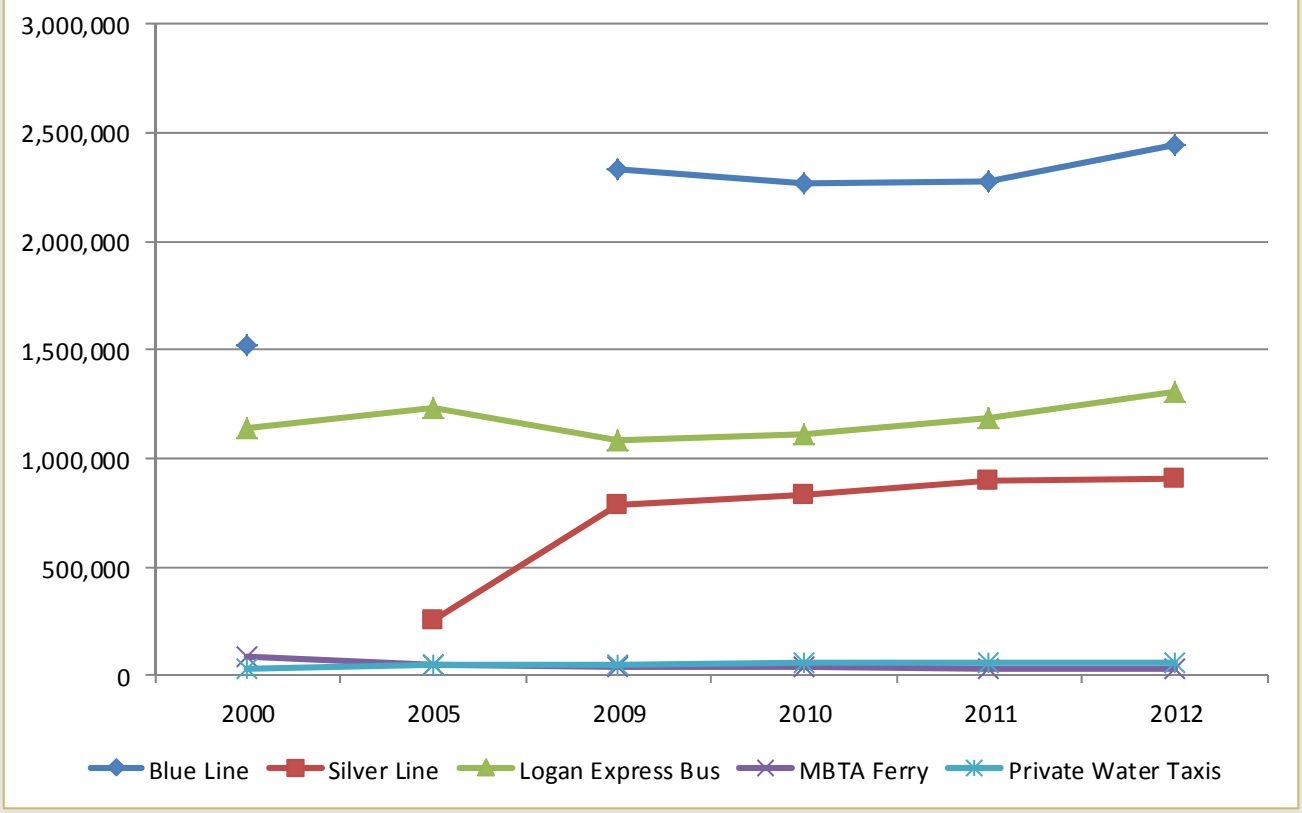
- Massachusetts Bay Transportation Authority (MBTA) Silver Line bus boardings at the Airport continued to grow. Blue Line transit boardings at Airport Station increased about 7 percent over 2011 levels. MBTA ridership on the Blue and Silver Lines has been increasing steadily over the past several years, and thus has maintained mode share.

- In the summer of 2012, Massport initiated a pilot program that allowed passengers free boarding on the Silver Line at Logan Airport. The program also entailed added customer service staff during peak arrivals periods in the summer and increased public transportation signs and wayfinding. The promising results of this program have demonstrated reduced dwell times and faster travel times through the terminal area. Average peak-period dwell times at the terminals have been reduced by half-minute in some cases, resulting in travel times through the terminals that are up to two minutes faster.

- In 2012, ridership on all types of water transportation to the Airport remained flat in comparison to the previous year (see Figure 2). Ridership on the MBTA ferry continued its decreasing trend, while water taxi use has exhibited a slight growth since 2007.

- In 2012, air passenger ridership using Logan Express bus service increased overall by 10 percent compared to 2011 levels, with employee use of Logan Express increasing by 16 percent and non-employee passengers increasing nearly 5 percent.

Figure 2: Annual Ridership and Activity Levels on HOV/Shared-Ride Modes, 2000, 2005 and 2009 - 2012



Source: Massport

Notes: Silver Line was not in service in 2000; Blue Line ridership data were not available for 2005.

Key Findings

- In 2012, there was a significant drop in regional jet operations as airlines switched to using larger aircraft to carry more passengers on routes instead of adding operations. Accordingly, the average annual commercial airline operations at regional airports decreased by 4.1 percent between 2005 and 2012.

- Compared to 2011, the 2012 day-night average sound level (DNL) 65 decibel (dB) contours are slightly larger in East Boston, Revere, South Boston, and Winthrop (see Figures 3 and 4). There are several factors that influenced the contour changes, including:

    - Runway 15R-33L, which is the nighttime noise abatement runway, was temporarily closed from June 16, 2012 through October 2, 2012 to allow for construction of the enhanced Runway 33L Runway Safety Area (RSA). There were also partial closures of the runway before and after this period. Typically, this runway is used during these periods for head to head operations (arrivals to Runway 33L and departures from Runway 15R) at night, which keeps air traffic over Boston Harbor.
    - The 2012 closure was a longer period than in 2011 which extended the use of other runways for nighttime operations during 2012.
    - During the Runway 15R-33L closure period, night operations primarily used Runway 22R and Runway 9 for departures and Runway 4R, 27, and 22L for arrivals.
    - Compared to 2011, there was an increased use of Runway 22L, 22R, and 4R for departures and Runway 27 arrivals.

- The overall number of people exposed to DNL values greater than 65 dB increased to 4,702 people in 2012 from 3,947 people in 2011 (an increase of 755 people) (see Table 7). The number of people residing within the DNL 70 dB contour increased from 130 people in 2011 to 200 people in 2012. These levels are still well below the number of people exposed in the year 2000 when 17,745 people were exposed to DNL noise levels greater than 65 dB and 1,551 people were exposed to DNL levels greater than 70 dB. All of the residences exposed to levels greater than DNL 65 dB in 2012 have been eligible to participate in Massport's residential sound insulation program (RSIP).

- The 2012 Cumulative Noise Index (CNI) of 152.2 Effective Perceived Noise Decibels (EPNdB) remained well below the cap of 156.5 EPNdB established under Massport's noise regulations (see Table 8). This small increase from the 2011 level (0.1 EPNdB) is due to slight changes in aircraft fleet mix.

- Massport has an extensive sound insulation program in the areas surrounding Logan Airport. All of the residences exposed to levels greater than DNL 65 dB in 2012 have been eligible to participate in Massport's RSIP. Participation in the program is voluntary and all of the homeowners who have chosen to participate in the Massport's RSIP, have been sound-insulated by Massport. Massport will continue to seek funding for sound insulation for properties that are eligible.

- Massport's system continuously measures the noise levels at 30 microphone locations around the Airport. Table 6 compares the measured 2011 DNL values to the measured 2012 DNL values at each location.

Airspace and Airfield Changes

- The aRea NAVigation (RNAV) departure portions of Phase 1 of the Boston Logan Airport Noise Study (BLANS), first implemented in 2010, continued to be utilized in 2012. The primary focus of the BLANS is to determine viable ways to reduce noise from aircraft operations to and from Logan Airport without diminishing airport safety and efficiency.
    - The Runway 33L departure is the last RNAV Standard Instrument Departure (SID) procedure to be implemented that originated from the BLANS recommendations.
    - The Federal Aviation Administration (FAA) issued a Finding of No Significant Impact/Record of Decision (FONSI/ROD) in June of 2013 for the Boston Logan International Airport Runway 33L RNAV SID Final Environmental Assessment. The procedure became available for use on June 5, 2013 and will be shown as part of the 2012/2013 Environmental Data Report (EDR).
    - The RNAV SID overlays as closely as possible (given existing RNAV criteria) to the existing conventional SID. The procedure was designed this way so that it would not introduce overflights to new areas but will allow more efficient routing of aircraft out of Logan Airport's airspace.
    - RNAV Standard Terminal Arrival Routes (STARS) were available to aircraft for all of 2012 and have consolidated arrival routes into Logan Airport airspace.

  All other major Logan Airport runways that are capable of accommodating RNAVs have been implemented by the FAA and are in operation today.

- The 2012 Flight Track Monitoring report (refer to Appendix A) shows that 99 percent of shoreline crossings are by aircraft above 6,000 feet, reflecting a slight increase from 2011, which is beneficial to communities under those flight paths.

- The Runway 27 departure procedure continued to remain in compliance with the Runway 27 ROD. The FAA determined in early 2012 that no further evaluation is needed. Massport will continue to monitor and publish compliance with the procedure in the annual Flight Track Monitoring Report in the EDRs and Environmental Status and Planning Reports (ESPRs).

- The visual approach procedure to Runway 33L which began during the summer of 2009, continued in 2012. The procedure, also an outcome of Phase 1 of BLANS, keeps aircraft offshore avoiding areas of Cohasset and Hull at night in good weather when visual flight rules are in use.

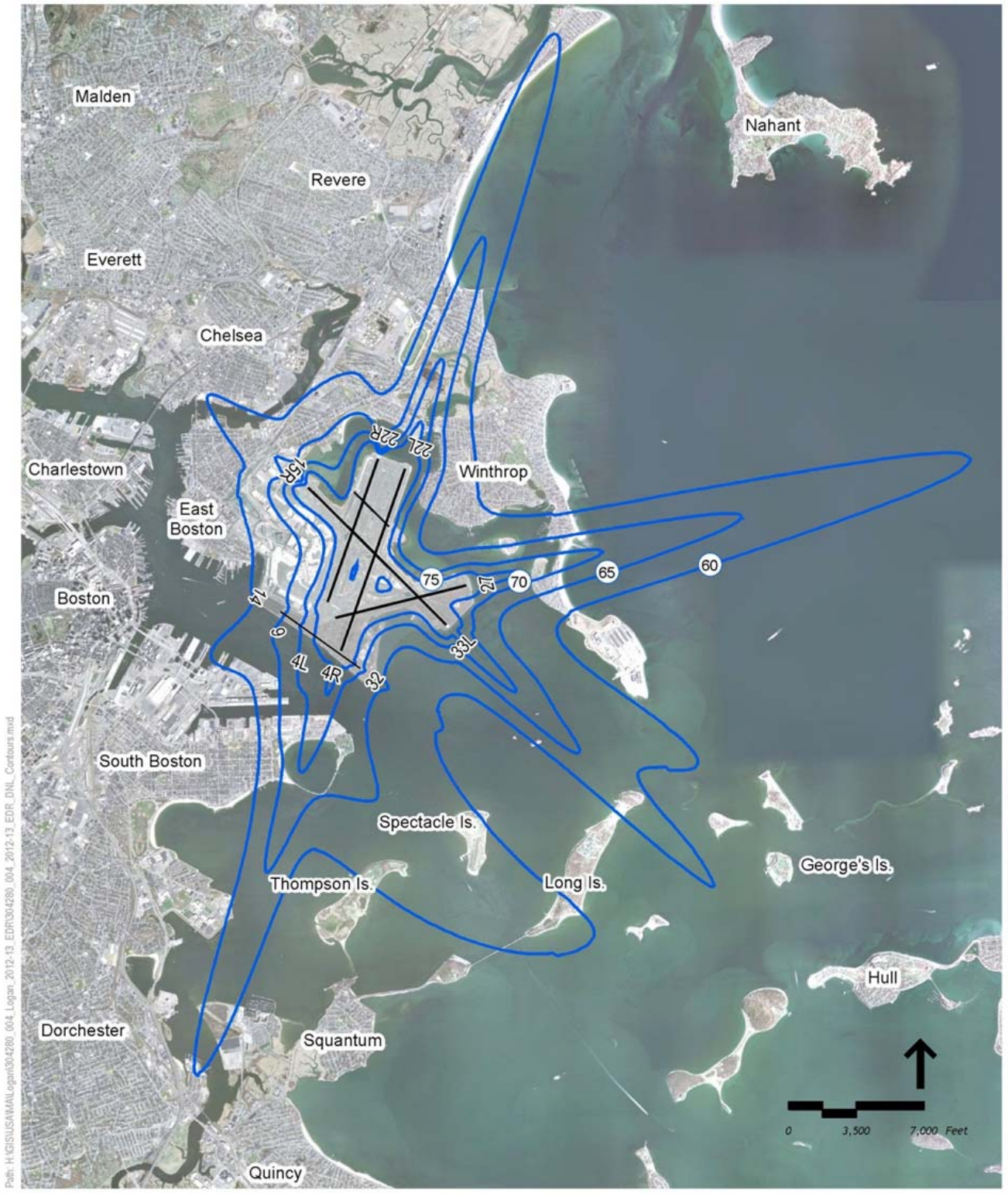
Table 6: Measured Versus Measured - Comparison of Measured DNL Values From 2011 to 2012

Location	Site	Distance from Logan Airport (miles)	2011 Measured Air-craft (DNL)	2012 Measured Air-craft (DNL)	Difference 2012 minus 2011
South End – Andrews Street	1	3.7	51.7	51.7	0.0
South Boston – B and Bolton	2	2.9	52.9	51.5	(1.4)
South Boston – Day Blvd. near Farragut	3	2.5	62.3	67.8	5.5
Winthrop – Bayview and Grandview	4	1.6	71.6	71.8	0.2
Winthrop – Harborview and Faun Bar	5	1.9	64.0	63.9	(0.1)
Winthrop – Somerset near Johnson	6	0.8	61.3	61.7	0.4
Winthrop – Loring Road near Court	7	1.0	65.5	66.4	0.9
Winthrop – Morton and Amelia	8	1.6	59.8	59.8	0.0
East Boston – Bayswater near Annavoy	9	1.3	66.6	68.1	1.5
East Boston – Bayswater near Shawsheen	10	1.3	62.2	62.3	0.1
East Boston – Selma and Orient	11	1.8	55.7	55.8	0.1
East Boston Yacht Club	12	1.2	NA	NA	NA
East Boston High School	13	1.9	58.5	58.5	0.0
East Boston – Jeffries Point Yacht Club	14	1.2	53.5	54.5	1.0
Chelsea – Admiral's Hill	15	2.8	57.1	56.5	(0.6)
Revere – Bradstreet and Sales	16	2.4	68.5	68.3	(0.2)
Revere – Carey Circle	17	5.3	59.6	59.7	0.1
Nahant – U.S.C.G. Recreational Facility	18	5.9	42.4	38.9	(3.5)
Swampscott – Smith Lane	19	8.7	40.5	41.8	1.3
Lynn – Pond and Towns Court	20	8.4	54.0	53.1	(0.9)
Everett – Tremont near Prescott	21	4.5	44.4	46.9	2.5
Medford – Magoun near Thatcher	22	6.0	46.6	46.2	(0.4)
Dorchester – Myrtlebank near Hilltop	23	6.3	52.6	55.4	2.8
Milton – Cunningham Park near Fullers	24	8.1	49.4	49.4	0.0
Quincy – Squaw Rock Park	25	4.2	43.5	37.7	(5.8)
Hull – Hull High School near Channel Street	26	6.0	56.1	54.5	(1.6)
Roxbury – Boston Latin Academy	27	5.3	50.1	50.0	(0.1)
Jamaica Plain – Southbourne Road	28	7.7	41.4	41.3	(0.1)
Mattapan – Lewenburg School	29	7.3	37.8	35.6	(2.2)
East Boston – Piers Park	30	1.5	47.0	48.5	1.5
Arithmetic Average [1]			54.1	53.5	0.6[2]

Source: HMMH
Notes: Changes in ( ) represent a decrease in measured noise level from 2011 to 2012.
Distance from Logan Airport calculated from the Airport Reference Point.
Site 12 is no longer operational.
Site 3 had interference from an outside source in 2012.

1 Sites 3 and 12 are not included in the Average values due to the issues noted above.
2 Absolute Average

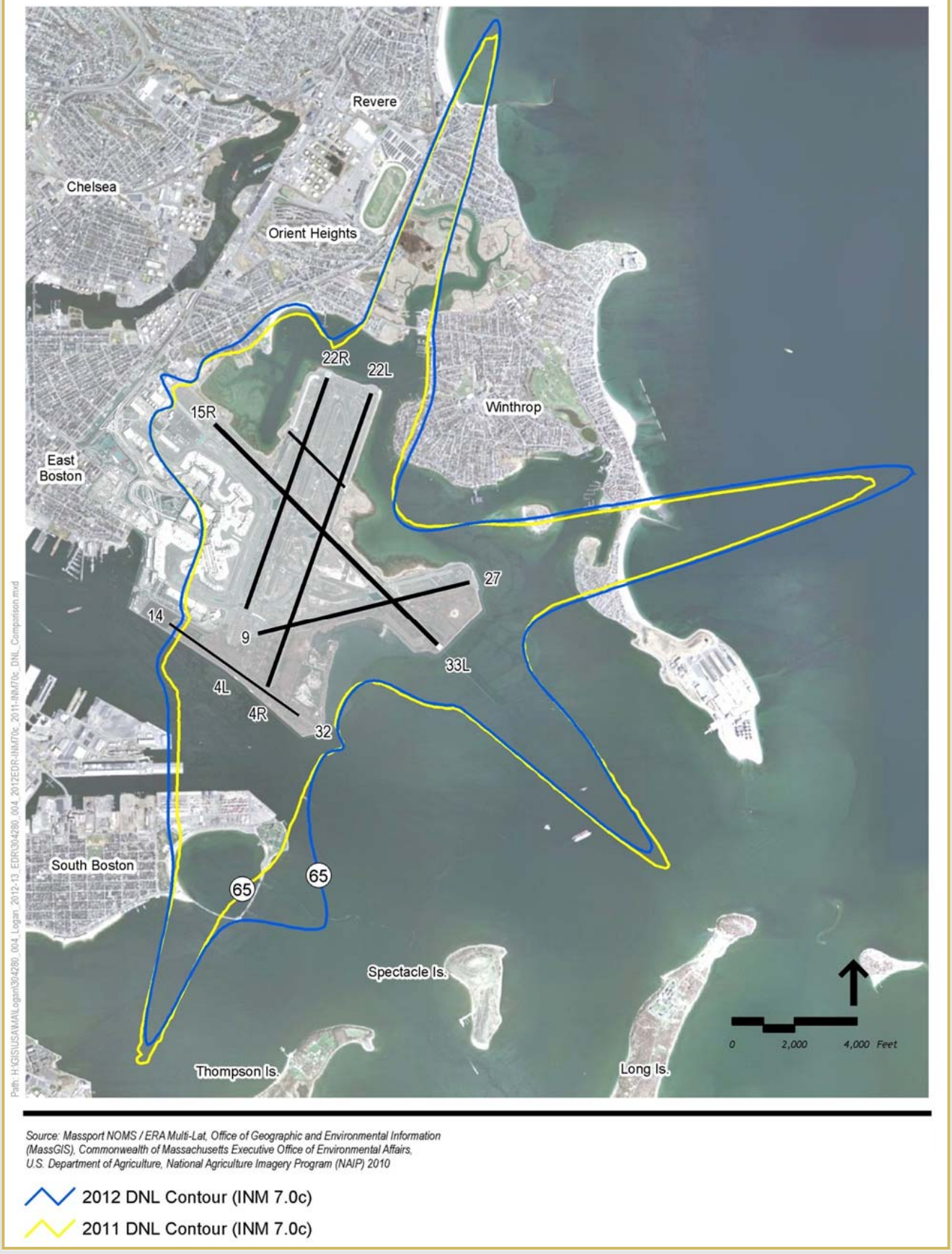
Figure 3: 60-75 DNL Contours for 2012 Operations Using INM 7.0c



Source: Massport NOMS / ERA Multi-Lat, Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs, U.S. Department of Agriculture, National Agriculture Imagery Program (NAIP) 2010

2012 DNL Contour (INM 7.0c)

Figure 4: Comparison of the 65 dB DNL Contours for 2011 and 2012 Operations Using INM 7.0c



Source: Massport NOMS / ERA Multi-Lat, Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs, U.S. Department of Agriculture, National Agriculture Imagery Program (NAIP) 2010

2012 DNL Contour (INM 7.0c)

2011 DNL Contour (INM 7.0c)

Table 7: Noise-exposed Population by Community, 1990, 2000, 2005, and 2011–2012

Boston						Revere					
Year	Census	> 75 DNL	70-75 DNL	65[1]-70 DNL	Total (65+)[1] DNL	Year	Census	> 75 DNL	70-75 DNL	65[1]-70 DNL	Total (65+)[1] DNL
1990	1990	0	1,788	28,970	30,748	1990	1990	0	0	4,274	4,274
2000	2000	0	234	9,014	9,248	2000	2000	0	0	2,496	2,496
2005	2000	65	104	2020[2]	2189[2]	2005	2000	0	82	2,540	2,622
2011 (7.0b)	2010	0	0	331	331	2011 (7.0b)	2010	0	0	2,547	2,547
2011 (7.0c)	2010	0	0	331	331	2011 (7.0c)	2010	0	0	2,547	2,547
2012 (7.0c)	2010	0	0	421	421	2012 (7.0c)	2010	0	0	2,775	2,775
Chelsea						Winthrop					
Year	Census	> 75 DNL	70-75 DNL	65[1]-70 DNL	Total (65+)[1] DNL	Year	Census	> 75 DNL	70-75 DNL	65[1]-70 DNL	Total (65+)[1] DNL
1990	1990	0	0	4,813	4,813	1990	1990	676	1,211	2,420	4,307
2000	2000	0	0	0	0	2000	2000	247	1,070	4,684	6,001
2005	2000	0	0	0	0	2005	2000	39	347	1,280	1,666
2011 (7.0b)	2010	0	0	0	0	2011 (7.0b)	2010	0	130	939	1,069
2011 (7.0c)	2010	0	0	0	0	2011 (7.0c)	2010	0	130	939	1,069
2012 (7.0c)	2010	0	0	0	0	2012 (7.0d)	2010	0	200	1,306	1,506
Everett						All Communities					
Year	Census	> 75 DNL	70-75 DNL	65[1]-70 DNL	Total (65+)[1] DNL	Year	Census	> 75 DNL	70-75 DNL	65[1]-70 DNL	Total (65+)[1] DNL
1990	1990	0	0	0	0	1990	1990	676	2,989	40,477	44,142
2000	2000	0	0	0	0	2000	2000	247	1,304	16,194	17,745
2005	2000	0	0	0	0	2005	2000	104	533	5,840[2]	6,477[2]
2011 (7.0b)	2010	0	0	0	0	2011 (7.0b)	2010	0	130	3,817	3,947
2011 (7.0c)	2010	0	0	0	0	2011 (7.0c)	2010	0	130	3,817	3,947
2012 (7.0c)	2010	0	0	0	0	2012 (7.0c)	2010	0	200	4,502	4,702

Source: HMMH 2013, Massport.

Notes: Population counts for 2009 are based on the 2000 U.S. Census block data and the contours beginning in 2004 from the RealContoursTM system Population counts for 2010 through 2013 are provided for the 2010 U.S. Census block data (as indicated) and the contours are from the RealContoursTM system

1 65 dB DNL is the federally-defined noise criterion used as a guideline to identify when residential land use is considered incompatible with aircraft noise.

2 These values reflect the effect of the FAA-approved terrain adjustment in Orient Heights.

Table 8: Cumulative Noise Index (EPNdB), 1990, 2000, 2005, and 2010-2012							
	Logan Airport CNI Cap – 156.5 EPNdB						
	1990	2000	2005	2010	2011	2012	Change (2011-2012)
Full CNI (Entire Commercial Jet Fleet)	156.4	154.7	153.2	151.9	152.1	152.2	0.1
Total Passenger Jets	155.2	153.6	152.1	150.9	150.6	151.3	0.7
Total Cargo Jets	150.1	148.2	146.6	145.1	146.7	144.9	(1.8)
Total Daytime	152.5	149.5	148.2	146.8	146.9	147	0.1
Total Nighttime	154.4	153.1	151.6	150.3	150.6	150.6	0.0
Total Stage 2 Jets	NA	124.7	NA	113.6[1]	110.8[1]	104.9[1]	(5.9)
Total Stage 3 Jets	NA	154.7	153.2	151.9	152.1	152.2	0.1
Daytime Stage 2	NA	122.6	NA	103.6[1]	NA	104.9	NA
Nighttime Stage 2	NA	120.5	NA	113.1[1]	110.8	NA	NA
Daytime Stage 3	NA	149.5	148.2	146.8	146.9	147	0.1
Nighttime Stage 3	NA	153.1	151.6	150.3	150.6	150.6	0.0
Passenger Jet Stage 2	NA	124.2	NA	NA	NA	104.9[1]	NA
Passenger Jet Stage 3	NA	153.6	152.1	150.9	150.6	151.3	0.7
Cargo Jet Stage 2	NA	114.8	NA	113.6[1]	110.8[1]	NA	NA
Cargo Jet Stage 3	NA	148.2	146.6	145.1	146.7	144.9	(1.8)
Daytime Passenger	NA	149.3	147.9	146.6	146.5	146.8	0.3
Nighttime Passenger	NA	151.6	150.1	149.0	148.5	149.4	0.9
Daytime Cargo	137.1	137.5	135.8	134.5	136.6	134	(2.6)
Nighttime Cargo	149.9	147.8	146.2	144.7	146.3	144.5	(1.8)
Daytime Passenger Stage 2	NA	122.3	NA	NA	NA	104.9[1]	NA
Daytime Passenger Stage 3	NA	149.2	147.9	146.6	146.5	146.8	0.3
Nighttime Passenger Stage 2	NA	119.8	NA	NA	NA	NA	NA
Nighttime Passenger Stage 3	NA	151.6	150.1	149.0	148.5	149.4	0.9
Daytime Cargo Stage 2	NA	111.1	NA	103.6[1]	NA	NA	NA
Daytime Cargo Stage 3	NA	137.5	135.8	134.4	136.6	134	(2.6)
Nighttime Cargo Stage 2	NA	112.3	NA	113.1[1]	110.8[1]	NA	NA
Nighttime Cargo Stage 3	NA	147.8	146.2	144.7	146.3	144.5	(1.8)

Source: HMMH, 2013
Note: General aviation and non-jet aircraft are not included in the calculation.
NA No operations by this aircraft type in the commercial fleet.
1 The Stage 2 results are from a Falcon 20 aircraft arrival and departure flown by a Charter Operator during 2012.

Air Quality

The U.S. Environmental Protection Agency established National Ambient Air Quality Standards (NAAQS) for a group of criteria air pollutants to protect public health, the environment, and the quality of life from the detrimental effects of air pollution. These NAAQS are set for the following seven pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM10 and PM2.5), and sulfur dioxide (SO_2) . The NAAQS primary standards (designed to protect human health) and secondary standards (designed to protect human welfare) are summarized in Table 9. The NAAQS and the Massachusetts State Implementation Plan (SIP) regulate the standards for air quality in Massachusetts.

Table 9: National Ambient Air Quality Standards

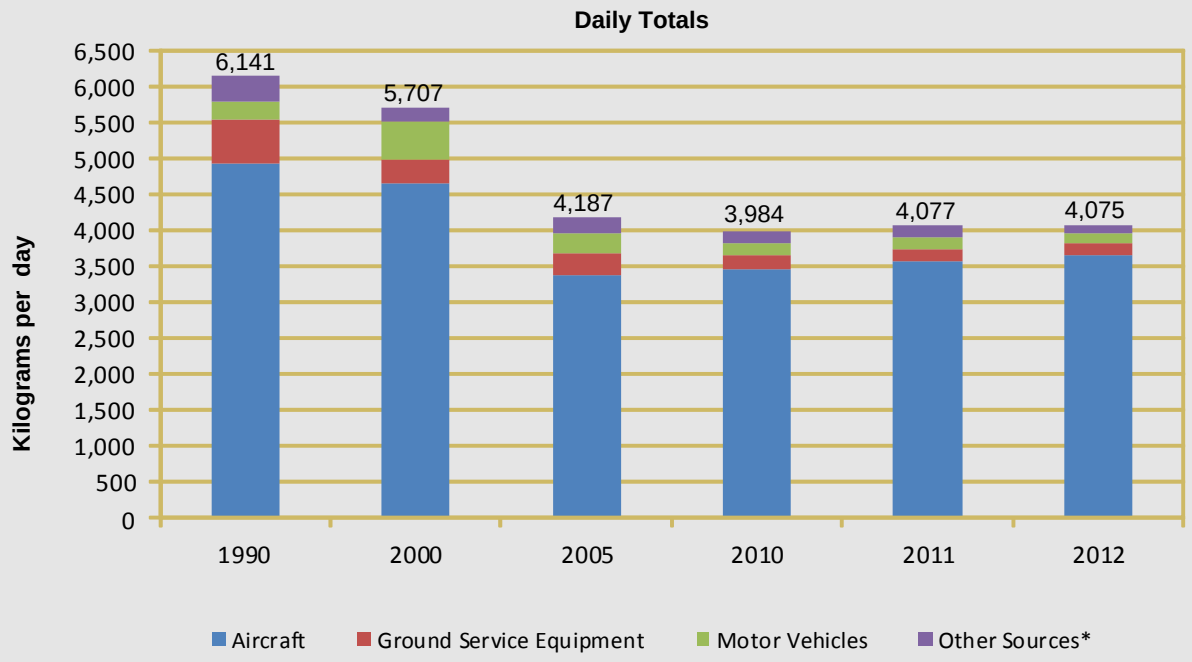
Pollutant	Averaging Time	Standard		Notes:
		ppm	µg/m^3	
Carbon Monoxide (CO)	1 hour	35	40,000	Not to be exceeded more than once a year.
	8 hour	9	10,000	Not to be exceeded more than once a year.
Lead (Pb)	Rolling 3-Month Average	—	0.15	Not to exceed this level. Final rule October 2008.
	Quarterly	—	1.5	The 1978 standard (1.5 µg/m^3 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 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.
Nitrogen Dioxide (NO_2)	1 hour	0.100	188	The three-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm.
	Annual	0.053	100	Not to exceed this level.
Ozone (O_3)	8 hour[1]	0.08	157	The average of the annual 4th highest daily 8-hour maximum over a three-year period is not to exceed this level.
	8 hour[2]	0.075	147	The average of the annual 4th highest daily 8-hour maximum over a three-year period is not to exceed this level.
Particulate Matter with a diameter $\leq$ 10 µm (PM_{10})	24 hour	—	150	Not to be exceeded more than once a year on average over three years.
Particulate Matter with a diameter $\leq$ 2.5 µm ($PM_{2.5}$)	24 hour	—	35	The three-year average of the 98th percentile for each population-oriented monitor within an area is not to exceed this level.
	Annual (Primary)	—	12	The three-year average of the weighted annual mean from single or multiple monitors within an area is not to exceed this level.
	Annual (Secondary)	—	15	The three-year average of the weighted annual mean from single or multiple monitors within an area is not to exceed this level.
Sulfur Dioxide (SO_2)	1 hour	0.075	196	Final rule signed June 2, 2010. The three-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed this level.
	3 hour	0.5	1,300	Not to be exceeded more than once a year.

Source: EPA, 2013 (www.epa.gov/air/criteria.html).
1 The 1997 NAAQS for ozone.
2 The 2008 NAAQS for ozone.
ppm Parts per million

Key Findings

Total emissions of NOx were 4,075 kg/day, a slight decrease from 2011 levels. Also, total NOx emissions in 2012 were 707 tons per year (tpy) lower than Massport's 1999 Air Quality Initiative (AQI) benchmark (see Figures 5 and 6 and Table 10). This represents an overall decrease of 30.1 percent in NOx emissions since 1999. The AQI is a 15-year program with the overall goal to maintain NOx emissions at or below 1999 levels.

Figure 5: Emissions of NOx at Logan Airport, 1990, 2000, 2005, and 2010-2012



Note: Other sources include stationary sources (e.g., Central Heating and Cooling Plant, snow melter usage, fire training, etc.) and fueling sources.

Figure 6: NOx Emissions Compared to AQI, 1999—2012

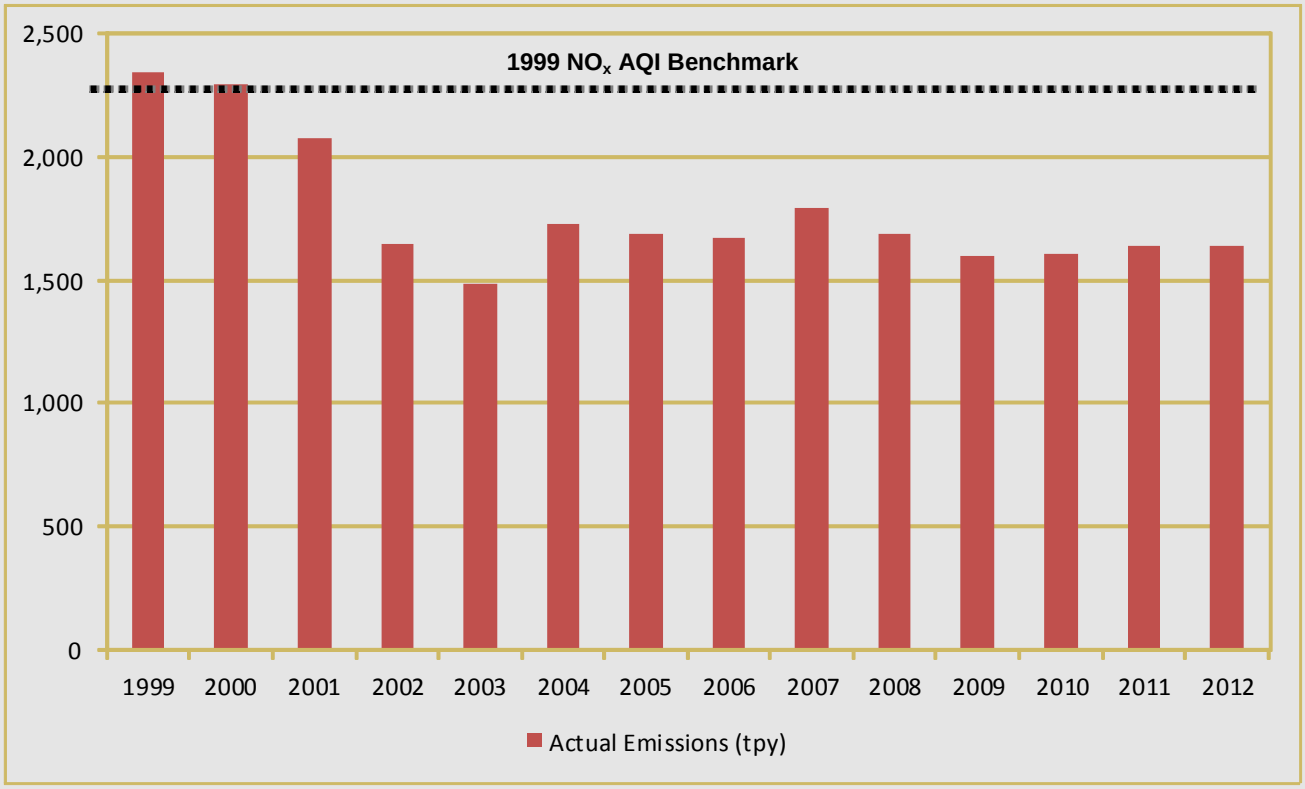


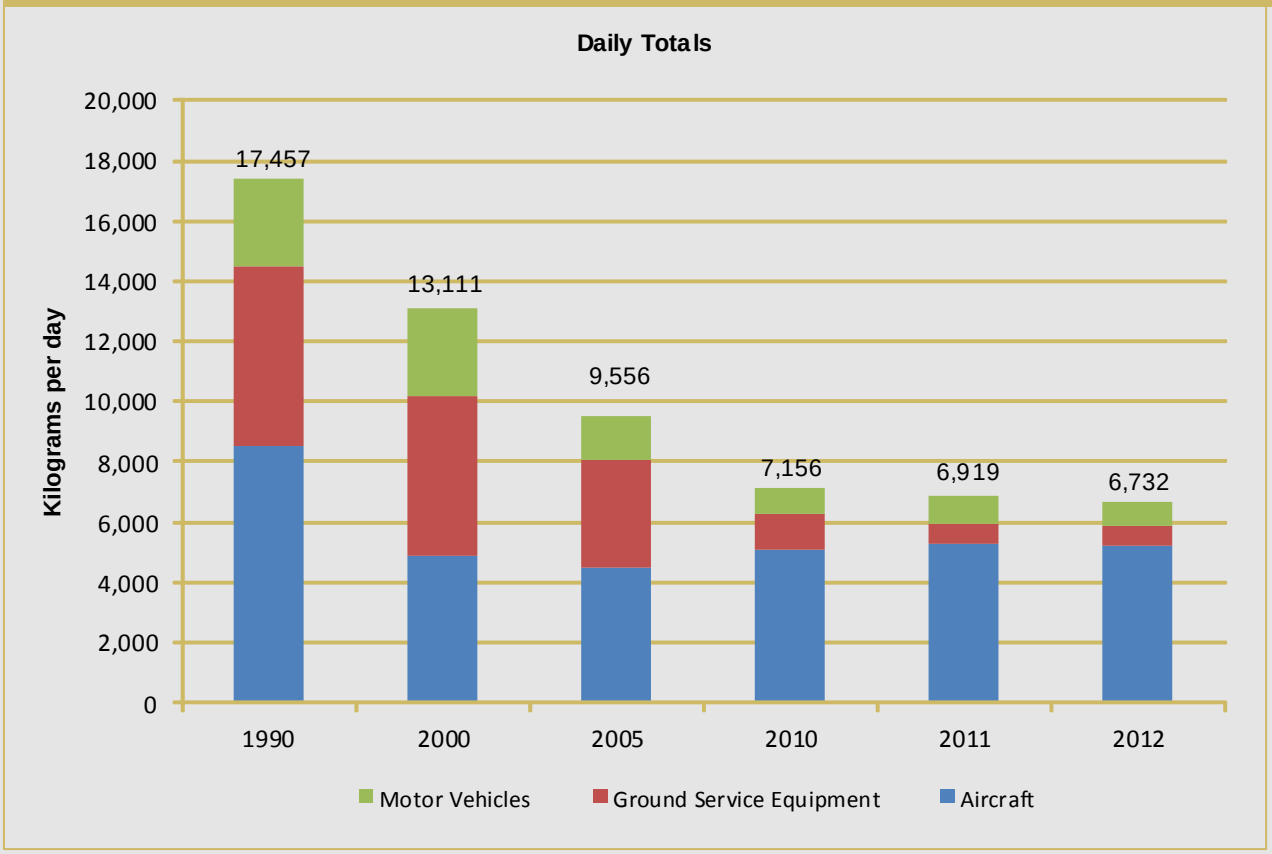
Table 10: AQI Inventory Tracking of NO_x Emissions (in tpy)[1] for Logan Airport, 2000, 2005, 2010-2012, and 2014-2015

	Actual Conditions[2]					Forecasted Conditions[3]	
	2000	2005	2010	2011	2012	2014	2015
Total Annual Emissions	2,315	1,703	1,608	1,647	1,645	1,719	1,740
Above (Below) 1999 Levels Before Reductions	(32)	(644)	(739)	(700)	(702)	(628)	(607)
Potential Reductions/ Increases[4]							
Alternative Fuel Vehicles/ Shuttle Bus	(4)	(9)	(2)	(1)	0	0	1
Alternate Fuel Ground Service Equipment[5]	(14)	(9)	(3)	(6)	(5)	(11)	(11)
Total Potential Reductions	(19)	(18)	(5)	(7)	(5)	(11)	(10)
Above (Below) 1999 Levels After Reduction	(51)	(662)	(744)	(707)	(707)	(639)	(617)
Credit Trading[6]	NA	NA	NA	NA	NA	NA	NA
Net Total w/Reductions and Credits	2,296	1,685	1,603	1,640	1,640	1,708	1,730

Source: Massport
Notes: Values in parentheses, such as "(250)" are negative values. Values without parentheses are positive values.
NA Not available.
1 For consistency with the AQI, the NOx emission values in this table are reported in tpy. The EDR/ESPR Emissions Inventory values are reported in kg/day. A conversion factor of 0.40234 is used to convert kg/day to tpy.
2 The 2009 analysis was completed using EDMS v5.1.2 and MOBILE6.2.03. The 2010 through 2013 analysis was completed using EDMS v5.1.3 and MOBILE6.2.03.
3 The years 2014 and 2015 were interpolated using the 2030 analysis provided in Table 7-8 of the 2011 ESPR.
4 Other initiatives that Massport and Logan Airport tenants may use for possible emission reductions include: Central Heating and Cooling Plant boilers, 400-Hz power at gates, and low NOX fuels in Logan Express buses.
5 Massport's current plan for the conversion of GSE to alternative fuels is being re-evaluated based on the new diesel rule (2007). GSE AFV credits were based on fuel type data obtained from the aerodrome vehicle permit applications beginning in 2007.
6 Since the AQI threshold is not exceeded in 2012 or 2013, nor are the emissions expected to exceed the threshold in the near future, no credits will need to be purchased in the immediate term.

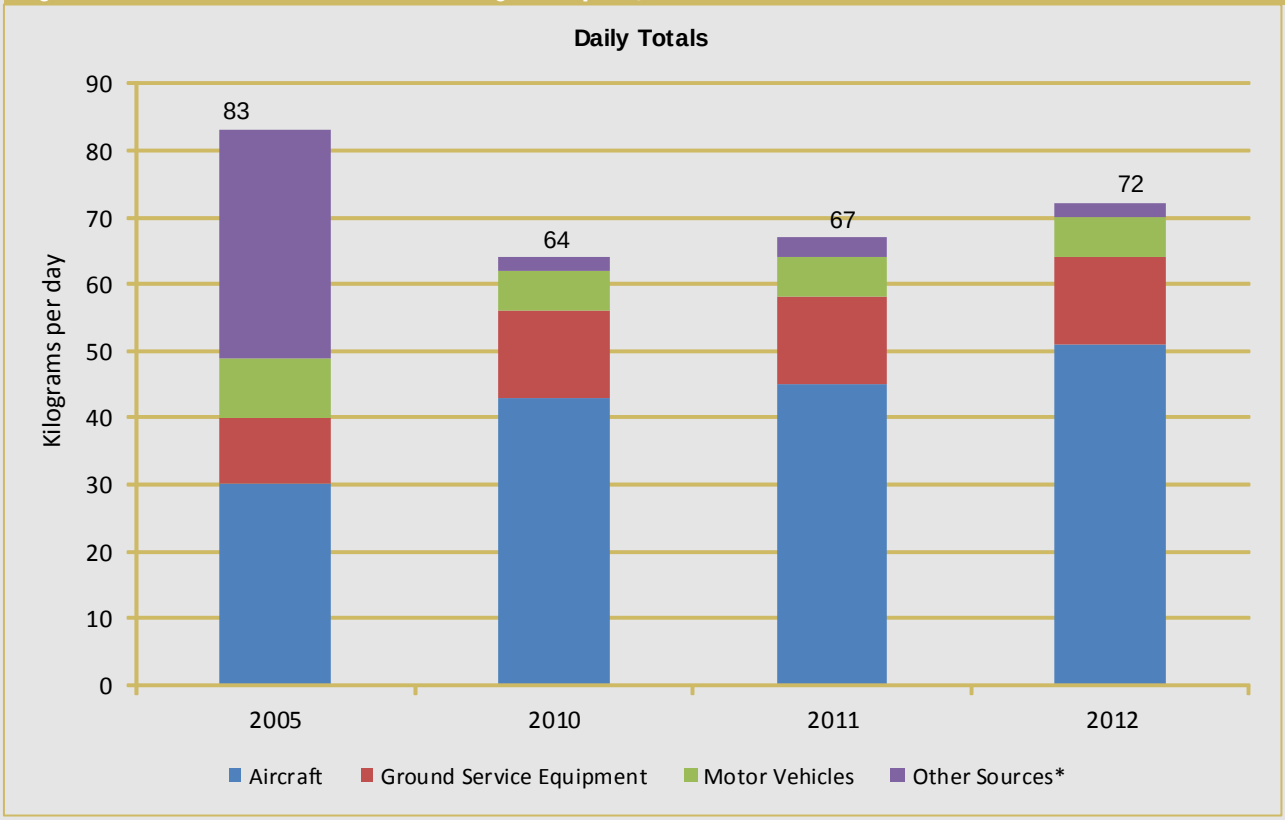
Total emissions of CO were 6,732 kg/day, or 3 percent lower than 2011 levels (see Figure 7).

Figure 7: Emissions of CO at Logan Airport, 1990, 2000, 2005, and 2010 - 2012



Total emissions of $PM_{10}/PM_{2.5}$ associated with Logan Airport increased in 2012 by approximately 7.0 percent to 72 kg/day compared to 2011 levels, but still following a long-range downward trend decreasing by 13.3 percent since 2005 (2005 is the first year that $PM_{10}/PM_{2.5}$ emissions were reported) (see Figure 8). This one year increase is mostly attributable to the increase in the number of high $PM_{10}/PM_{2.5}$ emitting air carrier aircraft operations.

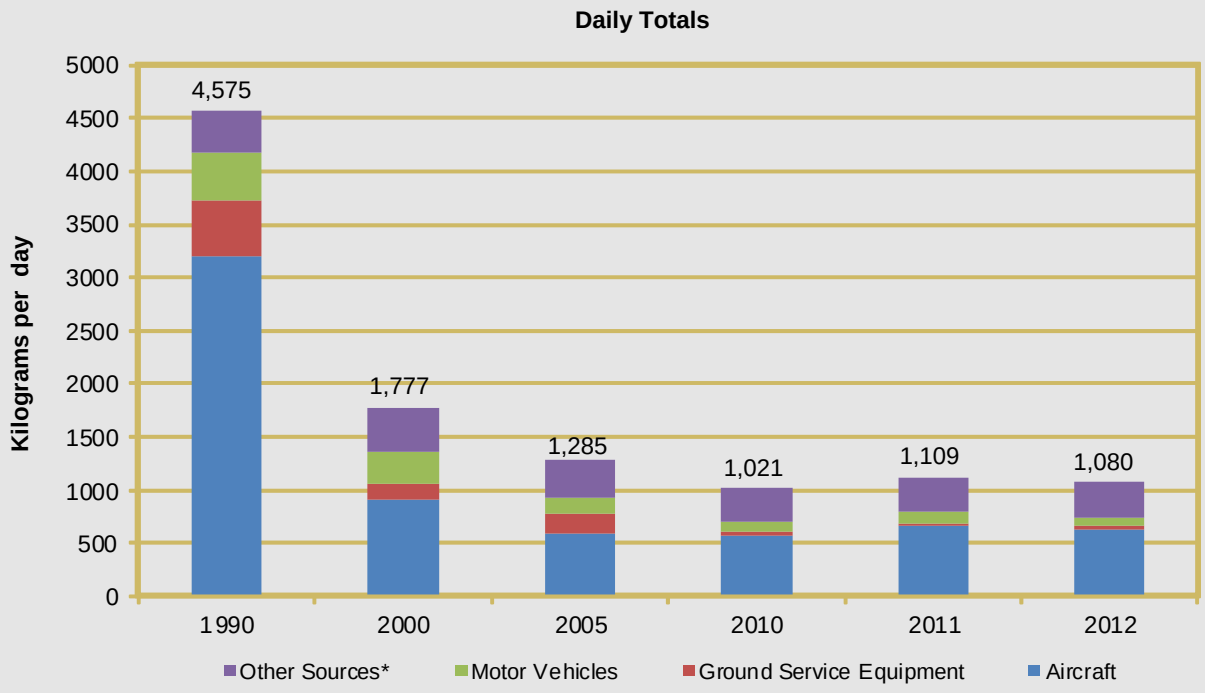
Figure 8: Emissions of $PM_{10}/PM_{2.5}$ at Logan Airport, 2005 and 2010-2012



Note: Other sources include stationary sources (e.g., Central Heating and Cooling Plant, snow melter usage, fire training, etc.) and fueling sources.

Total volatile organic compounds (VOC) emissions were 1,080 kilograms per day (kg/day), or 2.6 percent lower than 2011 levels, following a long-range (i.e., a period of over 20 years) downward trend decreasing by 76 percent since 1990 (see Figure 9). This decrease is primarily due to the 3.8 percent decrease in aircraft landing and takeoff operations (LTOs) when compared to 2011 (184,494 LTOs in 2011 and 177,439 LTOs in 2012) and a 5.0 percent decrease in aircraft taxi time.

Figure 9: Emissions of VOCs at Logan Airport, 1990, 2000, 2005, and 2010 - 2012



Note: Other sources include stationary sources (e.g., Central Heating and Cooling Plant, snow melter usage, fire training, etc.) and fueling sources.

Appendix A

Flight Track Monitoring Report

Introduction

As part of its ongoing commitment to mitigate noise at Logan Airport, Massport has undertaken evaluating the flight tracks of turbojet aircraft engaged in the implementation of established FAA noise abatement procedures. As is true for any airport operator, however, Massport has no authority to control where individual aircraft actually fly. That remains the responsibility of the FAA, while the individual pilots are responsible for safely executing the FAA's instructions. The flight procedures, which are used by the Air Traffic Control (ATC) staff at Boston Tower to achieve desired noise abatement tracks, are contained in the FAA's Tower Order BOS TWR 7040.1.

This is the eleventh annual report for flight track monitoring; prior to 2002, Massport had issued semi-annual reports, an outgrowth of the Flight Track Monitoring Program study. That study was contained in the *Generic Environmental Impact Report* filed with Massachusetts Environmental Policy Act (MEPA) in July of 1996, and was the subject of two Community Working Group (CWG) workshops in September and October of 1996. The time period covered by this report is January 1 through December 31, 2012.

The purpose of the ongoing monitoring program is to identify any systematic changes in flight tracks that may occur and to reduce flight track dispersion, where appropriate. The next report will cover the period January 1, 2013 through December 31, 2013, and will be included in the 2012/2013 Environmental Data Report (EDR).

FAA Air Traffic Control Procedures

FAA Tower Order BOS TWR 7040.1 entitled "Noise Abatement" describes the series of noise abatement policies, rules, regulations, and the procedures to be followed by the FAA air traffic controllers in meeting their designated responsibilities to be "a good neighbor, while meeting our operational objectives/responsibilities to the National Airspace System (NAS)". Section 7.a.3 of the Order, subtitled "Turbojet Departure Noise Abatement Procedures" lists that all turbojet departures shall be issued the Standard Instrument Departure (SID) procedure appropriate for the departure runway. They are paraphrased from the LOGAN SIX SID below.

Note in the descriptions that follow that terms such as "BOS 2 DME" are used frequently. Here, BOS refers to an aid to navigation known as the BOSTON VORTAC, a radio beacon physically located on the Airport near the eastern shoreline between the ends of Runways 27 and 33L. DME refers to "Distance Measuring Equipment", a co-located aid to navigation that provides pilots with a cockpit display of the number of nautical miles that the aircraft is from the designated radio beacon. Thus, BOS 2 DME means an aircraft should be two nautical miles away from the BOSTON VORTAC. The term "vectored" means the pilot is assigned to fly a magnetic heading given by and at the discretion of the FAA air traffic controller in order to maintain the safe separation of aircraft. "MSL" is defined as feet above mean sea level and is the indicator of aircraft altitude used both by the pilot in the cockpit and the air traffic controller on the ground.

During 2010, several of the conventional-only (or radar vector) and aRea NAVigation (RNAV) procedures from the Boston Logan Airport Noise Study (BLANS) CATEX[1] were implemented. There are eight new RNAV procedures for departures from Logan Airport. These eight procedures are used by Runways 4R, 9, 15R, 22L and 22R. These procedures primarily affected departures flying over the North and South shores and were designed to increase the amount of jet traffic crossing back over land above 6,000 feet to minimize noise impacts to communities. A ninth RNAV procedure which is used by Runway 27 has been in use at the airport and has been modified several times.

- For departures, the procedures from the LOGAN SIX SID are:
  - For Runway 4R, climb heading 036 degrees to BOS 4 DME, then turn right to a heading of 090 degrees, and then expect radar vectors to assigned route/navaid/fix. Aircraft that are initially vectored over water can expect to cross the coastline above 6,000 MSL before proceeding on course.
  - For Runway 9, climb heading 093 degrees, and then expect radar vectors to assigned route/navaid/fix. Aircraft that are initially vectored over water can expect to cross the coastline above 6,000 MSL before proceeding on course.
  - For Runway 14, climb heading 142 degrees to BOS 1 DME, then turn left to heading 120 degrees, then expect radar vectors to assigned route/navaid/fix. Aircraft that are initially vectored over water can expect to cross the coastline above 6,000 MSL before proceeding on course.
  - For Runway 15R, climb heading 151 degrees to BOS 1 DME then turn left to 120 degrees, then expect radar vectors to assigned route/navaid/fix. Aircraft that are initially vectored over water can expect to cross the coastline above 6,000 MSL before proceeding on course.
  - For Runway 22R and 22L, climbing left turn to a heading of 140 degrees, then expect radar vectors to assigned route/navaid/fix. Aircraft that are initially vectored over water can expect to cross the coastline above 6,000 MSL before proceeding on course.
  - For Runway 33L, climb heading 331 degrees to BOS 2 DME then turn left to 316 degrees, then expect radar vectors to assigned route/navaid/fix.
  - For Runway 27, climb heading 273 to BOS 2.2 DME, then turn left heading 235 degrees, then expect radar vectors to assigned route/navaid/fix.

These brief procedural statements form the basis of the verbal instructions and flight clearances that are passed from controller to pilot in order to achieve reduced noise in the communities surrounding Logan Airport while also maintaining the safe and efficient flow of aircraft in and out of the Airport. However, consistency with which these procedures are used varies due to air traffic demands, controller workloads, weather conditions, and other operational factors, as noted in the Flight Track Monitoring Program Study.

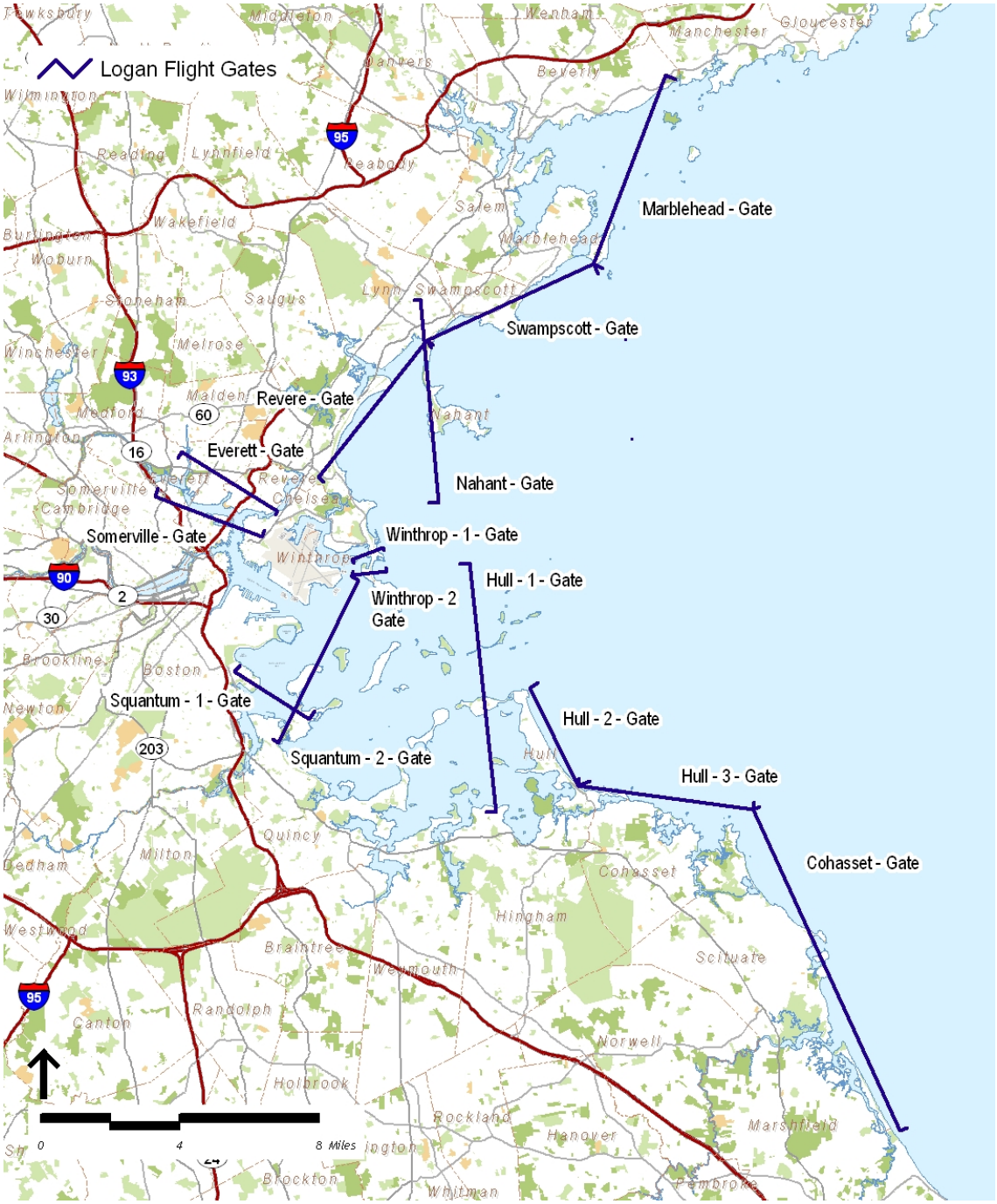
- The RNAV procedures and the runways they serve:
  - BLZZR ONE – Runways 4L, 9, 15R, 22L, 22R: This procedure directs most jet traffic in a well-defined flight corridor over the ocean and crossing back over the South Shore near Cohasset and Scituate.
  - BRUWN TWO – Runways 4L, 9, 15R, 22L, 22R: This procedure directs most jet traffic in a well-defined flight corridor over the ocean towards Cape Cod.
  - CELTK TWO – Runways 4L, 9, 15R, 22L, 22R: This procedure directs most jet traffic in a well-defined flight corridor over the ocean.
  - HYLND TWO – 4L, 9, 15R, 22L, 22R: This procedure directs most jet traffic in a well-defined flight corridor over the ocean and crossing back over the North Shore near Beverly.

1 Federal Aviation Administration Categorical Exclusion Record of Decision, Issued October 16, 2007

- LBSTA TWO – 4L, 9, 15R, 22L, 22R: This procedure directs most jet traffic in a well-defined flight corridor over the ocean and crossing back over the North Shore near Manchester and Gloucester.
- PATSS TWO – 4L, 9, 15R, 22L, 22R: This procedure directs most jet traffic in a well-defined flight corridor over the ocean and crossing back over the South Shore near Cohasset and Scituate.
- REVSS ONE – 4L, 9, 15R, 22L, 22R: This procedure directs most jet traffic in a well-defined flight corridor over the ocean and crossing back over the South Shore near Cohasset and Scituate.
- SSOXS TWO – 4L, 9, 15R, 22L, 22R: This procedure directs most jet traffic in a well-defined flight corridor over the ocean and crossing back over the South Shore over Marshfield.
- WYLYY ONE – 27: This procedure directs most jet traffic in a well-defined flight corridor on a heading of 273 degrees then a turn to 235 degrees over South Boston.

Figure A-1 presents the gates used in the analysis for the Flight Track Monitoring Report. These gates are virtual vertical planes, which are used in the analysis to capture the Airport flight paths. The gates are defined using a geographic coordinate for each end of the gate along with a floor and a ceiling altitude. The gates also capture direction of flights (in or out). The edges of each gate in Figure A-1 point in the direction that the aircraft is coming from. This information is used to evaluate the performance of the flight procedures off each runway end and is presented below.

Figure A-1 Logan Airport Gates



Statistical Analyses of Flight Tracks - Runway 4R

The Nahant Gate (Figure A-1) monitors aircraft after the first turn at 4 DME. The Swampscott and Marblehead Gates monitor northbound shoreline crossings, while the Hull 2, Hull 3, and Cohasset Gates monitor southbound shoreline crossings.

Table A-1 shows the dispersion of the jet departures on Runway 4R as they pass through the Nahant Gate. Table A-1 shows that Runway 4R departures were concentrated, with 98.8 percent "over the Causeway", and about 0.2 percent over the south end of the gate compared to 96.9 percent over the Causeway in 2011 and 0.1 percent over the south end of the gate. Departures through the north end of the gate decreased from 3.0 percent in 2011 to 1.0 percent in 2012.

Table A-1 Runways 4R Nahant Gate Summary for 2012

	Number of Tracks Through Gate Segment	Total Number of Tracks Through Gate	Percentage of Tracks Through Gate Segment
North End of Gate	92	9,123	1.0%
Over Causeway	9,009	9,123	98.8%
South End of Gate	22	9,123	0.2%
Total	**9,123**	**9,123**	**100.0%**

Source: Massport, HMMH 2013.

Table A-2 shows how many of the shoreline crossings from Runway 4R were above 6,000 feet. For 2012, 98.3 percent of the flights were above 6,000 feet compared to 98.4 percent in 2011. The Swampscott gate had 30.1 percent of flights above 6,000 feet compared to 34.1 percent in 2011. The number of flights through the Swampscott gate increased in 2012 (41 in 2011, up to 73 in 2012). The crossing percentage for this gate is historically lower than most gates due to its proximity to the Nahant gate itself. As seen in Figure A-1, the Swampscott gate is adjacent to the Nahant gate and aircraft would have to climb very quickly in order to be above 6,000 feet when crossing the Swampscott gate.

Table A-2 Runways 4R Shoreline Crossings Above 6,000 Feet for 2012

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Swampscott Gate	73	22	30.1%
Marblehead Gate	3,537	3,482	98.5%
Hull 2 Gate	792	792	100.0%
Hull 3 Gate	1,393	1,388	99.6%
Cohasset Gate	932	928	99.6%
Total	**6,727**	**6,612**	**98.3%**

Source: Massport, HMMH 2013.

Statistical Analyses of Flight Tracks - Runway 9

The Winthrop 1 and Winthrop 2 gates (Figure A-1) monitor early turns for departures off Runway 9. The Revere, Swampscott, or Marblehead gates monitor northbound shoreline crossings, while the Hull 2, Hull 3, or Cohasset gates monitor southbound shoreline crossings.

Table A-3 shows how many tracks turned prior to the BOS 2 DME. Northbound turns before BOS 2 DME pass through the Winthrop 1 Gate. Southbound traffic would pass through the Winthrop 2 Gate. In 2012, between both gates there were a total of 98 such turns, or less than 0.1 percent. This is similar to 2011except the number of tracks through the gates is slightly higher.

Table A-3 Runway 9 Gate Summary — Winthrop Gates 1 and 2 for 2012

	Number of Departure Tracks	Number of Tracks Through Gate	Percent Turning Before BOS 2 DME
Winthrop 1 Gate	44,951	62	<0.1%
Winthrop 2 Gate	44,951	36	<0.1%
Total	**44,951**	**98**	**<0.1%**

Source: Massport, HMMH 2013

Table A-4 indicates that 98.7 percent of Runway 9 departures were above 6,000 feet when crossing the shoreline, as compared with 98.4 percent in 2011. The number of Runway 9 departures crossing back over the South Shore decreased from 37,714 in 2011 to 33,620. A decrease in the percentage above 6,000 feet occurred at the Revere gate (48.5 percent in 2011 to 23.4 percent in 2012) and a slight decrease at the Hull 2 gate (99.1 percent in 2011 to 99.0 percent in 2012).

The number of crossings increased for the Revere gate (33 in 2011 to 47 in 2012) and the Swampscott gate (145 in 2011 to 191 in 2012). The Marblehead gate had a decrease in crossings (from 13,122 in 2011 to 12,069 in 2012), and an increase in the percent above 6,000 feet (from 98.6 percent in 2011 to 99.2 percent in 2012). Both the Hull 2 and Hull 3 gates have an increase in crossings compared to 2011. Hull 2 increased from 881 in 2011 to 1,668 in 2012 and Hull 3 increased from 2,820 in 2011 to 4,133 in 2012.While the Hull 2 crossing percentage remained almost the same as 2011, the Hull 3 gate crossings above 6,000 feet increased from 94.1 percent to 96.6 percent. The crossings through the Cohasset gate decreased (from 34,013 in 2011 to 27,819 in 2012) and the percent above 6,000 feet increased from 98.8 percent in 2011 to 99.0 percent in 2012.

Table A-4 Runway 9 Shoreline Crossings Above 6,000 Feet for 2012

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Revere Gate	47	11	23.4%
Swampscott Gate	191	156	81.7%
Marblehead Gate	12,069	11,971	99.2%
Hull 2 Gate	1,668	1,652	99.0%
Hull 3 Gate	4,133	3,994	96.6%
Cohasset Gate	27,819	27,541	99.0%
Total	**45,927**	**45,325**	**98.7%**

Source: Massport, HMMH 2013.

Statistical Analyses of Flight Tracks - Runway 15R

After takeoff, Runway 15R departures turn left approximately 30 degrees to avoid Hull, head out over Boston Harbor, and return back over the shore through the Swampscott and Marblehead Gates (Figure A-1) to the north, or through the Hull 2, Hull 3, and Cohasset Gates to the south.

Table A-5 indicates that 97.9 percent of Runway 15R departures were above 6,000 feet when crossing the shoreline, as compared with 99.4 percent in 2011. At 92.3 percent, the percent above 6,000 feet for the Swampscott Gate decreased in 2011 as it was 96.3 in 2011. The Marblehead gate had a decrease in crossings (from 1,866 in 2011 to 1,369 in 2012) and a slight decrease in the percent above 6,000 feet (from 99.8 percent in 2011 to 99.6 percent in 2012). The Hull 2 gate increased its percentage from 95.7 percent in 2011 to 100 percent in 2012, and the Hull 3 gate decreased from 92.8 percent in 2011 to 90.5 percent in 2012. The Cohasset gate had a decrease in crossings (from 4,563 in 2011 to 3,584 in 2012) and the percent above 6,000 feet decreased from 99.6 percent to 97.8 percent.

Table A-5 Runway 15R Shoreline Crossings Above 6,000 Feet for 2012

	Number of Tracks Through Gate	Number Above 6,000 ft	Percentage Above 6,000 ft
Swampscott Gate	65	60	92.3%
Marblehead Gate	1,369	1,363	99.6%
Hull 2 Gate	22	22	100%
Hull 3 Gate	220	199	90.5%
Cohasset Gate	3,584	3,504	97.8%
Total	**5,260**	**5,148**	**97.9%**

Source: Massport, HMMH 2013.

Statistical Analyses of Flight Tracks - Runways 22R/22L

The Squantum 2 and Hull 1 Gates (Figure A-1) are used to monitor the turn to 140 degrees over Boston Harbor and north of Hull. The shoreline gates are used to monitor shoreline crossings, as for Runways 4R, 9, and 15R above.

Table A-6 shows the dispersion of the jet departures from Runways 22R-22L as they pass through the Squantum 2 Gate. The first segment of the gate is the northernmost segment and is primarily over Boston Harbor. The other segments extend southward toward Quincy. The percentage of tracks passing through the first two segments of this gate dropped from 79.0 percent in 2011 to 77.2 percent in 2012. This is due to an increase in flights over the third segment from 20.9 percent in 2011 to 22.8 percent in 2012.

Table A-6 Runways 22R/22L Squantum 2 Gate Summary for 2012

	Number of Tracks Through Gate Segment	Total Number of Tracks Through Gate	Percentage of Tracks Through Gate Segment
0 - 12,000 ft	19,418	59,678	32.6%
12,000 - 14,000 ft	26,627	59,678	44.6%
14,000 - 21,000 ft	13,585	59,678	22.8%
21,000 - 27,000 ft	48	59,678	0.1%
Total	**59,678**	**59,678**	**100.0%**

Source: Massport, HMMH 2013.
Note: Percentages sum to more than 100 percent due to rounding.

Table A-7 shows that 98.9 percent of the tracks were north of the Hull peninsula as they passed through the Hull 1 Gate, which is an increase from 2011 (98.0 percent).

Table A-7 Runways 15R/22R/22L Gate Summary – North of Hull Peninsula for 2012			
	Number of Tracks Through Gate	**Number of Tracks North of Hull Peninsula**	**Percentage of Tracks North of Hull Peninsula**
Hull 1 Gate	65,797	65,081	98.9%

Source: Massport, HMMH 2013

Table A-8 indicates that 99.3 percent of Runway 22R/22L departures were above 6,000 feet when crossing the shoreline, as compared with 99.4 percent in 2011. For the Revere gate, the percent above 6,000 feet increased from 97.5 percent in 2011 to 100 percent in 2012. The Swampscott gate remained the same as 2011 at 99.5 percent. The Marblehead gate had an increase in crossings (from 14,791 in 2011 to 15,715 in 2012) and the percent above 6,000 feet remained the same as 2011 at 99.9 percent. The Hull 2 gate decreased in percent above 6,000 feet from 96.6 percent in 2011 to 95.5 percent. The Hull 3 gate decreased in percent above 6,000 feet from 96.2 in 2011 to 95.5 percent in 2012. The number of crossings for the Cohasset gate increased (34,102 in 2011 versus 35,701 in 2012) and the percentage slightly decreased from 99.3 percent in 2011 to 99.2 percent in 2012.

Table A-8 Runways 22R/22L Shoreline Crossings Above 6,000 Feet for 2012			
	Number of Tracks Through Gate	**Number Above 6,000 ft**	**Percentage Above 6,000 ft**
Revere Gate	61	61	100%
Swampscott Gate	730	726	99.5%
Marblehead Gate	15,715	15,705	99.9%
Hull 2 Gate	66	63	95.5%
Hull 3 Gate	1,841	1,758	95.5%
Cohasset Gate	35,701	35,429	99.2%
Total	**54,114**	**53,742**	**99.3%**

Source: Massport, HMMH 2013.

Runway 27

On September 15, 1996, the FAA implemented a new departure procedure for Runway 27 called the WYLYY RNAV procedure. In accordance with the provisions of the ROD issued for the Runway 27 Environmental Impact Statement (EIS), Massport has been providing on-going radar flight track data and analysis to the FAA with respect to the new procedure.

For the first time since 1997 when flight track monitoring began, each gate (Gates A-E) averaged over 68 percent for every month the Airport had all runways open and for the annual average. The percent of flight tracks through all gates (a number tracked but not required per the 1996 ROD) rounded up to 68 percent for the last two months of 2011 and continued for all of 2012. The FAA had discussed this data internally and concluded that acceptable flight track dispersion had been achieved and that no subsequent action by FAA is required per the 1996 ROD requirements[2].

Massport will continue to provide Table A-9 in the subsequent annual reports. Table A-9 presents the results for the Runway 27 corridor complied for 2012. The average percentage of tracks through the corridor was 73.9 percent, an increase from 59.6 percent for 2011 and an increase from 53.5 percent for 2010.

2 Logan Airport Runway 27 Advisory Committee Meeting - January 23, 2012 meeting minutes

Table A-9 Runway 27 Corridor Percent of Tracks Through Each Gate for 2011

Month	Total # of Tracks	Total # of Tracks Through All Gates	Percent of Tracks Through All Gates	Gate A 1,400 ft[1]	Gate B 2,200 ft[1]	Gate C 2,900 ft[1]	Gate D 4,700 ft[1]	Gate E 6,300 ft[1]	Average Percent Through Each Gate
January	843	605	71.8%	77.6%	86.7%	94.8%	97.0%	96.0%	90.4%
February	1832	1373	75.0%	79.3%	90.0%	96.1%	98.4%	96.3%	92.0%
March	1129	847	75.0%	79.5%	91.1%	96.4%	98.9%	97.3%	92.6%
April	1866	1410	75.6%	80.9%	90.2%	96.3%	98.5%	95.4%	92.3%
May	119	91	76.5%	79.8%	89.9%	93.3%	95.0%	94.1%	90.4%
June	139	100	71.9%	75.5%	82.7%	87.8%	89.2%	87.1%	84.5%
July[2]	18	5	27.8%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%
August[2]	7	0	0.0%	0.0%	0.0%	0.0%	0.0%	14.3%	2.9%
September[2]	65	38	58.5%	61.5%	72.3%	78.5%	81.5%	80.0%	74.8%
October	180	124	68.9%	73.3%	85.0%	90.0%	94.4%	93.9%	87.3%
November	1208	916	75.8%	82.4%	91.2%	96.6%	98.4%	95.7%	92.9%
December	1172	875	74.7%	80.4%	89.0%	94.3%	98.0%	97.4%	91.8%
Average[2]	**943**	**705**	**73.9%**	**78.7%**	**88.4%**	**93.9%**	**96.4%**	**94.8%**	**90.5%**

Source: Massport, HMMH 2013
Gray shading indicates the Percentage rounds up to 68% or greater.
1 Width of Each Gate in Feet.
2 Runway 33L completely closed June 16, 2012 - October 2, 2012, RSA project, reduced use of Runway 27 departures. Excluded from overall average.

Statistical Analyses of Flight Tracks — Runway 33L

The Somerville and Everett Gates (Figure A-1) extend from BOS 2 DME to BOS 5 DME and are used to monitor the departure procedure for Runway 33L. Turns to the left prior to the BOS 5 DME would pass through the Somerville Gate. Turns to the right prior to the BOS 5 DME would pass through the Everett Gate. Table A-10 shows the results of the analyses. The table indicates that in 2012 7.0 percent of tracks turned prior to reaching the BOS 5 DME. This is a decrease compared to 2011 when 8.0 percent of departures turned early before reaching 5 DME. The total number of tracks decreased from 12,894 in 2011 to 12,782 in 2012. The level of tracks in 2012 is similar to 2011 because Runway 33L was closed again for 3 months during 2012 as it was in 2011.

Table A-10 Runway 33L Gates — Passages Below 3,000 Feet for 2012

	Number of Departure Tracks	Number of Tracks Turning Before BOS 5 DME	Percentage of Tracks Turning Before BOS 5 DME
Everett Gate	12,782	119	1.0%
Somerville Gate	12,782	679	6.0%
Total	**12,782**	**796**	**7.0%**

Source: Massport, HMMH 2013